# FIX THE CITY

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The Honorable Herb Wesson, President, Los Angeles City Council

**RE: FTC COMMENT LETTER ADDENDUM 2: EXPO CORRIDOR TRANSPORTATION SPECIFIC PLAN (CF 18-0437, CPC 2013-0621-CZ-GPA-SP, ENV. 2013-0622 EIR) AND ATTACHED SUBSTANTIAL EVIDENCE**

July 30, 2018

Dear Council President Wesson and Members of the City Council:

Fix the City submits this second Addendum to its Comments on the Expo Plan. Our prior submission provided over 26,000 pages of substantial evidence supporting our arguments that infrastructure and city services are inadequate as defined by city departments. At issue is public safety and a crumbling, inadequate infrastructure that jeopardizes the safety of all Angelenos.

It is the city's legal duty to support its conclusions with substantial evidence and not argue, as it has, that it is the public's duty to provide substantial evidence.[1] However, Fix the City has provided extensive substantial evidence of inadequate fire service, rising crime rates, power blackouts, sewer, water supply, road repairs, sidewalk repairs, declining mass transit ridership and increased air pollution from transportation.

We don't ask for first-class services, we ask for adequate. Right now, no community is safe because the City Council has failed to invest in new water lines, sewer lines, repairing pot holes, building new fire stations, hiring additional firefighters and police. As a result of upzoning in the absence of adequate infrastructure, our city has the worst air and traffic in the nation.

TODs such as Expo are based on several aspirational goals: to lower auto use, to provide additional housing that may lower nearby rents (trickle-down affordable housing), and to improve GHG and air quality. A recent California Air Resources Board -financed study discussed below, provides empirical analysis of TODs in Los Angeles and San Francisco. It shows that the three goals of TODs were not achieved: traffic increases, nearby housing costs rise, and air quality declines. **Based on substantial evidence, adding additional density in the name of accommodating added population, jobs and affordable housing amounts to municipal fraud.** The current

[1] The falsely stated that "FTC has not provided new evidence to support its arguments." Letter, Planning Director Vincent Bertoni, to LA City Council, June 28, 2018, p. 1. Clearly it ignored the 26,000 pages of substantial evidence and expert testimony provided by LAFD Captain Craig Nielsen (Ret.).

General Plan Housing Element has the capacity to provide housing for increased residents and jobs, taking the current 4.3 million up to 6 million.

Finally, the TOD concept was rejected by the City Council in 2001 (it was an alternative for the General Plan Framework EIR) because it would overload the infrastructure and services of the city. Under the GPF, the City must show substantial evidence that infrastructure and city services are adequate. The City has not presented such evidence.

## FIRE SERVICE, OTHER SERVICES AND INFRASTRUCTURE ARE INADEQUATE

Substantial evidence shows that infrastructure and emergency services are not adequate. Fix the City has provided expert testimony from LAFD Capt. (Ret.) Craig Nielsen, who served for 20 years within the Expo Plan Area. Captain Nielsen's letter addressed the inadequacy of fire service in the City and in the Plan Area. Captain Nielsen is specifically knowledgeable about the delays in response time due to at-grade crossings of the Expo Line, an impact Fix the City raised, but was ignored by the City.

City reports, a Grand Jury Report, a Third-Party Report, and the 2018 LAFD Strategic Plan all provide substantial evidence that response time is not adequate. All of these documents have previously been submitted by Fix the City. The city has had a month to review them and still not provided evidence that LAFD and LAPD response time and staffing levels are adequate.

The City's claims of adequate fire and police service ignore the City's own **admission that the Expo Plan will have cumulative impacts on fire protection services** (Appendix G, p. 4). Yet the city has not analyzed those impacts or offered mitigations. Instead, it deflected by discussing project-level mitigations (sprinklers, hydrants, water pressure and access) that are code requirements for all projects in the city and not related to improvements in response time or staffing ratios, as noted in our previous comment letter. **No mitigation is proposed for cumulative impacts on fire service, nor is there a Statement of Overriding Considerations for unmitigated cumulative impacts on fire service.**

The City claims that its analysis was adequate and that it has made the required findings of adequacy.[2] That is contradicted by substantial evidence and common knowledge: Los Angeles has the worst traffic in the nation, the worst air quality, sinkholes from aging water lines, potholes and broken sidewalks, and blackouts due to

[2] Ibid.

an aging power system. **It took a 2010 ADA class action lawsuit to force the city to repair dangerous broken sidewalks.**[3] And that program will take 30 years.

**AIR QUALITY.** In addition to the ARB reports cited below, asthma is increasing[4] in Los Angeles, an indication that the City is jeopardizing public health by granting increased density over allowable level of development under the General Plan. This is exactly what the General Plan Framework promised the court and the people of Los Angeles that it would not do – endanger public health or safety.

**FIRE.** The Findings adopting the General Plan Framework state that mitigation is mandatory. The Notice of Determination for the GPF FEIR states mitigation is mandatory. Since fire service is inadequate, the **LAFD Dispatch Center map** provided by Captain Nielsen, is almost entirely colored **red.** If service were adequate, it would be mostly **green**, indicating available staff and equipment. But it is **almost all red**, signifying that there is no one available in the firehouse. Consequently, further-away stations will be required to respond and they will travel further and encounter traffic.

Adequate LAFD response time is defined by LAFD using the NFPA 1710 standard, as explained by Captain Nielsen. Response time and staffing are measures of adequacy included in the West LA Community Plan.[5] The city substitutes planning, monitoring and evaluating for adequate response times, staffing, and facilities.

The City Council, under the General Plan Framework 2.10.5, is obligated to provide adequate fire service. Fire service is not adequate as defined by LAFD, i.e., within five minutes 90% of the time for EMS, and 5:20 minutes 90% of the time for fire. The City's own consultant has confirmed that response times are inadequate. The Grand Jury has found them to be inadequate. The City Controller found them inadequate. We know of no substantial evidence that response times, facilities or staffing are adequate.

Despite extensive articles on the relationship between cardiac arrest deaths above three stories that were submitted previously by FTC, there has been no analysis of the impact of increased building heights permitted by the Expo Plan and their impact on public health and safety.

There is no way to know how many deaths have been caused by inadequate response times. EMS calls are logged, but under federal law patient information is not public record.

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[3] An agreement to resolve the Willits v. City of Los Angeles case was reached that will result in a more than $1 billion investment in city sidewalk repairs and other pedestrian improvements. ***Willits v. City of Los Angeles*** (2015).

[4] In Los Angeles County, approximately 1,221,000 children and adults have been diagnosed with asthma. Los Angeles County Asthma Profile, September 2016.

[5] WLA Community Plan, Chapter IV, p. IV-2.

**POLICE.** Police will not ride bicycles to reach emergencies. The shortage of LAPD **basic cars** has been noted by Councilmember Bonin. He is right. The people of this city need more basic cars. Under current conditions, police response times are inadequate and there is no plan to provide the number of sworn officers estimated in the GPF or the basic cars Councilmember Bonin suggested.

Instead of providing adequate policy service, residents and businesses are told to purchase a patrol service or install Ring doorbells. The message that many senior lead officers share is that we are on our own, don't expect the police to come rapidly, if at all. This is not the fault of the officers. It is the duty of the City Council to staff at a level that adequately protects the public.

## THE EXISTING GENERAL PLAN HOUSING ELEMENT HAS LARGE CAPACITY FOR NEW HOUSING

Advocates for TODs such as Expo claim that there is a huge demand for housing for increasing population and jobs and argue that the only way to accommodate the increase in population is to upzone. This is patently false. The existing General Plan can accommodate the projected SCAG population and jobs increase. ***The current General Plan Housing Element has enormous capacity for additional housing*** *units and can accommodate growth from the current 4.3 million*[6] *persons to 6 million*. Those units are by-right and do not require general plan amendments or zone changes.

As for the argument that TODs by increasing supply (of market-rate or luxury housing) will lower rents, this is disproven by the Chapple, et al., study, which found that rents go up, not down, near rail lines, mass transit ridership declines, and air pollution rises.

The City Controller's 2017 Audit of density bonuses found that only 7% of the (329 out of 4,463) affordable units in the city were built by market-rate developers.[7] The Expo Plan is for primarily market-rate housing. Given this evidence, the claims by housing advocacy groups in support of Expo are not supported by substantial evidence.

Under GPF Policy 3.3.2(b) the city must initiate a *study to determine whether additional growth should be accommodated and correlate the infrastructure and service improvements necessary to accommodate that level of growth*. There is no evidence of such an analysis and proposed mitigations beyond restriping intersections (still requiring a statement of overriding considerations) and claims that each project will mitigate its impacts on fire service. This is false. As mentioned in our first comment letter, each project will be required to provide adequate water pressure, hydrants if required, sprinkler, and access to the structures. This has nothing to do with response time.

[6] Expo FEIR p. 2-11.

[7] LA City Controller Audit of Density Bonuses, January 2017, p. 2 of 3.

The City has not provided a proposed capital budget to bring fire, police and traffic service and other infrastructure and services up to adequacy. There is no budget to begin to mitigate those impacts within 12 months.

In the absence of a mitigation plan and funding to at least begin mitigation within twelve months, the WLA Community Plan calls for halting development and downzoning (p. III-29), and the Plan's Policy 16-2.1 requires a finding of adequate infrastructure in order to approve any discretionary requests that increase density or intensity. There is no budget to mitigate the fire and police impacts for inadequate response times, the prescribed measure of adequacy per the WLA Community Plan (p. IV-2). There isn't even a statement of overriding considerations for the unmitigated cumulative impacts on fire and police response times.

Policy 3.3.2(c) states that the city "consider regulating the type, location, and or timing of development when all of the preceding steps have been completed, additional infrastructure and services have been provided, and there remains inadequate public infrastructure or service to support land use development (P42, P43)." No additional infrastructure or service are being proposed.

Typically, the City seizes upon the word "consider" and claims that the policy for mitigation is not mandatory by ignoring the requirement of providing additional infrastructure and services. No such additional infrastructure and services are offered for inadequate police and fire, traffic, air quality, etc.

GPF Findings and the legal arguments made by the city defending the GPF in the Hillside cases, clarify the mandatory nature of not increasing density without adequate infrastructure and city services.

Mitigation is not proposed on a case-by-case basis, as claimed by the city (Expo FEIR p. 2-12), but on a community plan level and citywide, with budgets for new stations, new staff, new police cars, perhaps lower bus and train fares, etc. There is no budget authorization to begin to make infrastructure and city services adequate in the next 12 months.

## NEW EVIDENCE THAT TODS LEAD TO GENTRIFICATION, DISPLACEMENT, INCREASED GHG, HIGHER RENTS AND RISING AUTO USE

A 2017 415-page study of Los Angeles and San Francisco TOD was commissioned by the California Air Resources Board, to determine if TOD developments in fact reduce greenhouse gases and air pollution or create more affordable housing. The report concluded that "market-rate infill housing can cause displacement and undermine the

goal of reducing car use."[8] "When displacement is significant enough and population density declines, regional VMT is expected to increase."[9]

Fix the City has already provided substantial evidence that public transit ridership is continuing to decline. We remain concerned that the Expo Plan will result in gentrification and displacement. "'This study…produces the strongest evidence to date of the relationship between transit-oriented development and displacement."[10] The study also found that displacement of poorer families by wealthier families leads to increased automobile use.[11] Thus the City's hopes, expectations and aspirations that TODs lead to reduced VMT is not supported.

Empirical substantial evidence from UCLA and Berkeley shows the expectation of reduced auto use is not a result of densification along rail lines. In addition, the expectation that providing market-rate or luxury housing will result in more affordable housing was shown to be false: TODs raise property values and thus rents. They do not necessarily result in more affordable housing, according to the study or reduced greenhouse gas emissions.[12]

GPF Policy 3.3.2 is a mandatory mitigation that requires keeping the LAFD Dispatch Center map green. Response times are inadequate, traffic is NOT adequate (LOS C or D as defined by the WLA Community Plan). The Expo Plan will in fact worsen traffic according to the EIR.

The rail line is not a substitute for adequate traffic levels – firefighters will not be riding Expo to reach fires or medical emergencies. And the UCLA-Berkeley study of TODs concluded that wealthier residents will use cars more than the poorer residents they are displacing. Couple that with rising, not lowering rents in the vicinity of the stations, the TOD assumption of trickle-down housing improving the affordable housing market is unsupported. In fact, the study found that rents rise adjacent to TODs.[13]

## POLICY 3.3.2 MITIGATION IS MANDATORY: THE CITY IS ESTOPPED

[8] Tim Redmond, "Dramatic new study questions transit-oriented development," 48 Hills, April 18, 2017, https://48hills.org/2017/04/dramatic-new-study-questions-transit-oriented-development/.
[9] Karen Chapple, et al, Chapter 4: "The Effects on Auto Use of Household Displacement from Rail Station Areas," **Developing a New Methodology for Analyzing Potential Displacement**, (California Air Resources Board, March 24, 2017), p. 171.
[10] Karen Chapple, et al, **Developing a New Methodology for Analyzing Potential Displacement**, (California Air Resources Board, March 24, 2017).
[11] Ibid., p. 162.
[12] Ibid., p. 171.
[13] Karen Chapple, et al, **Developing a New Methodology for Analyzing Potential Displacement**, (California Air Resources Board, March 24, 2017), p. 171.

Fix the City's challenge to approving this project rests on a legal argument that the General Plan Framework mandates balancing development with available infrastructure and public services in order to maintain adequate infrastructure and public services. Policy 3.3.2 and GPF FEIR Sections 2.10.5 and 2.11.5 are mandatory, enforceable mitigation measures adopted by the City Council on August 9, 2001.[14]

The City Council lacks authority to endanger its citizens, having already promised in 2001 to balance development with adequate infrastructure and public services, and to guarantee mitigation of development. No community plan amendments were to be permitted unless substantial evidence was provided to show that infrastructure was adequate.

That promise has been violated for decades, and the cost of this deferred mitigation, of insuring that the infrastructure is adequate and that emergency services are adequate, is staggering. It is the position of Fix the City that the City cannot lawfully approve this plan because mitigation was promised and has not been delivered. If the city provides adequate infrastructure and city services, then and only then, can it lawfully upzone. If it cannot afford to bring it up to adequacy, then it cannot upzone. The City has a choice.

Furthermore, the City told the Court in the two *Hillside Federation* lawsuits challenging the General Plan Framework, published appellate decisions, that the mitigations were mandatory and enforceable, that development would never be permitted to exceed infrastructure and public service capacities. The City is estopped from arguing that mitigations are discretionary. ***The city has a clear choice: provide adequate infrastructure and services, or don't upzone.*** Given the lack of adequate infrastructure and inadequate city services, the City, under the General Plan Framework has forfeited its right to upzone.

## POLICE RESPONSE TIME AND STAFFING ARE INADEQUATE

Yes, the city can plead poverty and not implement mitigations, but it cannot compound its failure to maintain adequate infrastructure and public services by intensifying the congestion and slowing first responders. It made a binding commitment when it adopted the GPF and its FEIR, and the findings supporting that commitment frequently repeat the non-discretionary nature of the mitigations required under the GPF. For example, the GPF Findings estimated that the city would need 17,673 sworn police officers by 2010. (GPF Findings, p. 19). It then concluded "Additionally, the Framework Element includes a policy that requires the City to correlate the type, amount, and location of development with the provision of adequate supporting infrastructure and public services." (Ibid.). There is nothing discretionary about this mitigation measure.

[14] City of Los Angeles, Notice of Determination.

The GPF promised provision of adequate infrastructure and public services. Similarly, the mitigation measures for Recreation and Open Space repeated the same language (Ibid., p. 20).

In Neighborhood Districts, the GPF anticipated that "new development would be largely in-fill and **at the same scale as surrounding structures**." (Ibid., p. 28). There is nothing in scale about the Expo Plan.

**The traffic within the Plan Area is primarily not local.** Even in 2001, over 60% of the total Vehicle Miles Traveled were from growth outside the City. (Ibid., p. 33), and this outside traffic was forecast to account for 80% of the projected increase in freeway travel by 2010 (Ibid.). Thus the expectation of reduced VMT is not supported by the external sources of traffic.

*A variation of the Expo Plan was rejected as an Alternative for the GPF because it was considered "infeasible because the permitted levels of population, employment, and housing are insupportable given current and planned levels of infrastructure and transit services."* (Ibid., p. 36). Clearly, the City was committed to growing only as much as it could provide adequate infrastructure and services; if it could not, then it could not approve increased density.

However, under the GPF and the WLA Community Plan, **discretionary increases** in density or intensity of land use, such as the Expo Plan, are only permitted if there is adequate infrastructure and city services, as defined by city departments and a WLA Community Plan finding, supported by substantial evidence, is made that infrastructure is adequate. The city's findings of adequacy, of public convenience and necessity are wishful thinking and unsupported by substantial evidence.

The Community Plans already have room to accommodate growth. But only if infrastructure and services are adequate. If funding is not available to begin to make them adequate, then moratoria and downzoning are required to maintain adequacy.[15] Updating, monitoring, evaluating are not substitutes for funding and implementing the mitigations promised to keep this city safe and livable. That is what Policy 3.3.2 mandates, and what GPF FEIR 2.10.5 and 2.11.5 require. Require is not the same as consider. The City Council is required to provide adequate infrastructure and public services, to safeguard public safety.

The Expo Plan and other transit-oriented developments make the assumption that the transit line is where people need to go, and it adopts a let-them-eat-cake approach to providing affordable housing. This plan provides a lot more density to luxury developers and relies on a trickle-down effect to make housing more affordable. This is

[15] WLA Community Plan

unsupported by substantial evidence. Based on the City Comptroller's Audit of Density Bonuses, almost all of the affordable units built in the City were built by affordable housing developers, not by luxury or market-rate developers.[16]

The city admits that this discretionary approval will increase the need for added infrastructure and city services,[17] but fails to determine if those services and infrastructure are adequate or would become inadequate. Instead, the City relies on updating plans and makes a leap of faith that facilities and services will be improved to meet demand. How well has that worked for Los Angeles? The worst traffic, inadequate response times for police and fire – telling residents to subscribe to private patrols because the police cannot get to them in time, etc. are all evidence of a city that is not meeting demand and cannot meet added demand.

Under these circumstances, and in consideration of the substantial evidence provided by Fix the City regarding first responders response times, and LOS E and F intersections, the GPF and WLA Community Plans do not permit the City Council to turn a blind eye to the lack of adequate infrastructure and city services. If it cannot afford to make them adequate, it is not permitted to make them worse through discretionary increased density or intensity. Without the budget commitment to implement the mitigations promised by the GPF in Sections 2.10.5, 2.11.5 and Policy 3.3.2, required mitigation is not offered, and no admission of inadequate infrastructure or services is made. It is implied that somehow by updating plans, that qualifies as mitigation. It does not, by definition, translate into adequacy. Planning is not a substitute for providing adequate infrastructure and public services. It is a necessary first step, but not the mandatory mitigation promised by the City Council.

Under the General Plan Framework requests for greater density or intensity of land use triggers proof of adequacy for infrastructure and city services. The proof is not dependent upon whether funding is available to make infrastructure and services adequate. If they are not adequate and funds are not available to make them adequate, then a discretionary increase density cannot be permitted. In fact, under those circumstances, the WLA Community Plan anticipates the need to impose moratoria and downzone properties.

**The City Council forfeited its discretion to approve upzoning if our street capacity is inadequate and our first responders are stuck in traffic and cannot meet the established performance standards for response time.**

The Housing Element of the General Plan provides for significant increases in housing units without any upzoning. The existing General Plan can easily accommodate more

[16] The Hon. Ron Galperin, Audit of Density Bonuses, January 2017, p.
[17] Expo FEIR p. 2-17.

housing, jobs and population throughout the city FTC has attached under separate cover maps and addresses for housing sites in the Housing Elements of the three impacted Community Plans: WLA, West Adams, and Palms-Mar Vista.

The City clearly promised mandatory mitigation. For example, when addressing mitigating Police impacts, "Additionally, the framework Element includes a policy that **requires** the City to correlate the type, amount, and location of development with the provision of adequate supporting infrastructure and public services" (Findings and SOC, p. 19).

The impacts of this alternative "would be greater for solid waste management, wastewater resources, water resources, utilities, flood control and drainage, transportation, fire/EMS, police protective services, education, libraries, recreation and open space, cultural resources, public health, geologic conditions/seismic safety, air quality, noise, and risk of upset." (Ibid.).

Keep in mind that public services were more adequate in 2001 than they are now, based on response times and traffic congestion. Thus, the impacts of upzoning in the name of a faith-based belief in transit-oriented districts would alleviate congestion, would have an even more disastrous impact on the environment now, compared with 2001.

***Transit-oriented-districts are inconsistent with the GPF because their impacts overload infrastructure and city services.*** They were infeasible because of their impacts in 2001 and they are still infeasible in 2018 for the same reasons.

**1.WATER.** The Revised GPF Findings noted that water delivery system is aging and "are need of repair or replacement." (P. 16). Since 2001 there have been chronic water main breaks and sinkholes that have become almost commonplace.

**2. POLICE**. "Based on the planning ratio standard used to determine the adequacy of the supply of sworn officers, a total of 17,673 **officers would be needed to adequately accommodate the City's 2010 average day/night population**. This is in comparison to the 8,817 sworn officers that were on the force as of 1990." (Ibid., p. 19). As of November 2016, the sworn strength of LAPD was 9,885 (LA City Councilmember Michael Bonin, **Back to Basic Car**, January 19, 2017, p. 9). Thus, the LAPD is not meeting the adequacy requirement of the GPF as defined in the Findings.

**3.RECREATION AND OPEN SPACE.** "…The Framework Element includes a policy that requires the City to correlate the type, amount, and location of development with the provision of adequate supporting infrastructure and services." (GPF Findings, p. 20).

**4. HILLSIDE 2000** decision Footnote 12 cites mandatory mitigations in GPF aside from TIMP.

**5. PROTECTION OF SINGLE FAMILY NEIGHBORHOODS in GPF and Community plans.**

**6. GPF Findings V.A.1.a.** "The Framework Element includes policies that maintain the functional role and pattern of uses of existing single-family residential areas." P. 24. "…The Framework Element allows for reductions in permitted densities through revisions to the community plans in areas where there is inadequate infrastructure or services." (Ibid., p. 25). "…The Frameworks Element's land use policies that require protection of lower-density residential neighborhoods and no adverse environmental impacts." (Ibid.)

**7. The Revised Findings and SOC for Framework** repeatedly reference **requiring** mitigations to balance infrastructure and services with increased development and include downzoning where infrastructure and services are inadequate (pp. 16 [water pipes are from 1940s and need replacement]; Police pp. 19, 20; R-1 (pp. 24, 25); pp. 27-28; 40, 41-42.

## LEGAL SETTLEMENTS FOR POTHOLES AND BROKEN SIDEWALKS ARE EVIDENCE OF INADEQUATE INFRASTRUCTURE

**Evidence of inadequate infrastructure** is excessive $200 Million legal settlements by the City of Los Angeles; "Los Angeles has spent "The surging cost of legal payouts has been a drain on the city budget as elected officials struggle to address serious challenges, including a backlog of broken streets and mounting demands to combat homelessness.""…Feuer pointed to deep cuts made during the last recession, which he said had worsened a longtime failure to properly fund street and sidewalk repairs…."[18]

**Legal payouts for 'dangerous conditions'** have rivaled and, last budget year, even exceeded the cost of lawsuits over police misconduct…." "Many cases have arisen from people wounded or killed while crossing city streets. "The surge has also included a boom in payouts tied to bicycle crashes. Seleta Reynolds, who heads the city Department of Transportation, said that until a few years ago, 'the department had not had enough of a coordinated and rigorous approach to inspecting pavement before we put in bike lanes."

"Garcetti called for the city to more than double the amount of money it spends on repairs to D- and F-ranked streets, where pavement is so damaged that it frequently needs to be rebuilt – typically at a cost of $1 million or more per lane mile." "About 25%

[18] Emily Alpert Reyes and Ben Welsh, "Soaring costs of legal payouts are a drain on L.A.'s budget," **LA Times,** June 29, 2018, pp. A1, 10.

of L.A.'s streets, or about 7,000 lane miles, are considered to be in poor condition, according to the city's most recent evaluation."[19]

The City Council forfeited its discretion to jeopardize public safety and infrastructure when it adopted the GPF with its mandatory mitigations to provide adequate emergency response times and infrastructure. One consequence of not implementing the GPF is huge legal settlements.

**TRAFFIC.** In addition to the EIR's admission that there will be an increase in VMT with the Expo Plan, there will also be increased congestion from **road diets** included in MP 2035, the Transportation Element of the General Plan. It is not clear if this additional congestion was analyzed in this EIR. Since it can reasonably be anticipated, CEQA requires this additional cause of congestion to be analyzed and mitigated, and in particular, its impacts on first responder's response times, must be identified, since the GPF FEIR 2.10.5 and 2.11.5 both mandate maintaining adequate infrastructure and public services, and the *WLA Community Plan requires adequate transportation capacity.*

The city's findings are insufficient under the WLA Community Plan's definition of inadequate traffic (LOS E and F, Goal 16, Object 16-1, Policy 16-1.1, and Objective 16-2, Policy 16-2.1, Program: "Decision makers shall adopt a finding with regards to infrastructure adequacy as part of their action on discretionary approvals resulting in increased density or intensity." (WLA Community Plan, pp, III-27-29).

Given the "acute traffic congestion" in the area, and the fact that as much as 60% of the trips are from outside the city boundaries (GPF Statement of Findings and SOC, p. 33), the finding of adequacy cannot be made. The City has failed to provide substantial evidence to support adequacy, and in fact, its Statement of Overriding Considerations for traffic congestion is evidence of **inadequate traffic capacity** in the area. There is no evidence of adequate infrastructure and adequate city services based on response time.

Normally, transportation planning starts with an origin-destination study that illuminates the routes that residents or employees will follow. There is no such empirical basis for this Specific Plan. Thus, an unsupported assumption is that the Expo Line residents and employees will need to travel in a linear manner rather than in other directions, such as the San Fernando Valley, and that in the absence of a transit system that can get people to where they actually need to go, they will drive.

[19] David Zahniser, "More needed in the pot to fix the holes," **LA Times**, June 10, 2018, pp. B1, B6.

## THE CITY'S RESPONSES TO COMMENTS ON THE GPF FEIR MAKE IT CLEAR THAT MITIGATION IS MANDATORY AND NOT PERMISSIVE

Finally, it is helpful to review some of the city's responses to comments made to the GPF DEIR that clarify that balancing infrastructure and city services with proposed increases in intensity or density was to be mandatory and not discretionary. These comments are then reflected in the GPF FEIR's mitigation sections.

"B-22 Page 2.1-129 of the DEIR [GPF] stipulates *"Require* the formulation of standards ...for mixed use structures that *mitigate the impacts* of the functional differences ... " **Under State legislation, the use of the term "require" is mandatory, not permissive**. Further, CEQA Guidelines define "mitigation" to include: "(a) Avoiding the impact altogether; (b)Minimizing the impacts ...; (c) Rectifying the impact... " The proposed mitigation measure indicates the range of considerations that should be addressed by the formulation of development standards in the City's Zoning Ordinance and Building Code. The standard for "adequacy" of the standards is the "mitigation of the *functional differences* of uses within the structure and site." Since the characteristics of mixed use structures are to be defined by the Code and not defined by the proposed project, the detail of impacts and the mitigation measure are commensurate with the definition of the project."

"Additional information regarding the use of policies as mitigation measures is presented in the response to comment W-3. W-3 In accordance with the comment, the first sentence on Page 2.1-129 of the DEIR will be revised as follows: "A diversity of policies are defined by the General Plan Framework to reduce land use impacts, as described in preceding sections." "The commenter is incorrect in stating that a "policy, in and of itself, is not a mitigation measure." The State Office of Planning and Research, in its publication preparing an Environmental Impact Report for a general Plan, states that "mitigation measures developed during the environmental review process can and should serve as the basis for policies and implementation measures (contained in the Plan)."

*As* examples of Draft General Plan Framework policies that mitigate potential environmental impact are the demand reduction programs in the Transportation chapter, policies for transitional height districts in the Land Use Chapter, and policies to maintain wastewater treatment capacity commensurate with population and industrial needs in the Infrastructure and Public Services Chapter. The role and significance of the plan's policies are reinforced by the State in its General Plan Guidelines, which defines a **"policy as a "specific statement that guides decision-making. It indicates a clear commitment of the local legislative body…it must be clear and unambiguous."**

"However, it is **understood that the uncertainties of budget could inhibit the ability to achieve a plan's policies and implementation programs**. In recognition of the statutory role of policies and any budget constraint, the "Analysis of Environmental Issues" section on Page 2.0-2 the DEIR will be revised as follows: "The Mitigation

Measures defined *by* this EIR in many instances encompass the policy contained in the proposed General Plan Framework. This fulfills the legislative intent for general plans and the CEOA process stipulating that 'mitigation measures developed through the environmental review process can and should serve as the basis for policies and implementation measures: **The inclusion of policies as environmental mitigation measures** acknowledge the role that has been defined by the Staff specifying that a **general plan's policies represent a clear commitment of the local legislative body for implementation.** For these reasons, the Policies defined as mitigation measures are assumed by the DElR to be fully implemented."

**AV-7 RESPONSE TO DRAFT GPF EIR COMMENTS.** "The comment pertains to the proposed project and does not address the analyses or findings of the DEIR. It should be noted that the Draft General Plan Framework cannot supersede or eliminate the statutory requirements of CEQA for environmental review of subsequent plans or projects."

"The comment states that the Housing/Population Class II impact should be Class I because the mitigation measures are ineffective. Please refer to the responses to comments B-22, W-3, AM-23, and D-l."

"The mitigation measures recommended in the General Plan Framework apply to development projects in the City of Los Angeles. The purpose of preparing a Program Environmental Impact Report such as this is that a Program EIR offers the advantages of preparing some of the environmental analysis uniformly for an area, recommending a consistent set of mitigation measures for various environmental impacts, avoiding repetition in analyses, and avoiding unnecessary speculation about future projects. As noted on page 1 of the Draft EIR, this EIR does not satisfy the environmental review requirements of all subsequent projects in the City of Los Angeles."

"For example, the Draft ElR examines urban design impacts of the Framework project. If a Community Plan update were to follow all of the guidelines identified by the general Plan framework without changes, further assessment of urban design impacts would probably be unnecessary. The mitigation measures identified in the Draft EIR for the General Plan Framework would be applied to the Community Plan update. If, however, a Community Plan update were not to follow the guidelines identified in the Framework, further assessment of urban design impacts would likely be required and new, additional mitigation measures applied. The same analysis logic applies to environmental analyses prepared for private development projects and all other public projects within the City of Los Angeles."

"This approach is known as 'tiering' and describes a procedure whereby each refinement of the environmental analysis results in increasingly project-specific impact assessments and mitigation measures. The tiering approach has the benefit of ensuring uniform mitigation measures for more general impacts and more tailored mitigation measures for those impacts that are project-specific. Additionally, time and effort in preparing EIRs is reduced; every EIR does not need to "reinvent the wheel".

Finally, attention is focused in later EIRs on the most project-specific impacts of a particular project."

"Thus, mitigation monitoring would be applied, as appropriate, to projects occurring within the context of the General Plan Framework. For example, some of the mitigation measures identified in the Framework Draft EIR apply to Community Plans."

D-1. "As stated on page 2.0-2 of the DEIR, Class I impacts are defined as 'Significant adverse impacts which cannot be feasibly mitigated or avoided.' Decision makers must make a Statement of Overriding Considerations under Section 15093(b) of the State CEQA Guidelines for project approval."

"In addition, CEQA states in "Section 15146 that "the degree of specificity required in an EIR will correspond to the degree of specificity involved in the underlying action which is described in the EIR." Thus, if the policies are general, as indicated by the author of the comment, the impact evaluation and mitigation measures would be defined at the same level of generality."

"With regard to the use of the proposed project's policies as mitigation measures, please refer to the response to comment BF-2."

BF-2. "Please refer to the response to comment B-6. Traffic impact evaluations conducted for the DEIR and Draft General Plan Framework were based on the accommodation of approximately 50 to 75 percent of all multi-family housing in areas designated for 'mixed use.' It should be noted that the 'mixed use' designation is not limited to lands currently planned or zoned for commercial uses, as a number of Regional and Community Centers designated on the Preliminary Land Use Diagram encompass lands currently designated for multi-family housing (e.g., Wilshire Center, Hollywood, North Hollywood, Warner Center, and Panorama City)."

"These mitigation measures would be incorporated into the EIRs prepared for Community Plans and monitored appropriately. The mitigation measures in the Framework Draft EIR that apply to development projects would be incorporated into the EIRs for those projects and monitored accordingly."

## AIR POLLUTION FROM TRANSPORTATION SOURCES IS INCREASING

A fundamental premise of the Expo Plan and the Statement of Overriding Considerations is the claim that locating increased density adjacent to transit lines will reduce air pollution, particularly, greenhouse gases. This is aspirational and unsupported by substantial evidence as required by CEQA. The SOC[20] states "The proposed Plan would be expected to contribute to decreasing regional vehicle miles traveled per capita and greenhouse gas emissions in the region over time."

[20] Expo FEIR Appendix B, Item 17, p. 42.

This is speculative and conclusory. Fix the City has provided substantial evidence (reduced mass transit ridership, increased traffic congestion, and rising air pollution levels from cars and trucks) that shows the expectation is problematic. CEQA requires substantial evidence, not expectations that are unsupported by evidence and are in fact contradicted by substantial evidence.

Adoption of a plan is not mitigation, *per se*. Plan implementation is mitigation. The city has consistently substituted aspirational statements for implementation at the expense of a crumbling infrastructure and inadequate emergency services that do not meet departmental standards of adequacy. That is because implementation requires capital resources and a comprehensive network for transportation that must compete in price, time and convenience to be competitive with the automobile. Adopting multi-modal transportation plans (i.e., bike lanes for the one percent who cycle), does not make a dent in increasing traffic gridlock and slower emergency response times.

Supporters of transit-oriented-development hitched their wagon to a belief that TOD will lower greenhouse gases and that given the option to ride mass transit, people will go to work along the transit lines. In the absence of an origin-destination study, there is no basis to assume that people who can afford to live in the mostly market-rate units will need to go to work along the transit line. The Chapple, et al, study shows that TOD gentrification and displacement leads to increased auto use.

There is also increasing evidence that mass transit ridership has continued to decline over the past few years,[21] and **transportation-generated air pollution is increasing**, not decreasing, despite TOD laws and development incentives. Unsupported by substantial evidence, TOD is a plan, a policy, a goal, an aspiration. The SOC claims that the project will "reduce(s)vehicle mode share and vehicle miles traveled per capita emissions regionally."[22]

The Expo EIR relies on the AQMP (2016) to make a claim that air quality has been thoroughly analyzed and that it "seeks to achieve multiple goals in partnership with other entities promoting reductions in greenhouse gases and toxic risk."[23] But multiple goals are not substantial evidence that the project will yield the benefits assumed by city planners, especially in the face of declining transit ridership and increasing transportation-generated air pollution.

[21] Articles and Metro reports on declining ridership were provided with FTC's first Comment Letter.
[22] Expo FEIR Appendix B, p. 41.
[23] Expo DEIR p. 4.2-12.

Recent California studies[24] indicate that **transportation-generated air pollution is increasing, not decreasing**, and constitutes the largest source of air pollution.[25] Since emissions from cars and trucks are the biggest source of greenhouse gases,[26] and those emissions are increasing, not decreasing,[27] and mass transit ridership continues to decline,[28] there is no substantial evidence to support the claim that TOD projects will lead to significant reductions in transportation-generated air pollution, as claimed by the City in the EIR and in the Statement of Overriding Considerations.[29]

SCAG's plan, based on compact development[30] for reducing air pollution is not the equivalent of delivering reduced air pollution, including greenhouse gases, because transit ridership is declining and auto and truck pollution are increasing. Empirical evidence does not support the plan's alleged benefits as claimed.

Finally, the basis for the SOC is that the City air quality plan "would be expected to contribute to decreasing regional vehicle miles traveled per capita and greenhouse gas emissions in the region over time"[31] Given empirical data of declining transit ridership and increasing transportation-generated air pollution, including greenhouse gases, there is no substantial evidence to support the conclusion that the project will benefit air quality merely because the city has a plan, a GPF alternative rejected in 2001 because it would overload infrastructure and city services. The evidence available from the state and Metro indicate that TODs are not lowering GHG. Granting a SOC for a project based on unsupported claims of air quality improvements is unlawful.

## PROCEDURAL DEFECTS

Fix the City objects to the PLUM Agenda not including CD 5 and CD 10 (7/3/18) and reminds the Council that it must send the Expo Plan back to Planning Commission per Charter Section 555, since the Council made substantial changes to the plan approved by the City Planning Commission.

## QUALIFICATIONS OF DR. LAURA LAKE

This is the second letter I have prepared for Fix the City on the Expo Plan. Attached is my c.v. as an environmental professional whose testimony has been accepted by LA

[24] https://www.arb.ca.gov/cc/inventory/data/data.htm
[25] Ibid.
[26] Tony Barboza and Julian H. Lange, "Achieving Climate goal far from ideal scenario: Vroom for improvement on car emissions," **LA Times**, July 24, 2018, pp. A1, 10.
[27] Ibid.
[28]
[29] Expo DEIR p. 4.2-12.
[30] Expo FEIR Appendix B, p. 41.
[31] Ibid., p. 42.

Superior Court as substantial evidence.[32] I have provided this analysis in a pro bono capacity as a board member of Fix the City.

Sincerely,

Laura Lake

Laura Lake, Ph.D.

Board Member, Fix the City

[32]"The court finds there is substantial evidence in the record to support a fair argument…. The evidence includes written and oral comments by Dr. Laura Lake…." *Burton Way Foundation, et al. v. City of Los Angeles, et al,* BS104256 (4/26/07).

# C.V. Laura Lake, PhD.

**Laura.Lake@gmail.com**

***Laura Lake*** *is a* former Ford Foundation program officer, retired UCLA faculty member, community advocate and author. Her testimony has been accepted in LA Superior Court as substantial evidence (***Burton Way Foundation v. City of Los Angeles***). In addition, Dr. Lake's testimony has helped to build the administrative record in several successful land-use cases: the "Catalina" case in Koreatown, and the "8150 Sunset" case requiring a street vacation. She also co-founded Friends of Westwood, and successfully challenged building by right in California (***Friends of Westwood v. City of Los Angeles,*** 1987).

She received her BA from the University of Wisconsin at Madison, where she majored in Political Science and minored in Scandinavian Studies and graduated with Honors in 1967. She serves on the Board of Visitors of the University of Wisconsin's Political Science Department.

Dr. Lake received her M.A. and Ph.D. in Political Science from Tufts University, Medford, Massachusetts, in 1972. Her Dissertation, ***Massachusetts: A Case Study of the Politics of the Environment***, was one of the first environmental politics studies, and chronicled the first Earth Celebration on the Boston Commons. Moving to New York City, Laura worked as a policy analyst for Congressman Herman Badillo's NYC Mayoral campaign and then joined the program staff of the Ford Foundation's Office of Resources and the Environment, where she initiated a program of grants to explore environmental mediation as an alternative to environmental lawsuits.

Her books include: **Environmental Mediation, the Search for Consensus** (Boulder: Westview Press, 1980). This book was followed by **Environmental Regulation: The Political Effects of Implementation** (NY: Praeger, 1982). At UCLA she collaborated with scientists and engineers on power plant siting, groundwater reclamation issues, g water standard-setting, and **The Institutional Barriers to Waste water Reuse in Southern California** (Washington D.C.: US Department of the Interior, 1988).

Dr. Lake has testified before every level of government: on Superfund cleanup before Congress, on the proposed Ward Valley Nuclear Dump near Needles (a briefing for the California Delegation), on water quality standard-setting before the California Senate Democratic Caucus, on Ward Valley before the California Senate, on the LANCER incinerator before the LA City Board of Public Works, and numerous hearings on land-use.

Dr. Lake is a past president of the National Council of Jewish Women of Los Angeles, co-founded Heal the Bay, Not Yet New York, Americans for a Safe Future, and the Coalition for Veterans Land to save the WLA VA from sale and used for direct services to Veterans. She is currently advocating to establish Mullen House, permanent supportive housing for homeless women Veterans with children who were victims of Military Sexual Trauma.

# Volume I

# Power Infrastructure – Part A

NAVIGANT

# 2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

## Power Infrastructure Report, Part A
## Volume I

**Prepared for:**
**The City of Los Angeles**

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December 8, 2015

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# Executive Summary

## Objectives & Approach

This report presents Navigant's findings on Power Infrastructure, Part A for the IEA Survey. Power Infrastructure is particularly important as LADWP enters a major transition period to simultaneously reduce greenhouse gas emissions and realize a cleaner energy future, repower in-basin units to eliminate once-through cooling, and deliver reliable electricity while supplying power to its customers at competitive prices. For the IEA Survey, Power Infrastructure encompasses:

- Power Generation Infrastructure (Part A)
- Power Transmission and Distribution (T&D) Infrastructure (Part B)

*Power Generation Infrastructure*: Part A (this report) focuses on LADWP's 2014 Integrated Resource Plan. The current and future mix of power generation resources is critical for meeting and balancing the Department's key objectives related to the reliable supply of electricity, affordable rates, and environmental stewardship. LADWP will face significant new challenges as renewable generation capacity is increased to a major portion of the resource portfolio and new demand-side resources are developed. In this report, Navigant evaluated the Department's 2014 integrated resource planning effort, including resource goals, modeling methodology, and LADWP's recommended resource portfolio.

*Power Transmission and Distribution (T&D) Infrastructure*: Part B is featured as a separate report. LADWP is contending with aging infrastructure, sub-optimal contracting processes, and budget pressures. Additionally, it must integrate increasing amounts of intermittent renewable generation resources and transformational technologies such as energy storage, electric vehicles, and other aspects of the smart grid. These challenges will put additional stress on the Department's existing T&D assets and will require further investment. Addressing these challenges while maintaining safe and reliable power supply at competitive rates requires a robust asset management function. To ensure that the Department has a sound plan to maintain, repair and replace its T&D assets, Navigant assessed the Department's approach to asset management against best practice in the power utility industry, identified gaps, and provided recommendations to address existing gaps, using primarily the 2013 Power System Reliability Program (PSRP) and the 2014 Long-Term Transmission Assessment.

Insights from interviews and supporting document review complemented these analyses. To a certain extent, this report also addresses linkages (or lack thereof) between the two Power Infrastructure areas, since best practice aligns resource planning with infrastructure asset management to ensure aging assets are replaced with infrastructure that is able to meet new system requirements and maintain reliability with a modern generation mix.

## The 2014 Integrated Resource Plan

An integrated resource plan is an electric utility's long-term plan for meeting customer loads while meeting regulatory mandates, making prudent economic decisions, and satisfying the policy and operational goals dictated by management and key stakeholders. LADWP's 2014 IRP covers the 2014-2034 period.

*Goals & Objectives*

The Department has been focused on transforming the Power System from one dominated by fossil fuel resources (low-cost but highly polluting assets) to a cleaner, more nimble generation fleet. Significant progress has been made to this end, but in 2013 coal still accounted for 42 percent of the generation mix. The IRP completed comprehensive scenario planning which lays out alternative strategies to shape the Department's resource portfolio in order to complete this major transformation over the next 20 years.

Most importantly, LADWP must comply with mandated greenhouse gas (GHG) emissions levels. Hence, the major focus in the 2014 IRP is on evaluating multiple resource strategies to reduce GHG emissions. Specific goals featured in the 2014 IRP's recommended resource portfolio are the following:

- Reduce GHG emissions 80 percent below 1990 levels by 2050
- Eliminate once-through-cooling (OTC) in coastal thermal power plants by 2029
- Eliminate coal by 2025
- Achieve 15 percent energy efficiency savings by 2020 compared to the 2010 baseline
- Meet a renewable portfolio standard (RPS) of 33 percent by 2020 and 40 percent by 2030
- Implement 506 MW of demand response capability by 2026
- Install 178 MW of energy storage by 2021 (including 24 MW by 2016 and 154 MW more by 2021)

The 2014 IRP also includes objectives to increase local (distributed) solar, electrify the transportation sector, and invest in LADWP's Power System Reliability Program (PSRP).

State mandates impact the majority of LADWP's goals in the 2014 IRP. Coal replacement, elimination of once-through cooling, reduction of GHG emissions, higher RPS, distributed solar programs, energy efficiency and demand response are all mandated in various ways in California.

- **Reduce GHG Emissions:** The California Global Warming Solutions Act of 2006 established an aggressive GHG reduction target for the State of California, which requires LADWP to reduce GHG emissions to 1990 levels by 2020. The state goal is 80 percent below 1990 levels by 2050.
- **Eliminate Once-Through Cooling and Repower In-Basin Units:** The Clean Water Act requires LADWP to eliminate OTC cooling at its in-basin power plants by 2029. In 2000, LADWP also received a Stipulated Order for Abatement to reduce local air emissions through the repowering of its less efficient in-basin generating facilities.
- **Eliminate Coal:** Senate Bill 1368 requires LADWP to end its two coal plant contracts when they expire in 2019 and 2027 because they exceed the minimum emissions standard. Above this requirement, the Department has opted for pre- end of contract replacement (2015 and 2025).
- **Increase Energy Efficiency and Demand Response:** Senate Bill 1037 and Assembly Bill 2021 require LADWP to meet its resource needs first through all cost-effective energy efficiency and demand response. This is an open-ended requirement determined by cost-effectiveness studies.
- **Meet the Renewable Portfolio Standard:** Senate Bill 2 (1X) requires LADWP to procure 25 percent of its retail sales for RPS-eligible resources in 2016 and 33 percent in 2020. Above this requirement, the Department has opted for a 40 percent RPS in 2030; however, Senate Bill 350 recently established a 50 percent RPS in 2030.
- **Increase Local Solar:** Senate Bill 1 requires LADWP to offer a solar incentive program for customer net-metered solar up to a funding cap of $313 million, and Senate Bill 32 requires LADWP to offer a feed-in tariff to buy 75 MW of electricity from eligible renewable energy

systems. Significantly above this requirement, the Department currently offers a feed-in tariff for 150 MW and will add an additional 300 MW.

- **Install Energy Storage:** Assembly Bill 2514 requires LADWP to determine an appropriate target for cost-effective energy storage on the grid. Accordingly, LADWP developed an Energy Storage Development Plan which quantified targets for the 2016 and 2020 deadlines.

The Department's goals are also driven by the core objective of "environmental stewardship exceeding all regulatory obligations."[1] Policies and positions that are non-binding, but are influential on those of LADWP's goals that go above and beyond state mandates, include the California Energy Action Plan and the California Energy Commission's Integrated Energy Policy Report. Mayor Garcetti's Sustainable City pLAn describes a vision for Los Angeles to be an environmental leader, and public feedback also made environmental concerns a top priority.

Navigant considers the Department's goals in the 2014 IRP to be in line with the policy positions of the State of California and City of Los Angeles, as summarized in the following table. LADWP's voluntary goals also contribute to meeting one crucial mandate: reducing GHG emissions 80 percent below 1990 levels by 2050 under AB 32.

**Table E-1. Summary of 2014 IRP Goals & Drivers**

| Goals | Drivers |
|---|---|
| Reduce GHG emissions 80 percent below 1990 levels by 2050 | AB 32; core objective (environment) |
| Eliminate once-through-cooling (OTC) in coastal thermal power plants by 2029 | Clean Water Act section 316(b) |
| Eliminate coal by 2025 | SB 1368; AB 32; public feedback; core objective (environment) |
| Achieve 15 percent energy efficiency improvement by 2020 | SB 1037; AB 2021; AB 32; California Energy Commission; Mayor's pLAn, public feedback |
| Meet a renewable portfolio standard (RPS) of 33 percent by 2020 and 40 percent by 2030 | SB 2; AB 32; SB 350; Mayor's pLAn; public feedback; core objective (environment) |
| Implement 506 MW of demand response capability by 2026 | SB 1037; California Energy Commission |
| Install 178 MW of energy storage by 2021 | AB 2514; Mayor's pLAn; public feedback |
| Increase local solar | SB 1; SB 32; Mayor's pLAn; public feedback |
| Electrify the transportation sector | California Energy Commission; Mayor's pLAn, public feedback |
| Invest in the Power System Reliability Program | Core objective (reliability); California Energy Commission |

*Methodology & Modeling*

As the comprehensive 20-year roadmap to guide the Power System, it is critical that the 2014 IRP be created using a robust methodology and modeling approach. The IRP conforms to best practice through its preparation by a group of engineers dedicated to resource planning who collaborate with numerous work groups and functional areas of the utility, including wholesale marketing, grid operations, renewable procurement, environmental and legislative affairs, and financial services.

For the 2014 IRP, a new IRP Advisory Committee formed the cornerstone of the public outreach process. Although it did not have approval authority, the Committee played an important role in the

[1] 2014 IRP, Executive Summary (ES-1).

development of the resource cases that were evaluated and the final selection of the recommended case. This addition, along with several other changes to public outreach, demonstrates the Department's new alignment with stakeholder best practice.

The 2014 IRP uses system modeling tools to analyze and determine the long-term economic, environmental, and operational impact of select alternative resource portfolios. The resource scenarios are selected based on LADWP goals and input from Department groups. Model assumptions change based on market conditions for fuel, resource availability and pricing, regulations, load forecasts, and system reliability needs.[2] Navigant evaluated the core assumptions informing the model, which are effectively in line with benchmarks.

- **Load Forecast:** The IRP's load forecast is a particularly important assumption because it directly impacts electricity generation required over the 20-year timeframe. Navigant performed a benchmarking study comparing LADWP's forecast with other California utilities and found that the growth rate is generally in line with the California IOUs and SMUD (until 2020). However, it does not include a sensitivity analysis for a range of load growth scenarios.
- **Fuel Prices:** Navigant compared LADWP's natural gas price forecasts to the Energy Information Administration's Energy Outlook for the Pacific region and the California Energy Commission's forecast, and found that the Department is consistent with these for the 2014-2024 period.
- **Renewable Costs:** LADWP used a base renewable portfolio levelized cost of energy (LCOE) based on recently signed power purchase agreements for large central solar, geothermal, and wind projects. Navigant compared the Department's LCOE inputs to Lazard's subsidized LCOE analysis.[3] LADWP's LCOE is consistent with Lazard for most resources, but is substantially higher for wind and LADWP-built solar, likely due to older wind projects and high labor costs.
- **Carbon Prices:** Navigant benchmarked LADWP's carbon price assumptions against an industry expert forecast range and found them to be in line with the mid scenario and the California Energy Commission's low preliminary Integrated Energy Policy Report forecast.
- **Risk Analysis:** The 2014 IRP quantifies risk associated with natural gas price volatility by modeling high and low fuel price scenarios for each resource case and integrating a natural gas hedging program. Navigant found that other risks should also be considered for a more complete model, as discussed in Section 2.3.3.

The 2014 IRP reflects the standard practices in integrated resource planning and Navigant considers it to be in line with peer and industry expectations. However, LADWP should still consider adopting IRP best practices from leading utilities, particularly for load sensitivity analysis, risk analysis, and portfolio optimization to consider lowest-cost scenarios outside of the fixed selection.

*The 2014 IRP Cases*

The Department created five cases for the 2014 IRP based on the goals and requirements above and including updated assumptions. The cases analyzed include two coal replacement cases and three renewable and energy efficiency combinations. The 2014 IRP base case includes no pre- contract end date coal replacement, a 33 percent RPS maintained through 2030, moderate energy efficiency, 500 MW of

[2]LADWP 2014 IRP, p. 133.
[3]Lazard's Levelized Cost of Energy Analysis – Version 8.0, 2014, p. 4.

local solar, and base case electrification of the transportation sector. Case 5 represents the high case, and includes pre- contract end date coal replacement, a 50 percent RPS by 2030, advanced energy efficiency, 1,200 MW of local solar, and high electrification of the transportation sector (100 percent over the base).

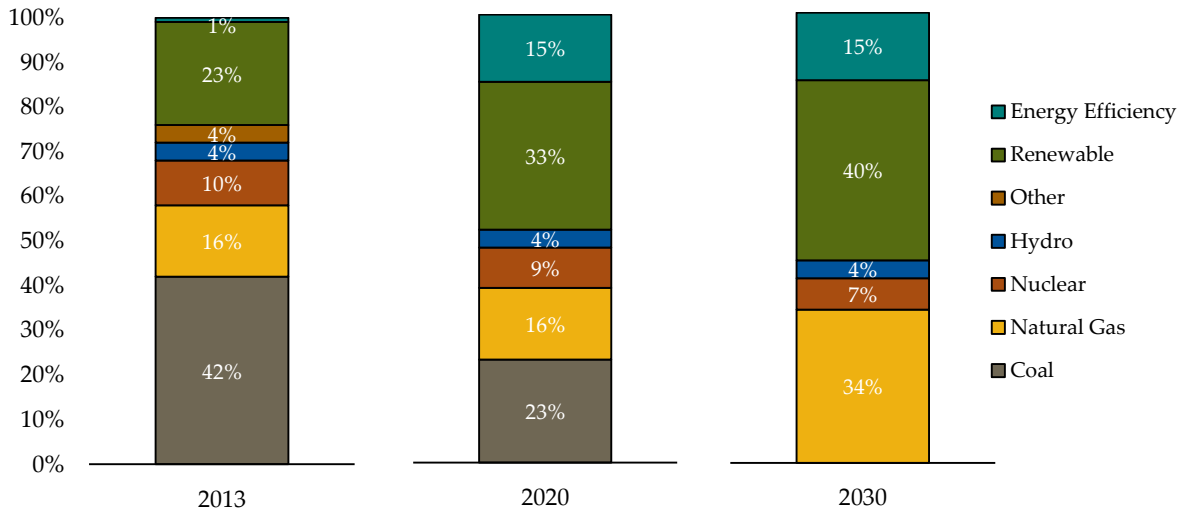
*The Recommended Strategic Case*

The Recommended Strategic Case is the preferred resource scenario selected by the Department as the basis for LADWP's supply and demand-side resource plans and programs going forward that meets its goals. Navigant comprehensively evaluated the 2014 Recommended Strategic Case, which comprises the scenarios in the following table and produces the future energy mix shown in Figure E-1.

**Table E-2. The 2014 IRP Recommended Case**

| Attribute | Case | Year |
|---|---|---|
| Coal Replacement | Navajo early divestiture<br>IPP early replacement | 2015<br>2025 |
| Energy Efficiency | 15 percent less electricity usage (2010 baseline); "advanced" | 2020 |
| RPS | 25 percent of retail electricity sales<br>33 percent of retail electricity sales<br>40 percent of retail electricity sales | 2016<br>2020<br>2030 |
| Local Solar | 800 MW | 2023 |
| Transportation Electrification | 2,344 GWh for 580,000 electric vehicles; "high" | 2030 |
| Demand Response | 506 MW | 2026 |
| Energy Storage | 178 MW | 2021 |

**Figure E-1. LADWP 2014 IRP Energy Mix**




*Source: Navigant analysis of LADWP 2015 Briefing Book*

In terms of its overall resource mix, LADWP is ahead of California for renewable energy but still relies heavily on coal for its power supply. This sets it apart from the rest of the State of California and maintains a long reliance on coal. Cost and contractual issues are the primary constraints driving this continued dependence. However, by 2030 LADWP's power portfolio is expected to eliminate coal and

more closely resemble California's. The 2030 resource mix reasonably represents LADWP's interest in becoming a leader in clean energy without deviating dramatically from the rest of the state.

Navigant evaluated the components of the Department's Recommended Strategic Case in terms of approach, current status, and future outlook.

**Greenhouse Gas Emissions:**

| | |
|---|---|
| **Approach** | Multiple activities contribute to the reduction of GHG emissions, including eliminating coal, repowering in-basin natural gas plants, and increasing renewables. The Recommended Strategic Case is designed to make progress towards the required 80 percent reduction by 2050. |
| **Status** | In 2014, LADWP's GHG emissions were 23 percent below 1990 levels. |
| **Outlook** | LADWP expects emissions to be 55 percent below 1990 levels by 2025 and 60 percent by 2030 (potentially, 74 percent by 2030 after including forecasted transportation emissions savings from fuel switching/electrification). LADWP has not yet defined a strategy to reach 80 percent. Although this is beyond the timeframe of the 2014 IRP, it is important to prepare a complete plan in the future. |

**Once-Through Cooling and Repowering:**

| | |
|---|---|
| **Approach** | LADWP is required to eliminate OTC from its coastal power plants by 2029, which is discussed in the 2014 IRP. |
| **Status** | The Department reports being on schedule: Haynes Units 5 and 6 began commercial operation in June 2013, and Scattergood 3 broke ground in June 2013 and is expected to reach substantial completion by December 30, 2015. |
| **Outlook** | LADWP appears to have made good progress on OTC and repowering. In the past two years the repowering program has been relatively in line with its overall budget. The current Scattergood Unit 3 project appears to be on scheduled based on monthly reports highlighting completed work and remaining work items by activity. |

**Coal Replacement:**

| | |
|---|---|
| **Approach** | LADWP is required to let expire contracts for power that does not meet an emissions standard. In the 2014 IRP, LADWP examined cases for divesting from and replacing two coal plants by 2015 and 2025 respectively, before contracts end. |
| **Status** | LADWP finalized the sale of Navajo Generating Station in 2015 and secured power from Apex Generating Station (natural gas) as part of the replacement. The agreement to repower the Intermountain Power Project (IPP) with natural gas has been delayed by other participants but is expected by the end of 2015, and LADWP still intends to eliminate coal in 2025. |
| **Outlook** | Repowering IPP two years before the contract ends is relatively conservative in terms of California's resource portfolio (largely divested from coal today), but may still be a challenge for LADWP because of difficulties coordinating natural gas repowering among various participants and because the Department estimates an approximately 10-year lead time for alternate replacement projects requiring new approvals, partners, and transmission assets. Having successfully sold Navajo, LADWP should now focus on other solutions for IPP. |

**Energy Efficiency:**

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|---|---|
| **Approach** | The 2013 Energy Efficiency Potential Study determined that 15 percent energy savings is feasible and cost-effective by 2020; this was adopted as the Recommended Strategic Case. |

| | |
|---|---|
| **Status** | In FY 2013-14 LADWP achieved 3.7 percent energy savings and has improved year-over-year since 2012. The Department has struggled with staffing and contracting and has not spent its program budget in recent years; however, it has been closing the gap by adjusting estimates and improving spending towards energy efficiency programs in FY 2013-14 and 2014-15. |
| **Outlook** | The current energy efficiency portfolio is cost-effective and has a business plan through 2020, in which programs collectively meet energy and societal goals. The Efficiency Solutions group has improved energy efficiency performance, but going from 3.7 percent to 15 percent by 2020 will require a serious commitment by the Department for additional staffing, procurement, and project management support. To date, LADWP has no energy efficiency goals or estimates beyond 2020 but plans to update the potential study and adopt goals in line with SB 350. |

**Renewable Portfolio Standard:**

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|---|---|
| **Approach** | LADWP plans to meet the required 33 percent RPS in 2020 and its voluntary (at the time of the 2014 IRP) 40 percent RPS in 2030 with solar PV, wind, and geothermal energy. Renewable wholesale purchases are expected to decrease. Replacing coal and increasing energy efficiency also contribute to the RPS. |
| **Status** | LADWP achieved 20 percent RPS in 2010 and has maintained this level by relying in part on wholesale renewable energy purchases and installed wind projects. Several large-scale solar PV projects have been recently completed or are under construction, but the Department has significantly underspent its capital budget in the past two years. |
| **Outlook** | Staff report that LADWP is on track to meet the 33 percent RPS by 2020. Notably, however, Senate Bill 350 increased the 2030 RPS to 50 percent which will pose additional challenges. In particular, the reliability impacts of such a high penetration of renewables are not yet fully understood. LADWP is in the process of studying these impacts and should place a high priority on finishing these studies and implementing any recommendations that result—this is critical to ensure system reliability and would follow best practice to closely link resource planning and asset management. Future plans and funding for RPS projects should be tied to the findings of these studies and the constraints identified, to ensure an integrated approach. |

**Local Solar:**

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| **Approach** | LADWP offers a Solar Incentive Program for customer net-metered solar, a 100 MW feed-in tariff Set Pricing Program (FiT 100), and a 50 MW feed-in tariff Competitive Pricing Program (FiT 50). It plans to offer a 300 MW feed-in tariff to reach 800 MW of local solar by 2023. LADWP is also developing a new Community Solar Program, which has not yet begun. |
| **Status** | Customer net-metered solar (via the Solar Incentive Program) is roughly on track with 143 MW installed. The FiT 100 has suffered from significant processing times and wait list cancellations, and although it is on the final allocation, has only installed 7.1 MW. |
| **Outlook** | Because LADWP has completed only 7.1 MW of FiT projects, it will be challenging for the Department to meet local solar targets on the timeline outlined in the 2014 IRP (2023); however, some process improvements have been made and the Department is re-assessing interest in the program after clearing inactive projects in the wait list. LADWP should continue to focus on program improvements to attract participants (including re-evaluating pricing) and project management support as needed to manage the ramp-up to the larger FiT. |

**Electrification of the Transportation Sector:**

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| **Approach** | LADWP modified the California Energy Commission's electric vehicle forecast to offer three cases in the 2014 IRP (base, medium, and high); the Advisory Committee selected the high case. |

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| **Status** | LADWP continues efforts to support its preferred electrification case through rebates and physical charging infrastructure. The Charge Up LA! Home, Work, and On the Go program offers rebates for residential and commercial chargers and the Department has installed and retrofitted over 300 chargers on City property and is in the process of installing DC fast chargers around the city. |
| **Outlook** | In 2014, Los Angeles had 11,000 electric vehicles of the 118,000 in California. The high forecast is dramatically above this number but agrees with several third-party forecasts. LADWP's current efforts only indirectly support long-term electric vehicle integration goals, so to move toward its aggressive target, the Department must create a comprehensive plan and rate design to incentivize electric vehicle charging and integrate electric vehicles with the grid. |

**Demand Response:**

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| **Approach** | LADWP created a detailed Demand Response Strategic Implementation Plan in 2013 which is featured in the 2014 IRP. The Department has begun its demand response Pilot I program for CII Curtailable Load and will implement Automated Demand Response in 2016. |
| **Status** | The first pilot program of the Plan is underway and reported to be on track. |
| **Outlook** | Pilot 2 is scheduled to roll out in 2016 and Pilot 3 in 2017. LADWP should report on program metrics and consider revising incentives and including an equipment installation incentive to encourage enough participation to meet its relatively aggressive goals. |

**Energy Storage:**

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| **Approach** | LADWP developed an Energy Storage Development Plan to procure energy storage by the state mandated dates of 2016 and 2021. The Department calculated energy storage targets using two approaches, one for selected locations and the other for the entire power system. |
| **Status** | An expansion to pumped storage at the Castaic Power Plant was completed in 2013 and a 1 MW LADWP-sited storage system was completed in June 2015. |
| **Outlook** | Scheduled projects include thermal energy storage at Valley and Apex Generating Stations, battery energy storage at several utility-scale solar PV projects, battery energy storage on the distribution system, and customer-sited thermal energy storage (LAX and large customers). At the time of this Survey, construction has not started except for the 1 MW system at the John Ferraro Building. Other projects are scheduled to be completed from 2017 to 2020. |

**Smart Grid:**

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| **Approach** | LADWP established a Smart Grid Investment Program in 2013 with 12 planned projects over the next 10 years, and is participating in the Smart Grid Regional Demonstration Program. |
| **Status** | The Department has installed 51,000 smart meters in three communities in Los Angeles. |
| **Outlook** | Advanced Metering Infrastructure is key for a number of other smart grid projects but it is unclear how LADWP intends to proceed at scale. LADWP should present its plan such that progress can be reported on a set timeline with milestones and metrics. |

## Conclusions

LADWP's 2014 IRP is a sound planning document based on Navigant's assessment of goals against regulatory mandates and policy objectives and the comparison of planning and modeling procedures to industry practices. The Recommended Strategic Case is a strong vision for the Department's future resource portfolio and LADWP has achieved a number of key accomplishments, including making significant progress towards eliminating OTC, increasing renewables, and replacing coal (the sale of Navajo Generating Station). Navigant considers the 2014 IRP to have established robust plans overall.

Certain programs do need further definition and refinement in future IRPs. For example, the plan to replace the coal-powered Intermountain Power Project (IPP) has encountered challenges due to contractual issues with other participants. After Navajo, LADWP must now take the opportunity to focus on IPP and make it a high priority to overcome these challenges with more creative replacement plans. Additionally, the Community Solar Program, demand response, and smart grid-related initiatives are early-stage programs that must be further developed. As they are, LADWP should actively communicate with stakeholders about the direction and status of the programs.

Despite the strength of the 2014 IRP as a planning document, implementation may prove to be a challenge. There are complex issues at the heart of LADWP's renewable energy and grid modernization efforts which will require careful management by the Department and City. Potential issues include maintaining power system reliability with a high penetration of renewables; requiring additional staffing resources, contracting ability, and project management; and lacking clear project metrics and oversight tying performance to rates. These areas have the potential to be significant risks.

The reliability impact of a high penetration of renewables is not yet fully understood. Goals for a high RPS and increased local solar are potentially at odds with the core objective to maintain power system reliability–at least, without careful implementation and specific, well-executed plans. The Department is currently studying this topic and will address it in more depth in the 2015 IRP update and 2016 IRP. LADWP must thoroughly understand distributed generation impacts on the reliability of the distribution system in particular, and undertake a cohesive planning effort with the PSRP. It is critical that any recommendations from these studies be implemented to ensure system operational reliability.

Most of the plans laid out in the 2014 IRP describe significant program ramp-ups over the next several years. This is also the case for the PSRP, which is discussed in the Power Infrastructure Report, Part B. However, the Department has struggled with capital underspending, reportedly due to staffing and contracting issues. Several programs have failed to achieve annual targets in recent years. These trends are a concern for LADWP's growth plans. Without sufficient support for struggling programs, there is little evidence the Department will be able to establish and maintain aggressive growth. Specifically, the Power System should meet needed staffing levels and adopt a more rigorous project management approach or hire a project management firm to support project contracting, execution, and tracking. Additionally, the Department would benefit from a review and redesign of its procurement practices. Navigant found proof of the ability to grow in the Efficiency Solutions group, which has increased staffing and spending towards the program budget—this should be emulated in other areas of the Department. Overall, the program escalation challenge is a Department-wide issue and is further discussed in the Governance report.

Capital program underspending is further complicated by opaque reporting of results and the restatement of project and annual budgets. In a number of cases, Navigant observed a lack of clarity in reporting on program progress toward specific goals and around the use of leftover funds from underspent capital programs. Complete information on the whole lifecycle of a project, including comparisons to original budgets, is often not readily available. Because achieving the clean energy transformation will come at a cost and LADWP's funding requirements will continue to increase, it is especially important to track program metrics on performance and spending. Tying progress and achievements to rates in some way would establish more transparency and accountability for the Department's budgets and plans. This would trigger more open discussions between the City and LADWP around program success and funding. For example, until the full cost of renewable integration

is fully understood, future rate increases related to new renewable generation resources should be tied to the results of such studies and phased based on the strategies adopted and progress against them.

Based on these findings, Navigant makes the following recommendations. Some are already underway, but others will require additional attention and resources from the Department and City.

High Priority Recommendations

- Formalize current IRP practices and link the IRP more closely to rates, requiring by ordinance bi-annual written updates to be submitted to the rate-approving authority reporting on key performance metrics for IRP programs and goals. Establish specific milestones for programs to be reflected in the reported metrics. In this way, the IRP will remain an engineering document produced by the Power System but also be effectively leveraged for rate decisions.
- Prepare for a significantly higher level of activity and spending in capital programs by:
    1. Ensuring that Power System divisions have the necessary staffing and contracting resources. LADWP could benefit from adopting Navigant's recommendations regarding the structural changes to hiring processes made in the *Governance* report.
    2. Adopting a more sophisticated project management business discipline with project management specialists reporting more detailed and transparent project metrics to key stakeholders on a monthly basis. Enhance tools and processes to centrally and comprehensively manage programs throughout procurement, construction, and commissioning.
- Place a high priority on completing the renewable integration reliability studies and implement critical recommendations from these studies. The Department should continuously update these studies, assess the resulting impacts on the Power System, and identify potential policy changes. Each IRP should incorporate the latest results.

Medium Priority Recommendations

- Include additional IPP replacement scenarios and updated timelines in the next IRP. LADWP should conduct an in-depth assessment of alternative non-coal scenarios, evaluate pros and cons, and present its best proposed strategy for complete IPP replacement in the 2016 IRP.
- Form a new, longer-term energy efficiency goal now that there is guidance from SB 350. Coordinate IRP modeling efforts with the Efficiency Solutions group to improve energy efficiency estimates past 2020 over the timeframe of the IRP, backed by an updated Energy Efficiency Potential Study as needed.

- Continue to prioritize finalizing new customer-focused programs (community solar, demand response, and smart grid-related programs) and as they are developed and refined, actively communicate with and hold discussions among stakeholders. Regularly communicate costs and benefits, timelines, and program milestones and include updates in each IRP.
- Conduct an assessment of the solar feed-in tariff program and make changes to support installation targets. As part of this, analyze pricing and program attractiveness to participants as well as streamline the program with process improvements.
- Create a preliminary rate design to send price signals to customers with electric vehicles. LADWP's plan to eliminate renewable overgeneration issues with electric vehicle charging will require new rates that incentivize customers to align their vehicle charging time with peak output from renewable generation. IRPs should include this work as it develops.

Low Priority Recommendations

- Include additional sensitivity and risk analysis in IRP modeling beyond fuel price scenarios and the natural gas hedging program; specifically, incorporate a load forecast sensitivity analysis with high and low scenarios, a wholesale electricity price sensitivity analysis, hydroelectric generation risk scenarios based on water availability, and unplanned thermal outage risks.
- Add a scenario optimization model to the IRP process to determine the least-cost portfolio.
- Conduct an independent third-party review of the economics of the LADWP project ownership strategy for all generation resources to determine the most cost-effective approach. For example, assess LADWP-built utility-scale solar PV projects versus third-party PPAs.
- Establish a preliminary strategy in the next IRP to reduce GHG emissions fully 80 percent below 1990 levels by 2050 and refine this strategy during annual IRP updates as conditions change.

NAVIGANT

# 1. Introduction

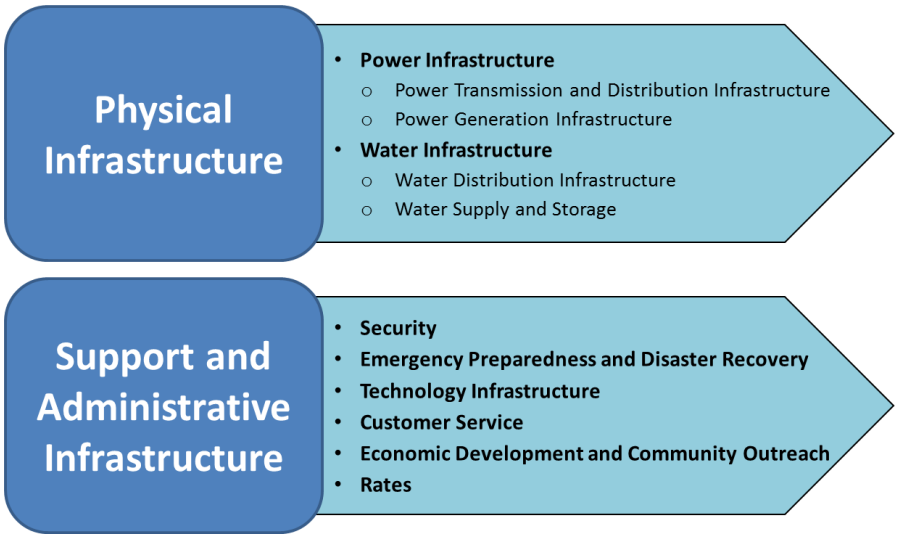
## *1.1 Study Objectives*

Section 266 of the Los Angeles City Charter requires that the City Controller conduct a Survey of the property and business of each of the City's proprietary departments, including the Los Angeles Department of Water and Power (LADWP, the Department), at least once every five years. These Surveys must be conducted jointly with the Mayor and City Council (Joint Administrators).

The 2015 Industrial, Economic and Administrative Survey (IEA Survey) of the LADWP is a comprehensive review of the strategic and operational readiness of the organization to meet critical challenges and an evaluation of current operations versus peers or leading practices. The goal of the Survey is to identify targeted recommendations for improvement through an independent and thorough series of assessments. Navigant Consulting, Inc. (Navigant) was retained to lead this effort.

For the LADWP, the most critical challenges currently revolve around power and water physical infrastructure and certain areas of administrative infrastructure. To address these, the Joint Administrators included the following focus areas in the scope of the 2015 IEA Survey:

**Figure 1-1. Focus Areas of the 2015 IEA Survey**




This report presents Navigant's findings on Power Infrastructure, Part A (Power Generation Infrastructure). Power Infrastructure is particularly important as LADWP enters a major transition period to simultaneously reduce greenhouse gas emissions and realize a cleaner energy future, repower in-basin units to eliminate once-through cooling, and deliver reliable electricity while supplying power to its customers at competitive prices.

*Power Generation Infrastructure*: The current and future mix of power generation resources is critical for meeting and balancing the Department's key objectives related to the reliable supply of electricity, affordable rates, and environmental stewardship. LADWP will face significant new challenges as

renewable generation capacity is increased to a major portion of the resource portfolio and new demand-side resources are developed. In this report, Navigant evaluated the Department's 2014 integrated resource planning effort, including resource goals, modeling methodology, and LADWP's recommended resource portfolio.

*Power Transmission and Distribution (T&D) Infrastructure*: LADWP is contending with aging infrastructure, sub-optimal contracting processes, and budget pressures. Additionally, it must integrate increasing amounts of intermittent renewable generation resources and transformational technologies such as energy storage, electric vehicles, and other aspects of the smart grid. These challenges will put additional stress on the Department's existing T&D assets and will require further investment. Addressing these challenges while maintaining safe and reliable power supply at competitive rates requires a robust asset management function. To ensure that the Department has a sound plan to maintain, repair and replace its T&D assets, Navigant assessed the Department's approach to asset management against best practice in the power utility industry, identified gaps, and provided recommendations to address existing gaps. This work comprises the Power Infrastructure, Part B report.

This Power Generation Infrastructure report focuses on the 2014 Integrated Resource Plan (IRP), while the Power T&D Infrastructure report focuses on the 2013 Power System Reliability Program (PSRP) and the 2014 Long-Term Transmission Assessment. Insights from interviews and supporting document review complemented these analyses. To a certain extent, this report also addresses linkages (or lack thereof) between the two Power Infrastructure areas, since best practice integrates resource planning with infrastructure asset management to ensure aging assets are replaced with infrastructure that is able to meet new system requirements and maintain reliability with a modern generation mix.

## *1.2 Approach*

Information for the Power Infrastructure report was derived from several primary sources:

- Interviews with LADWP Power System staff.
- Documents collected and reviewed from across the Power System including recent reports, budgets, model outputs, and other primary data provided in response to Navigant's data request.
- A literature review of California regulation, technical studies, and peer utility publications on relevant Power System topics.
- Best practices with regards to the management of T&D assets derived from Navigant's extensive experience working closely with utilities in this area.
- Navigant's experience with LADWP's prior IRPs, resource portfolios, and practices.

Navigant conducted interviews starting at the top level of Power System leadership down to expert staff on specific subjects. 3.3Appendix A contains a full description of the interviews conducted. Through a secure file share, the Department provided a total of 31 power-specific documents listed in 3.3Appendix B. The review of these documents was complemented with insights gathered from interviews with LADWP subject matter experts.

# 2. The 2014 Integrated Resource Plan

This chapter contains Navigant's assessment of the 2014 IRP. It first provides an overview of the nature of integrated resource planning and a high-level assessment of the Department's goals and its methodology for creating the 2014 IRP. Then, Navigant presents its in-depth evaluation of the 2014 Recommended Strategic Case for the future mix of power generation and related resources. The chapter is organized into the following subsections:

- Integrated Resource Planning
- Goals and Objectives
- IRP Methodology and Modeling
- The 2014 IRP Recommended Case

LADWP's goals and objectives in the 2014 IRP are discussed in terms of mandatory and non-mandatory directives; California state legislation is the primary driver for certain goals while other state and local policies influence LADWP's overall vision and voluntary goals.

In addition to goals and strategic direction, the process to create the 2014 IRP and the methods used to model the resource cases are critically important to the value of the IRP. Navigant reviewed LADWP's methodology and compared it to other utilities and best practice to further assess the quality of the plan.

The Recommended Strategic Case is the preferred resource scenario selected by the Department from a variety of options including coal replacement cases, RPS cases, energy efficiency cases, local solar cases, and electrification of the transportation sector cases. The Recommended Strategic Case is the basis for LADWP's supply and demand-side resource plans and programs going forward.

## *2.1 Integrated Resource Planning*

An integrated resource plan is an electric utility's long-term plan for meeting customer load, while meeting regulatory mandates, making prudent economic decisions, and satisfying the policy and operational goals dictated by management and key stakeholders. More specifically, an IRP is a utility's plan "for meeting forecasted annual peak and energy demand, plus some established reserve margin, through a combination of supply-side and demand-side resources over a specific future period."[4] Because an IRP is such an important planning document for electric utilities, many states and regulatory agencies require the development of an IRP before approving procurement programs or rate increases. Navigant believes the linkage between LADWP's IRP and future proposed rate actions should be tightened.

While California does not have a formal IRP requirement for its publicly-owned utilities (POUs) like LADWP, the California Energy Commission (California's primary agency for energy policy and planning) requires load-serving entities other than investor-owned utilities (IOUs) to file certain electricity resource planning information for use in the Commission's annual Integrated Energy Policy

[4]Rachel Wilson and Bruce Biewald. "Best Practices in Electric Utility Integrated Resource Planning." Synapse Energy Economics, Inc. for the Regulatory Assistance Project, June 2013 (www.raponline.org/document/download/id/6608).

Report.[5,6] IOUs are required by the California Public Utilities Commission (CPUC) to submit long-term procurement plans (LTPPs) every two years. Similar to an IRP, an LTPP must show that its proposed procurement will provide safe, reliable capacity which complies with state policies and is at the least cost to ratepayers.[7] As a POU, the LADWP must submit resource planning information to the California Energy Commission but is not required to submit an IRP or LTPP.

Instead, the Department has instituted its own annual integrated resource planning effort, with a new IRP issued every two years (even years) and updates provided in the interim years (odd years). Although voluntary, the IRP provides LADWP with a robust, evolving plan for successful integrating increasing levels of renewables, complying with greenhouse gas (GHG) emissions standards, and ensuring its infrastructure can reliably deliver electricity to customers into the future.

The LADWP 2014 Power Integrated Resource Plan (2014 IRP) serves as a comprehensive 20-year roadmap to guide the Power System in its efforts to supply reliable electricity in an environmentally responsible and cost-effective manner. The 2014 IRP was developed through a collaborative process and will be updated each year with input from customers and stakeholders. The IRP must take into account future energy demand, regulatory requirements, advances in renewable energy and other technologies, conservation and energy efficiency programs, and other factors.[8]

In particular, the 2014 IRP provides detailed analysis and results of several new resource cases. It investigates coal divestment timelines, higher levels of renewables, advanced energy efficiency, more local solar, and the electrification of the transportation sector. The IRP analyzes these cases and recommends a strategy to best meet the future electric needs of Los Angeles, using system modeling tools to determine the long-term economic, environmental, and operational impact of alternative resource portfolios. The 2014 IRP's recommended resource case is discussed in depth in this report.

## *2.2 Goals and Objectives*

The purpose of the 2014 IRP is to establish a long-term resource strategy to meet the City of Los Angeles' future energy needs at the lowest cost and risk, while being consistent with the Department's environmental priorities, reliability standards, and regulatory mandates. The 2014 IRP clearly establishes its guiding principles; as in previous IRPs, the Department prioritizes the following key objectives:




[5]Overview of California's energy policy: www.energy.ca.gov/energypolicy.
[6]California Energy Commission electricity resource plan requirements: www.energy.ca.gov/2012publications/CEC-200-2012-007/CEC-200-2012-007-SF.pdf.
[7]Long-term procurement planning requirements: www.cpuc.ca.gov/PUC/energy/Procurement/LTPP.
[8]Overview of the LADWP Integrated Resource Plan: www.ladwp.com/lapowerplan.

In addition to reiterating the importance of balancing these long-standing objectives, the Department is preparing for a major transformation over the next 20 years. Electricity will be used in new applications and be affected by increasing customer expectations of clean, affordable energy. According to the IRP's Power System Vision,

> *By increasing energy efficiency, implementing demand response, promoting solar rooftop and other clean technologies that mitigate the need to build new fossil-fueled power plants, both LADWP and its customers are embracing the vision of a greener resource portfolio that helps sustain the environment for future generations.*

Most importantly, LADWP must comply with mandated greenhouse gas (GHG) emissions levels. Hence, the major focus in the 2014 IRP is on evaluating multiple resource strategies to reduce GHG emissions.[9] These strategies are incorporated in the Department's 2014 IRP. Specific goals featured in the 2014 IRP's recommended resource portfolio are the following:

- Reduce GHG emissions 80 percent below 1990 levels by 2050
- Eliminate once-through-cooling (OTC) in coastal thermal power plants by 2029
- Eliminate coal by 2025
- Achieve 15 percent energy efficiency improvement by 2020 compared to the 2010 baseline
- Meet a renewable portfolio standard (RPS) of 33 percent by 2020 and 40 percent by 2030
- Implement 506 MW of demand response capability by 2026
- Install 178 MW of energy storage by 2021 (including 24 MW by 2016 and 154 MW more by 2021)

The 2014 IRP also includes high level goals to increase local solar, support the electrification of the transportation sector,[10] and invest in LADWP's Power System Reliability Program (PSRP).

### 2.2.1 Legislative and Regulatory Mandates

State of California mandates affect both the demand and supply side of electricity. On the demand side, California has set some of the most ambitious energy efficiency goals in the nation. On the supply side, a range of policies encouraging large-scale renewables and distribution generation, coupled with restrictions on thermal power plants emissions, are reshaping the state's electricity supply mix.

State mandates impact the majority of LADWP's goals in the 2014 Integrated Resource Plan. Coal replacement, elimination of OTC, reduction of GHG emissions, higher RPS, distributed solar programs, energy efficiency, and demand response are all mandated in various ways in California. These legislative requirements are described below along with their impact on LADWP's goals.

#### *2.2.1.1 Reduce Greenhouse Gas Emissions*

*Assembly Bill 32*

[9] "L.A.'s Power Transformation." Power System 2014 Integrated Resource Plan Public Outreach Presentation, October/November 2014.

[10] Converting gasoline and diesel-powered vehicles, light rail, docked shipping vessels, and others to electric power.

The California Global Warming Solutions Act of 2006[11,12] established a leading and progressive GHG reduction target for the State of California. The target will reduce the state's $CO_2$ emissions to 1990 levels (427 MMT $CO_2$-e) by 2020. Regulations for implementing a GHG emissions Cap and Trade program were adopted in 2011 by the California Environmental Protection Agency Air Resources Board (CARB). Enforcement and compliance began on January 1, 2013. The long-term goal of AB 32 is to reduce GHG emissions to 80 percent below 1990 levels by 2050. The table below shows CARB staff's latest recommended emissions allocation for LADWP for the 2013-2020 period.

**Table 2-1. Annual Allocation to LADWP under the Cap-and-Trade Regulation (tons $CO_2$-e)[13]**

| 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|
| **13,593,819** | 13,349,971 | 12,919,678 | 13,045,027 | 13,216,214 | 13,258,028 | 12,704,003 | 11,680,195 |

LADWP reports having already accomplished reducing its GHG emissions more than 20 percent below 1990 levels. In 2013, total $CO_2$ emissions were calculated to be 14.314 MMT, which is 3.611 MMT below 1990 levels despite net Megawatt-hour generation increasing nine percent over the period.[14] It is important to note, however, that LADWP primarily reduced its significant coal usage to accomplish this. Emissions were higher than the CARB allocation in 2013, but the 2014 IRP early coal cases reduce emissions below this level going forward to 2020 (due to divesting from Navajo in 2015). LADWP can accomplish large GHG emissions reductions compared to other California utilities, by replacing coal.

Achieving an 80 percent reduction below 1990 emissions by 2050 will require the Department to achieve an emissions level of 3.6 MMT $CO_2$-e. The resource cases discussed in the IRP approach this goal to varying degrees by 2034, but the timeframe does not extend to 2050. LADWP predicts an emissions reduction of 55 percent below the 1990 level by 2025 (9.8 MMT). It may be more of a challenge for the Department to make additional gains after eliminating coal from its portfolio

**LADWP is required to reduce GHG emissions to 1990 levels by 2020 and directed to reduce GHG emissions 80 percent below 1990 levels by 2050. This mandate drives LADWP's otherwise voluntary goals for high RPS, energy efficiency, and electrification of the transportation sector and is impacted by coal and OTC plans.**

#### *2.2.1.2 Eliminate Once-Through Cooling and Repower In-Basin Plants*

*Clean Water Act Section 316(b)*

Once-through cooling (OTC) is regulated by the Environmental Protection Agency (EPA) Clean Water Act section 316(b) and administered in California by the California State Water Resources Control Board (State Water Board). The State Water Board implemented the "Use of Coastal and Estuarine Waters for Power Plant Cooling" policy, effective on October 1, 2010, which established technology-based standards to reduce the harmful effects associated with cooling water intake structures on marine and estuarine

[11]AB 32, Nunez, Chapter 488, Statutes of 2006. Text of AB 32 available at: www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf

[12]Information from the California Environmental Protection Agency Air Resources Board: www.arb.ca.gov/cc/ab32/ab32.htm

[13]Annual Allocation to Electrical Distribution Utilities (EDU) under the Cap-and-Trade Regulation. Revised February 5, 2015 (www.arb.ca.gov/cc/capandtrade/allowanceallocation/edu-ng-allowancedistribution/electricity-allocation.pdf).

[14]2014 IRP, Appendix C. Total $CO_2$ emissions from owned and purchased generation including wholesale power sales.

life.[15] The policy was amended to include existing power plants on June 18, 2013,[16] and applies to LADWP's three coastal generating stations: Scattergood Generating Station in Playa Del Rey, Haynes Generating Station in Long Beach, and Harbor Generating Station in Terminal Island.

The Clean Water Act Section 316(b) originally required the elimination of OTC by 2020, while LADWP had sought a deadline of 2045 based on its preferred replacement cycle. The schedule was negotiated to adapt to the Department's unique system configuration and reliability requirements (no unit can be removed from service before its replacement is online, necessitating a step-wise process) and was settled at compliance in 2029.[17] Projects are underway according to the schedule.

According to Department interviews, in October the State Water Board will impose a mitigation fee for the use of ocean water, regardless of schedules to eliminate OTC. LADWP cannot accelerate the schedule due to the step-wise nature of the replacements, but fortunately does not expect a large mitigation fee.

*$NO_x$ Stipulated Order for Abatement*

In 2000, LADWP predicted that its $NO_x$ emissions from in-basin generating units would exceed its allocation of $NO_x$ RECLAIM Trading Credits issues by the South Coast Air Quality Management District (SCAQMD). SCAQMD is the air pollution control agency for the four-county region including Orange County and parts of Los Angeles, Riverside, and San Bernardino Counties.

On August 29, 2000, the SCAQMD issued a Stipulated Order for Abatement[18] that requires LADWP to reduce local air emissions through repowering of its less efficient in-basin generating facilities (Haynes and Scattergood Generating Stations). Although the Department did not actually exceed its allocation that year, LADWP and SCAQMD agreed on a schedule for repowering the in-basin units.

**LADWP is required to eliminate OTC cooling at its in-basin power plants and repower older units with more efficient turbines, according to a fixed schedule with compliance by 2029.**

#### *2.2.1.3 Eliminate Coal*

*Senate Bill 1368*

LADWP must remove its remaining two coal-fired power plants from its generation portfolio when current contracts expire. This is due to Senate Bill 1368, the California Greenhouse Gas Emissions Performance Standard Act (Perata, Chapter 598, Statutes of 2006), which required the CPUC and the California Energy Commission to implement an emissions performance standard for all retail providers of electricity.[19] SB 1368 established a standard for baseload generation owned by or under long-term contract to POUs of 1,100 pounds per megawatt-hour (the performance standard that can be achieved by gas-fired combined cycle units). Because LADWP is prohibited from entering into long-term financial

[15] www.swrcb.ca.gov/water_issues/programs/ocean/cwa316

[16] www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/otc_2014.pdf

[17] According to LADWP interviews and a proposed resolution regarding the Scattergood Generating Station Unit 3 Repowering Project, CAO File No. 0150-09704-0000.

[18] A Stipulated Order for Abatement requires a company operating out of compliance to take specific actions or to shut down its operations. This has the same legal effect as a regular Order for Abatement, with two differences: the Hearing Board is not required to find a violation of any rule or regulation, and the conditions of the order are agreed upon in advance by the parties (www.aqmd.gov/home/about/hearing-board/about-orders-for-abatement).

[19] Overview available at: www.energy.ca.gov/emission_standards.

commitments for baseload generation unless it complies with the $CO_2$ emissions performance standard, the Department may not import power from existing coal plants (they do not meet the standard) when current long-term contracts expire.

LADWP has one of the largest coal portfolios in the state, from contracts predating SB 1368 (42 percent of the energy mix in 2013). LADWP has already replaced its Navajo Generating Station (Navajo) which would have had contracts expire in 2019, and plans to not renew the coal contract for the Intermountain Power Project (IPP) in 2027. Beyond the SB 1368 emissions performance mandate, the Department opted for a voluntary pre- end of contract divestiture of Navajo (completed in 2015) and will attempt the same for IPP (in 2025). However, this time frame still lags behind the efforts of other large California utilities to eliminate coal from their portfolios and could be further scrutinized by LADWP.

Early coal replacement is strongly motivated by public support and political will; however, there are several critical operational and financial reasons for the comparatively slow removal of coal generation resources from the portfolio which will be discussed in Chapter 2.4.

**LADWP is required to eliminate its two coal plants from the generation portfolio in 2019 and 2027. Above this requirement, the Department has opted for early replacement (2015 and 2025).**

#### *2.2.1.4 Increase Energy Efficiency and Demand Response*

*Senate Bill 1037 and Assembly Bill 2021*

Senate Bill 1037 (Kehoe, 2005) directs local POUs to meet their resource needs first through all available energy efficiency and demand response resources that are cost-effective, reliable, and feasible. Assembly Bill 2021 (Levine, 2006) added to this policy by requiring each POU, beginning on or before June 1, 2007 and every three years after, to identify all potentially achievable cost-effective energy savings for the next 10-year period, establish annual targets, and report annually to the California Energy Commission.[20] Energy savings are supposed to meet the state goal of reducing energy consumption by 10 percent in 10 years.[21]

**LADWP is required to meet its resource needs first through all cost-effective energy efficiency and demand response. This is an open-ended requirement determined by cost-effectiveness studies, resulting in LADWP adopting a 15 percent energy savings goal for 2020.**

#### *2.2.1.5 Meet the Renewable Portfolio Standard*

*Senate Bill 2 (1X)*

California's Renewable Portfolio Standard (RPS) was originally established in 2002 under Senate Bill 1078, followed by Senate Bill 2 (SBX1-2, Simitian), or the California Renewable Energy Resources Act, on April 12, 2011.[22] SBX1-2 directed the California Energy Commission to set new RPS procurement targets, new renewable resource eligibility definitions, and new reporting requirements applicable to POUs. The

[20]Assembly Bill 2227 (Bradford, 2012) amended the reporting requirement to a quadrennial, rather than triennial basis.
[21]Levine, AB 2021, Chapter 734, Statutes of 2006. Full chapter text available at: www.energy.ca.gov/sb1/meetings/ab_2021_bill_20060929_chaptered.pdf
[22]SBX1-2 text available at: www.leginfo.ca.gov/pub/11-12/bill/sen/sb_0001-0050/sbx1_2_bill_20110412_chaptered.html

California Energy Commission established RPS enforcement procedures for local POUs under the California Code of Regulations, Sections 3200-3208.[23,24] Each POU is required to obtain a minimum of:

- An average of 20 percent of retail sales from renewables between 2011-2013;
- 25 percent by the end of 2016; and
- 33 percent by the end of 2020.

In 2021 and later years, all retail sellers must procure 33 percent of their retail sales from RPS-eligible resources.

The LADWP Board of Commissioners adopted a resolution on December 9, 2011 to relax the goal of a 35 percent RPS established in 2008, in order to align exactly with state requirements.[25] For the compliance period report due July 1, 2014, the Department reported to the California Energy Commission a 20.00 percent RPS for the period 2011-2013.[26]

*Senate Bill 350*

Senate Bill 350 (SB-350), the Clean Energy and Pollution Reduction Act of 2015, was approved on September 11, 2015. The bill references Governor Brown's objectives in clean energy, clean air, and pollution reduction for 2030:

- Increase the procurement of electricity from renewable sources from 33 percent to 50 percent, and
- Double the efficiency of existing buildings.

The bill differs from Governor Brown's original objectives by having eliminated the goal to reduce petroleum consumption 50 percent by 2030. In the 2014 IRP, LADWP anticipated the RPS development by including a 50 percent RPS resource case; however, it is not the recommended case.

**LADWP is required to procure 25 percent of its retail sales for RPS-eligible resources in 2016 and 33 percent in 2020. Above this requirement, the Department has opted for a 40 percent RPS in 2030; however, new legislation requires a 50 percent by 2030.**

### *2.2.1.6 Increase Local Solar*

*Senate Bill 1*

The Department's Solar Incentive Program (SIP) was established under state law and is a component of the IRP's goal to increase local solar. On August 21, 2006, Senate Bill 1 (SB 1) enacted the Million Solar Roofs Initiative and expanded the CPUC's California Solar Initiative and the California Energy

[23]Overview available at: www.energy.ca.gov/portfolio and full text at: www.energy.ca.gov/emission_standards/documents/sb_1368_bill_20060929_chaptered.pdf
[24]Chisholm, E., L. Gonzalez, A. Gould. 2013. *Enforcement Procedures for the Renewables Portfolio Standard for Local Publicly Owned Electric Utilities.* California Energy Commission. CEC-300-2013-002-CMF. (www.energy.ca.gov/2013publications/CEC-300-2013-002/CEC-300-2013-002-CMF.pdf)
[25]Los Angeles Department of Water & Power: Clean Energy Programs & Progress (http://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/Background.pdf)
[26]Local Publicly Owned Electric Utilities' Current Renewable Procurement Status. California Energy Commission. (www.energy.ca.gov/portfolio/pou_rulemaking/2013-RPS-01/POU_Reported_2011-2013_RPS_Percentage_Table.pdf)

Commission's New Solar Homes Partnership.[27] Effective 2007, POUs were required to implement solar energy incentive programs by January 1, 2008. This statewide effort is known collectively as Go Solar California and established a campaign goal of 3,000 MW of solar generating capacity with expenditures up to $3.35 billion by 2017.[28,29] In 2011, Senate Bill 585 (SB 585) amended Public Utilities Code Section 2851 to increase the total budget from $3.35 billion to $3.55 billion.[30]

SB 1 directed the California Energy Commission to establish eligibility criteria, conditions for incentives, and standard for projects applying to incentives. These are laid out in the *Guidelines for California's Solar Electric Incentive Programs*, now on its Fifth Edition.[31] SB 585 capped program funding for POUs at $784 million. POUs are also required to report on the progress of their solar incentive program to the California Energy Commission on an annual basis. As a POU, LADWP's cap for expenditure on net-metered solar energy systems over the 10-year period is $313 million (based on serving 39.9 percent of the municipal load in the state).

*Senate Bill 32 and Senate Bill 1332*

The Department's solar feed-in tariff (FiT) program was developed in compliance with Senate Bill 32 (SB 32)[32] and its successor, Senate Bill 1332 (SB 1332).[33]

SB 32 (October 9, 2009) Chapter 328 required POUs serving 75,000 customers or more to make a FiT available to owners and operators of an electric generation facility within the service territory of the utility until the utility meets its proportionate share of the statewide cap of 750 MW (for both IOUs and POUs). LADWP received a 10 percent, or 75 MW, share of the cap. Through this program, owners or operators of eligible renewable energy systems may sell their energy directly to LADWP. The purchase of qualifying energy includes all environmental attributes, capacity rights, and renewable energy credits, and therefore applies to LADWP's 33 percent by 2020 RPS. SB 1332 (September 27, 2012) updated the requirements of SB 32 to require that POUs adopt a feed-in tariff by July 1, 2013.

LADWP's 10 MW FiT Demonstration Program was the first compliance effort, launched in May 2012. On January 11, 2013 the Board of Water and Power Commissioners approved the 100 MW FiT Set Pricing Program as the first component of a 150 MW FiT.[34,35] The 100 MW FiT has been offered in 20 MW

[27]SB 1 (Murray, Chapter 132, Statutes of 2006, § 4), as codified in Public Resources Code Sections 25780-25784. A high-level overview from the California Energy Commission is accessible at: www.energy.ca.gov/sb1.
[28]Go Solar California website: www.gosolarcalifornia.ca.gov.
[29]Additional background information available at: www.energy.ca.gov/renewables.
[30]Senate Bill 585 (Kehoe, Chapter 312, Statutes of 2011) enacted on September 22, 2011.
[31]Pennington, G. William, P. Saxton, S. Neidich, S. Taheri, F. Nasim, J. Folkman. 2013. *Guidelines for California's Solar Electric Incentive Programs (Senate Bill 1), Fifth Edition.* California Energy Commission. CEC-300-2013-008-ED5-CMF. (www.energy.ca.gov/2012publications/CEC-300-2012-008/CEC-300-2012-008-ED5-CMF.pdf)
[32]SB 32 text available at: www.leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sb_32_bill_20091011_chaptered.html.
[33]SB 1332 text available at: www.leginfo.ca.gov/pub/11-12/bill/sen/sb_1301-1350/sb_1332_bill_20120927_chaptered.html.
[34]www.ladwp.com/fit
[35]www.labusinesscouncil.org/LargestintheNation-Feedin-Tariff-Solar-Program-Kicks-Off

allocations, or tranches, every six months starting in February 2013. The remaining 50 MW was bundled with a large, utility-scale solar project (Beacon Solar).

**LADWP is required to offer a solar incentive program for customer net-metered solar up to a funding cap of $313 million, and is also required to offer a feed-in tariff to buy 75 MW of electricity from eligible renewable energy systems. The Department currently offers a feed-in tariff for 150 MW and will add an additional 300 MW, going significantly above requirements.**

#### *2.2.1.7 Add Energy Storage*

*Assembly Bill 2514*

Assembly Bill 2514 (Skinner, Chapter 469, Statutes of 2020),[36,37] amended by Assembly Bill 2227, requires California utilities to incorporate energy storage into the grid. The legislation considers energy storage to be capable of reducing GHG emissions; reducing peak demand; deferring or eliminating investments in generation, transmission, or distribution assets; and improving the reliable operation of the grid.

By March 1, 2012, the governing board of each POU was required to initiate a process to determine appropriate targets, if any, for the utility to procure viable and cost-effective energy storage systems. Energy storage systems are to be achieved by the utility by December 31, 2016 and December 31, 2020.

**LADWP is required to determine an appropriate target for cost-effective energy storage on the grid. Accordingly, LADWP developed an Energy Storage Development Plan which sets a target of 24 MW by the end of 2016 and an additional 154 MW by the end of 2021.**

### 2.2.2 Policy and Strategy

As described above, the Department's goals are heavily influenced by compliance with state regulations. However, in the 2014 IRP they are also largely driven by the core objective of "environmental stewardship exceeding all regulatory obligations."[38] The Department and City of Los Angeles leadership have been relatively progressive in adopting clean energy goals and programs before formal laws and regulations are in place. For example, in 2005 the Department adopted a renewable procurement target of 20 percent by 2010 (which it accomplished). And with 132 MW of solar PV by the end of 2013, Los Angeles was the top city in the nation for installed solar capacity at the time. However, those accomplishments are tempered by the continued reliance on coal resources for the next decade.

The following policies and positions are non-binding but influential on those of LADWP's goals that go above and beyond state mandates, in line with its core environmental objective.

#### *2.2.2.1 State of California Energy Action Plan*

In 2003, the California Public Utilities Commission, the California Energy Commission, and the California Power Authority adopted an *Energy Action Plan* which established a unified approach to

[36]AB 2514 – Energy Storage Procurement Targets from Publicly Owned Utilities, California Energy Commission (www.energy.ca.gov/assessments/ab2514_energy_storage.html).
[37]Full text available at: leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200920100AB2514.
[38]2014 IRP, Executive Summary (ES-1).

meeting California's electricity and natural gas needs. The latest version, an update from 2008 in the wake of Assembly Bill 32 (the California Global Warming Solutions Act of 2006), examined the state's ongoing actions in the context of global climate change and established a number of key positions still relevant for California utilities:[39]

1. California must act to decrease its GHG emissions to reduce the impact of climate change.
2. California's programs are, in large measure, motivated by concerns about the environment.
3. Energy efficiency is a zero-emissions and least-cost strategy, and meeting AB 32 goals will require unprecedented levels of energy efficiency investment.
4. Emissions reduction mandates require the consideration of more demand response options.
5. Renewable energy policy is a cornerstone of our approach to reducing GHG emissions in the electricity sector.
6. As California seeks a cleaner energy future, it still has responsibility to ensure the reliability of the system using conventional power plants and transmission and distribution infrastructure.
7. One of the most promising options for reduction in GHG emissions from the transportation sector involves the increasing penetration of plug-in hybrid electric and all-electric vehicles.

These priorities, though they have evolved to a certain extent since 2008, are reflected in LADWP's current goals.

#### *2.2.2.2 Integrated Energy Policy Report*

Senate Bill 1389 (Bowen, Chapter 568, Statutes of 2002) requires the California Energy Commission to prepare a biennial Integrated Energy Policy Report (IEPR) that assesses major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors. The report also provides policy recommendations to conserve resources, protect the environment, ensure reliable, secure, and diverse energy supplies, enhance the state's economy, and protect public health and safety.

The latest full report was the 2013 Integrated Energy Policy Report,[40] which provides the California Energy Commission's assessment of a wide range of energy issues facing the state. The report re-iterates the state's "loading order" prioritizing energy efficiency and demand response for meeting California's energy needs. Renewable energy is another of California's top priorities and is next in the loading order, along with distributed generation. These priorities become even more important in the context of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050. As an overall snapshot of California's energy, these are mostly reflected in state mandates and hence in LADWP's requirements.

One point to highlight in the 2013 IEPR is that to help ensure progress toward its 2050 greenhouse gas reduction goals, California needs to determine what the electricity system should look like in 2030 (as an interim target). This concept is important and will be discussed further later in the Survey report.

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[39]2008 Update to the Energy Action Plan available at: www.energy.ca.gov/2008publications/CEC-100-2008-001/CEC-100-2008-001.PDF.

[40]California Energy Commission. 2013. *2013 Integrated Energy Policy Report*. Publication Number: CEC-100-2013-001-CMF. Available at: www.energy.ca.gov/2013publications/CEC-100-2013-001/CEC-100-2013-001-CMF-small.pdf.

The most recent update to the IEPR[41] was published following Governor Brown's inaugural address on January 5, 2015, which proposed three ambitious goals:

1. Increase from one-third to 50 percent our electricity derived from renewable sources,
2. Reduce today's petroleum use in cars and trucks by up to 50 percent, and
3. Double the efficiency of existing buildings.

Accordingly, the 2014 IEPR Update focuses on next steps for transforming transportation energy use in California, and highlights the importance of incentives in helping speed this transition. The California Energy Commission maintains that, "To meet California's climate and clean air goals, a transformation of the transportation system to zero- and near-zero technologies and fuels is needed."

The 2014 IEPR Update describes the plug-in electric vehicle (PEV) market in California, which continues to grow dramatically. In 2013, PEV sales were triple 2012 levels, and as of December 2014 more than 118,000 PEVs were sold in California, representing about 40 percent of national PEV sales. However, the Commission identifies electric vehicle charging infrastructure deployment as an ongoing challenge. Continued strategic investments in charging infrastructure at residential, workplace, multi-unit dwellings, and public sites along with regional readiness plans will be needed to continue advancing the adoption of PEVs. Greater attention to vehicle and electric grid integration will be needed as well.

The 2014 IEPR Update supports LADWP's focus on the electrification of the transportation sector. It also highlights the same recommendations that will be made by Navigant in this Survey; specifically, to develop detailed electric vehicle charging plans and further study vehicle-to-grid integration.

#### *2.2.2.3 The pLAn: Transforming Los Angeles*

On the city level, Mayor Eric Garcetti's Sustainable City pLAn describes a vision for Los Angeles to be a leader in the environment. The pLAn is intended to be a comprehensive and actionable directive for the city to move toward a sustainable future, and the Mayor's Office intends to use it as a tool for managing the city. City departments including LADWP will report to the Mayor's Office of Sustainability on progress implementing the pLAn's initiatives. Outcomes set forth in the pLAn relating to the power system are summarized in the table below.

**Table 2-2. Outcomes of the Mayor's pLAn**

| | 2017 | 2025 | 2035 |
|---|---|---|---|
| **Local Solar** | 400 MW<br>1 MW solar on LA Convention Center | 900-1,500 MW | 1,500-1,800 MW |
| **Energy Storage** | 24 MW (excluding the 1,500 MW Castaic Plant) | 1,654-1,750 MW (including Castaic) | - |
| **Energy Efficiency** | Expand the Better Buildings Challenge to 60 million square feet and avoid 1,250 GWh of energy use | Energy use per square foot 14 percent below the 2013 baseline for all building types | Energy use per square foot 30 percent below the 2013 baseline for all building types |

[41]California Energy Commission. 2015. *2014 Draft Integrated Energy Policy Report Update*. Publication Number: CEC-100-2014-001-CMF. Available at: www.energy.ca.gov/2014publications/CEC-100-2014-001/CEC-100-2014-001-CMF-small.pdf.

| | | | |
|---|---|---|---|
| **GHG Emissions** | Pathway to achieve 50 percent renewable electricity by 2030 | 45 percent below 1990 baseline<br>Completely divested from coal power plants | 60 percent below 1990 baseline |
| **Electrification** | 1,000 new publicly available EV charging stations | 10 percent of all light-duty passenger vehicles electric or zero emission (~250,000) | 25 percent of all light-duty passenger vehicles electric or zero emission (~625,000)[42] |

An overall energy efficiency goal also aligns with LADWP's: using energy efficiency to deliver 15 percent of projected electricity needs by 2020 (like the 2014 IRP, the pLAn cites the 2013 Energy Efficiency Potential Study which is described in more detail in Section 2.4.5).

The pLAn also calls for a revised IRP that includes the Mayor's long-term local solar goals. The new scenario (in a 2015 update or 2016 IRP) would include an analysis of reliability, pricing, overall greenhouse gas reductions, future RPS regulatory targets and definitions, and the potential need to shift away from planned investments in fossil fuel power generation. It would incorporate technical studies on increased renewable penetration, integration technologies, energy storage, and transportation electrification. While the 2014 IRP partly meets these expectations, the Department is working on new technical studies to address several of these topics. Navigant agrees that increased renewable penetration and impacts on reliability are particularly important topics and should be top priorities.

Overall, although certain goals (such as the amount of local solar) are not identical between the pLAn and the 2014 IRP, the strategic direction is closely aligned.

#### *2.2.2.4 Los Angeles Public Feedback*

As a municipal utility, LADWP is accountable to the people of the City of Los Angeles. Hence, it is also extremely important for the Department to consider feedback from customer-citizens in the adoption of its goals. The comments in the table below were synthesized from public outreach efforts during the formation of the 2014 IRP.

**Table 2-3. 2014 IRP Public Outreach Workshop Comments**

| Integrated Resource Plan | Comments |
|---|---|
| **Natural Gas** | Decrease natural gas (environmental concerns and cost risk) |
| | Consider other technologies to replace natural gas |
| **Renewables** | Strong support for 50 percent RPS with increased electrification of the transportation sector and local solar |
| **Energy Efficiency** | Maximize Energy Efficiency beyond 2020 |
| | Implement EE educational programs to promote EE |
| | Provide an EE Home Assessment Program |
| **Local Solar** | Streamline the solar permitting process |
| | Expand community solar |
| | Increase local solar |

[42]There are approximately 2.5 million private cars in Los Angeles, according to the Luskin Center for Innovation at UCLA (innovation.luskin.ucla.edu/news/complete-streets/reports-analyze-electric-vehicle-charging-los-angeles).

| | |
|---|---|
| **Energy Storage** | Increase energy storage to assist with renewables |
| | Strong support for higher RPS cases w/Energy Storage |

Of the more vocal stakeholders that participated in the Department's public outreach, environmental concerns were clearly a top priority. Participants pushed LADWP to develop a 50 percent RPS and decrease natural gas generation. The 2014 IRP includes a scenario for 50 percent RPS and also increasing levels of local solar, doing a reasonable job of providing options among which Los Angeles can choose. It did, however, take a more conservative approach to eliminating coal from the generation portfolio and does not have plan to decrease natural gas in its preferred scenario (this would be operationally very difficult based on resource adequacy and flexibility).

Additional commentary concerning the Department's outreach efforts can be found in the IEA Survey's report on Economic Development and Community Outreach.

### 2.2.3 Conclusions on the Goals and Objectives

Navigant considers the Department's goals in the 2014 IRP to be largely in line with the regulations and policy positions of the State of California and City of Los Angeles, with the exception of the prolonged use of coal as a generation fuel.[43] Most of the resource portfolio in the 2014 IRP is in fact driven by legislative and regulatory mandates in California, as described in the sections above and shown in

Table 2-4, below. Several components, including the 40 percent RPS and increased local solar, are voluntary goals clearly motivated by City policy and stakeholder input.

**Table 2-4. Summary of 2014 IRP Goals & Drivers**

| Goals | Drivers |
|---|---|
| Eliminate coal by 2025 | SB 1368; AB 32; public feedback; core objective (environment) |
| Eliminate once-through-cooling (OTC) in coastal thermal power plants by 2029 | Clean Water Act section 316(b) |
| Reduce GHG emissions 80 percent below 1990 levels by 2050 | AB 32; core objective (environment) |
| Meet a renewable portfolio standard (RPS) of 33 percent by 2020 and 40 percent by 2030 | SB 2; AB 32; SB 350; Mayor's pLAn; public feedback; core objective (environment) |
| Achieve 15 percent energy efficiency improvement by 2020 | SB 1037; AB 2021; AB 32; California Energy Commission; Mayor's pLAn, public feedback |
| Implement 506 MW of demand response capability by 2026 | SB 1037; California Energy Commission |
| Install 178 MW of energy storage by 2021 | AB 2514; Mayor's pLAn; public feedback |
| Increase local solar | SB 1; SB 32; Mayor's pLAn; public feedback |
| Electrify the transportation sector | California Energy Commission; Mayor's pLAn, public feedback |
| Invest in the Power System Reliability Program | Core objective (reliability); California Energy Commission |

In most areas where the IRP goes beyond state mandates, feedback from Los Angeles citizens appears to be the main driver. In addition to the alignment with City and stakeholder positions, LADWP's voluntary goals all contribute to meeting one important goal: reducing GHG emissions below 80 percent of 1990 levels by 2050.

[43]Several other POUs are actually in the same situation, which will be discussed in a later section (Section 2.4.3).

One critique is that although the Department's goal for energy efficiency meets California's requirement for all cost-effective energy efficiency at this time (as determined by the 2013 cost-effectiveness study) and the Department has met its 10-year reporting requirement to the California Energy Commission, the energy efficiency goal ends in 2020 and makes no progress over the rest of the IRP period. Navigant recommends that a future IRP in the next few years extend energy efficiency goals past 2020—an improvement the Department reports that it is already intending to make. The City may also further consider how the energy efficiency portfolio of programs reflects its goals; for example, typically 20 percent of programs provide 80 percent of energy savings—making them by far the most cost-effective—but other programs are included to serve all customers equitably and support local job creation.

After reviewing the goals and determining them to be in line with regulatory mandates and the City's and public's objectives, Navigant identified potential issues with the Department's ability to accomplish certain goals which will be discussed in Chapter 2.4. One issue is that goals for a high RPS and increased local solar may be at odds with the core objective to maintain power system reliability – at least, without careful implementation and specific, well-executed plans. The reliability impacts of a high penetration of renewables are not yet fully understood. LADWP is currently studying this topic and will address it in more depth in the 2015 IRP update and 2016 IRP. It is critical that any recommendations from these studies be implemented to ensure system reliability.

Navigant also notes potential tension between the goals of the 2014 IRP and the Department's core objective of competitive electric rates consistent with sound business principles. Specifically, achieving the clean energy transformation while maintaining power system reliability will come at a cost and LADWP's funding requirements are likely to continue to increase. The City of Los Angeles should consider an ordinance requiring a formal update to the IRP to be submitted with any proposed rate action. In addition, the ordinance should call for annual written updates on key performance metrics tied to IRP programs and goals. This should include the costs of changes to LADWP's reliability infrastructure to accommodate the IRP's generation mix. Tying progress and achievements more closely to budget-setting and to rates would establish more transparency and accountability for the IRP.

## *2.3 IRP Methodology & Modeling*

As the comprehensive 20-year roadmap to guide the Power System, it is critical that the 2014 IRP be created using a robust methodology and modeling approach. The decisions leading to the 2014 Recommended Case must be founded in stakeholder input, up-to-date information, and good modeling practices. This section investigates the Department's approach to the formation of the 2014 IRP.

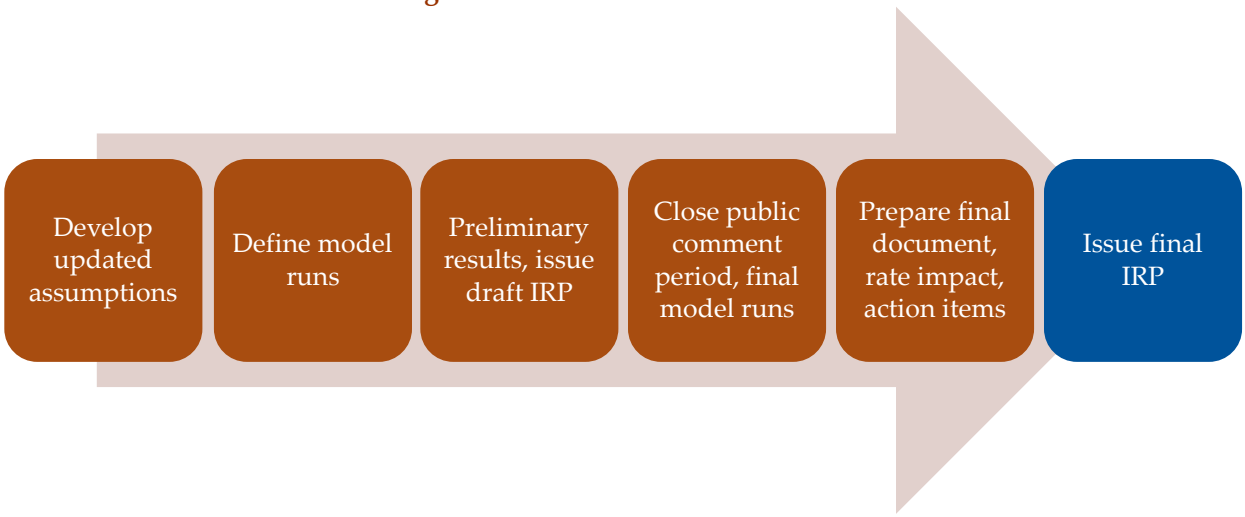
### 2.3.1 Development Process

LADWP's general sequence to develop the 2014 IRP was the following:

1. Gather stakeholder input
2. Establish clear goals and objectives
3. Identify and improve key assumptions
4. Establish strategic case alternatives
5. Conduct computer modeling of Power System operations
6. Present preliminary findings and gather internal and public comments
7. Recommend and approve a preferred resource case

The figure below depicts LADWP's 2014 IRP process flow chart for the modeling and IRP preparation.

**Figure 2-1. LADWP 2014 IRP Process**




The IRP is prepared by a group of engineers and professionals dedicated to resource planning who collaborate with numerous work groups and functional areas of the utility, including wholesale marketing, grid operations, renewable procurement, environmental and legislative affairs, and financial services. Modeling assumptions and case alternatives were approved by an internal IRP Steering Committee consisting of Power System Division and Section Managers.

For the 2014 IRP, a new IRP Advisory Committee formed the cornerstone of the public outreach process. Although it did not have approval authority, the Committee played an important role in the development of the resource cases that were evaluated and the final selection of the recommended case. The Committee was facilitated by the Power System and represented a range of stakeholder representatives including: Los Angeles City Council and Mayor's Office, Neighborhood Councils, the environmental community, Premier Account Customers, the business community, and academia. The Ratepayer Advocate of the Office of Public Accountability also attended as an observer. The IRP Advisory Committee met five times during the 2014 IRP process, including a kick-off meeting to begin updating assumptions and a meeting at each of the first three process steps in Figure 2-1, above.

In addition to the IRP Advisory Committee, the Department held three public outreach workshops in October and November 2014. The draft IRP was also made available for public comment on the LADWP website through the end of November 2014.

From the 2013 IRP development process to 2014, LADWP made several changes, including:

- New IRP Advisory Committee
- Energy Efficiency Potential Study (2013) recommendation adopted
- New Demand Response Implementation Plan (2014)
- Energy storage targets adopted
- New Power System Reliability Program
- Updated electric vehicle load growth based on the California Energy Commission's 2013 Integrated Energy Policy Report
- Updated natural gas prices and renewable energy costs

- Revised strategic case scenarios based on input from the 2014 IRP Advisory Committee

It is considered best practice for an IRP process to include meaningful stakeholder engagement; the utility should create and share the resource plan with stakeholders.[44] Convening a stakeholder advisory group, holding public meetings that are open to all interested parties, and providing a public draft are all elements of this process. These changes demonstrate the Department's new alignment with best practice in this regard.

### 2.3.2 Resource Cases

New resource cases in the 2014 IRP include higher levels of renewables, advanced energy efficiency, increased local solar, and greater electrification of the transportation sector. The IRP also includes an expanded Power System Reliability Program to incorporate not only electric distribution, but also generation, transmission, and substations.

The following are the resource cases in the 2014 IRP, based on the Department's determination of resource cases to meet goals, regulatory mandates, and power system requirements:

*Early Coal Replacement*

1. Navajo Generating Station (NGS): 2015 (early) or 2019 (mandatory)
2. Intermountain Power Project (IPP): 2025 (early) or 2027 (mandatory). Not considering 2020 in this IRP.

*Higher Levels of Renewable Portfolio Standards*

1. 33 percent by 2020 and maintained through 2030
2. 40 percent by 2030
3. 50 percent by 2030

*Advanced Energy Efficiency*

1. 10 percent EE savings by 2020
2. 14.8 percent EE savings by 2020

*Higher Levels of Local Solar*

1. 500 MW
2. 800 MW
3. 1,000 MW
4. 1,200 MW

*Electrification of the Transportation Sector*

1. Base case: California Energy Commission's 2013 Integrated Policy Report (127,000 plug-in electric vehicles by 2020 and 290,000 by 2030)
2. Medium case: 150 percent of the base case (190,000 plug-in electric vehicles by 2020 and 435,000 by 2030)

[44]Rachel Wilson and Bruce Biewald. "Best Practices in Electric Utility Integrated Resource Planning." Synapse Energy Economics, Inc. for the Regulatory Assistance Project, June 2013.

3. High case: 200 percent of the base case (253,000 plug-in electric vehicles by 2020 and 580,000 by 2030)

Alternative strategic cases assess different replacement options for coal-fired generation, as well as different projected levels of renewable portfolio standard (RPS), energy efficiency, and local solar. Cases with higher levels of RPS include high fuel switching/electrification of the transportation sector with higher expected load growth.

Candidate portfolios were modeled and case results were analyzed and compared to evaluate environmental benefits and cost impacts (total million metric tons of $CO_2$ emissions and the average incremental dollars per megawatt-hour cost). High and low scenarios based on fuel prices were also modeled for several cases, including the final recommended case, to quantify the risk associated with fuel price volatility.

### 2.3.3 Modeling Assumptions

#### *2.3.3.1 Resource Model*

The 2014 IRP uses system modeling tools to analyze and determine the long-term economic, environmental, and operational impact of alternative resource portfolios by simulating the integration of new resource alternatives within the existing mix of assets and providing the analytic results to inform the selection of a recommended case.

LADWP chose a widely used and industry accepted hourly chronological unit commitment and dispatch model to simulate the power system under different scenarios: Planning & Risk (PaR) model using the PROSYM algorithm.

#### *2.3.3.2 Load Forecast*

The IRP's load forecast is a particularly important assumption because it directly impacts electricity generation required over the 20-year timeframe. Navigant performed a benchmarking study comparing LADWP's load forecast with other California utilities. The analysis includes Pasadena Water and Power (PWP), Pacific Gas & Electric (PG&E), San Diego Gas & Electric (SDG&E), Southern California Edison (SCE), Sacramento Municipal Utility District (SMUD), and PacifiCorp in its California service territory.

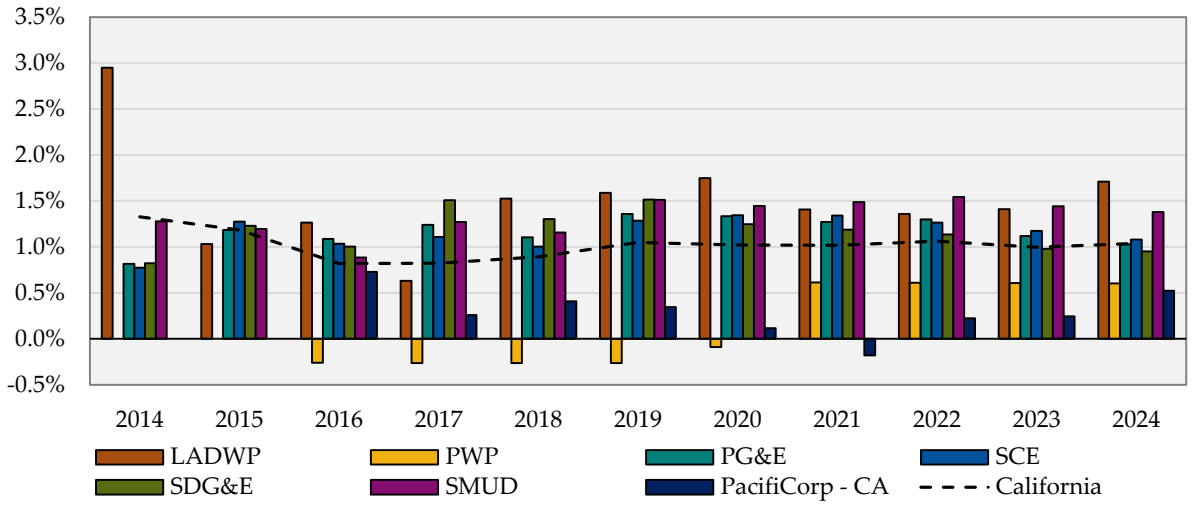
The Department's forecasted annual load growth (without energy efficiency measures) is on par with the California IOUs and particularly SMUD for the 2014-2024 period. However, Pasadena Water and Power's growth and PacifiCorp's California growth are both significantly lower, as shown below.

**Table 2-5. Annual Load Growth Rate for the 2015-2024 Period (No Energy Efficiency)**

| Annual Growth Rate | LADWP | PWP | PG&E | SCE | SDG&E | SMUD | PacifiCorp (CA) |
|---|---|---|---|---|---|---|---|
| **2015-2024** | 1.4% | 0.1% | 1.2% | 1.2% | 1.2% | 1.3% | 0.3% |

The peer utilities' projected annual load growth rate is shown in Figure 2-2, below. The overall growth rate for California is estimated by the California Energy Commission to be approximately 1.0 percent per year through 2024. LADWP is consistently slightly above this rate, as are SMUD and the IOUs.

**Figure 2-2. Annual Energy Load Growth for California Utilities (no Energy Efficiency)**

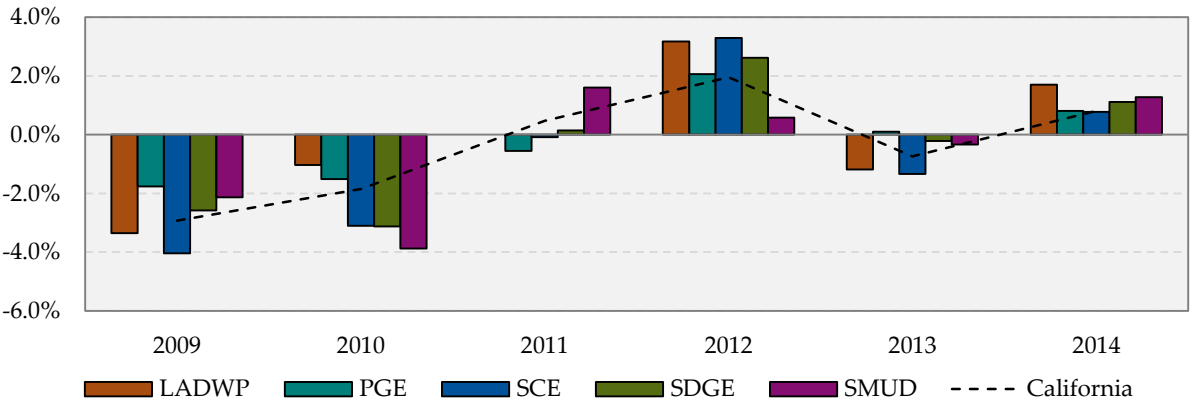



*Sources: LADWP, Pasadena Water and Power, California Energy Commission, PacifiCorp*[45]

The Department reported that the unusually high growth in 2014 was due to an increased commercial and residential customer count, which was changed by the Load Forecast group based on the forecasted population growth of Los Angeles.

LADWP has historically tracked closely with the IOUs and SMUD. And although this set of utilities sees consistent annual load growth in the future, they experienced similar variations in growth in the last several years as shown in Figure 2-3.

**Figure 2-3. Annual Net Energy for Load Growth for California Utilities**




*Sources: LADWP 2014 IRP Appendix A – Net Energy for Load, California Energy Commission Demand 2014-2024 Baseline Forecast, Net Energy for Load (Mid)*
*Note: LADWP data was recorded on a Fiscal Year basis.*

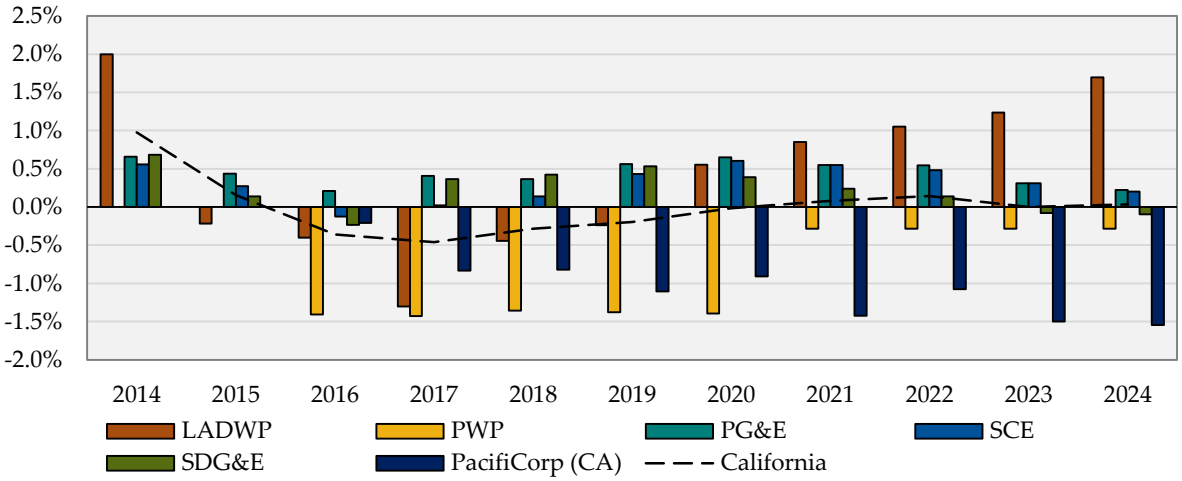
[45]LADWP 2014 IRP, Appendix N, p. N-25; PWP 2015 IRP Load Forecast Update, p. 1; California Energy Commission, California Energy Demand Forecast, 2014-2014, Form 1.1c (Mid Demand Baseline, no AAEE Savings); PacifiCorp 2015 IRP, Volume II, p. 3. The IOUs and SMUD are included in the California Energy Commission forecast.

LADWP's projected annual load growth rate with energy efficiency measures is also fairly consistent with the IOUs in California for the future 2015-2020 period; however, the Department's energy efficiency forecast is held constant after 2020. Consequently, the load growth rate is negative from 2014 to 2019 and positive from 2020 to 2024. PWP and PacifiCorp's load models have negative growth rates for the entire period (2014-2024). If the Department extended energy efficiency targets, it would likely be more in line with PWP for the entire period.

**Table 2-6. Annual Load Growth Rate (with EE) for the 2015-2024 Period (Energy Efficiency)**

| Annual Growth Rate | LADWP | PWP | PG&E | SCE | SDG&E | PacifiCorp (CA) |
|---|---|---|---|---|---|---|
| **2015-2024** | 0.3% | -0.9% | 0.4% | 0.3% | 0.2% | -1.0% |

**Figure 2-4. Annual Energy Load Growth for California Utilities (with Energy Efficiency)**




*Sources: LADWP, Pasadena Water and Power, California Energy Commission, PacifiCorp*[46]

To more accurately forecast future growth past 2020, LADWP should extend energy efficiency estimates through the entire IRP period. With its current inputs, the model unrealistically ends energy efficiency improvements in 2020 and load growth noticeably goes positive at this time. The energy efficiency goal is further discussed in Section 2.4.5.

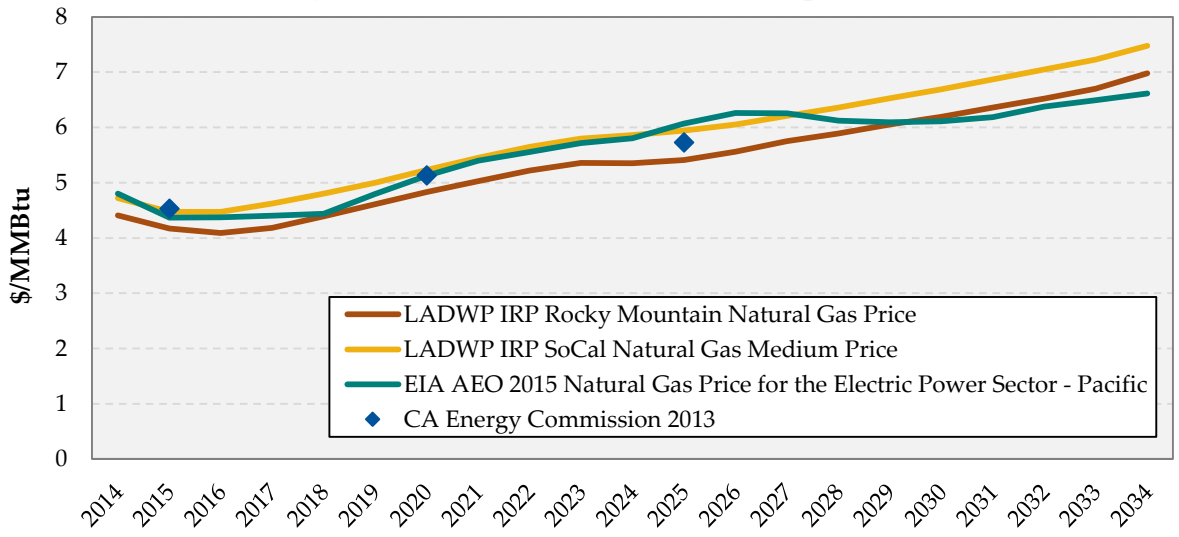
Navigant also recommends that the Department consider including a load forecast sensitivity analysis in the next iteration of the IRP, including high and low load scenarios. The Long Term Procurement Plans (LTPPs) filed by California IOUs include modeling similar to an integrated resource plan, and include a variety of sensitivity testing including at least three load scenarios. PacifiCorp also uses base, low, and high load forecast sensitivity analyses in its IRP. This is a good practice for LADWP to adopt in order to show a more complete range of future scenarios.

[46]LADWP 2014 IRP, Appendix N, p. N-25.; PWP 2015 IRP Load Forecast Update, p. 1.; California Energy Commission, California Energy Demand Forecast, 2014-2014, Form 1.1c (Mid Demand Baseline, Mid AAEE Savings); PacifiCorp 2015 IRP, Volume II, p. 16. The IOUs are included in the California Energy Commission forecast. SMUD does not have a publicly available IRP for recent years.

#### *2.3.3.3 Fuel Prices*

Navigant compared LADWP's natural gas price forecasts to the Energy Information Administration's (EIA) Energy Outlook for the Pacific region and the California Energy Commission 2013 Integrated Energy Policy Report. The Department's forecasts are consistent with both sources for the 2014-2024 period, as shown in the figure below.

**Figure 2-5. Natural Gas Price Forecast Comparison**




*Sources: LADWP 2014 IRP, Appendix N; EIA Annual Energy Outlook 2015 – Pacific Region; California Energy Commission Integrated Energy Policy Report 2013 – Reference Case.*

The Department did not include coal price projections in the published 2014 IRP report; however, the model includes coal prices and further includes a sensitivity analysis for both natural gas and coal prices. LADWP communicated to Navigant that coal prices were omitted from the document because coal supplied to the Intermountain Power Project is purchased on the open market in the Intermountain West region from various contracts between the Intermountain Power Agency (the owner) and the coal companies. However, the Department did share the aggregated, preliminary actual delivered cost of coal for FY 2014-15, which was $47.25 per ton. According to the EIA, the price of coal shipments to the electric power sector in Utah in 2013 was $45.17, in line with the Department's price.[47]

#### *2.3.3.4 Renewable Costs*

LADWP used a base renewable portfolio levelized cost of energy (LCOE) of $92 per MWh, based on recently signed power purchase agreements for large central solar, geothermal, and wind projects. Navigant compared the Department's LCOE inputs to Lazard's subsidized LCOE analysis. LADWP's LCOE is consistent with Lazard for most resources, but for some is substantially higher.

**Table 2-7. Levelized Cost of Energy Comparison ($2014/MWh)**

| Resource | 2014 IRP | Lazard LCOE |
|---|---|---|
| **Solar Photovoltaic - PPA** | $77 | $72 - $86 |

[47] www.eia.gov/coal/data.cfm#prices.

| | | |
|---|---|---|
| **Solar Photovoltaic - LA Solar** | $143 | $72 - $86 |
| **Solar Photovoltaic - Owens** | $130 | $72 - $86 |
| **Solar Feed-In-Tariff (C&I)** | $161 | $126 - $177 |
| **Wind** | $111 | $37 - $81 |
| **Geothermal** | $101 | $89 - $142 |
| **New Combined Cycle Gas** | $91 | $52 - $96 |
| **New Simple Cycle Gas** | $241 | $165 - $242 |

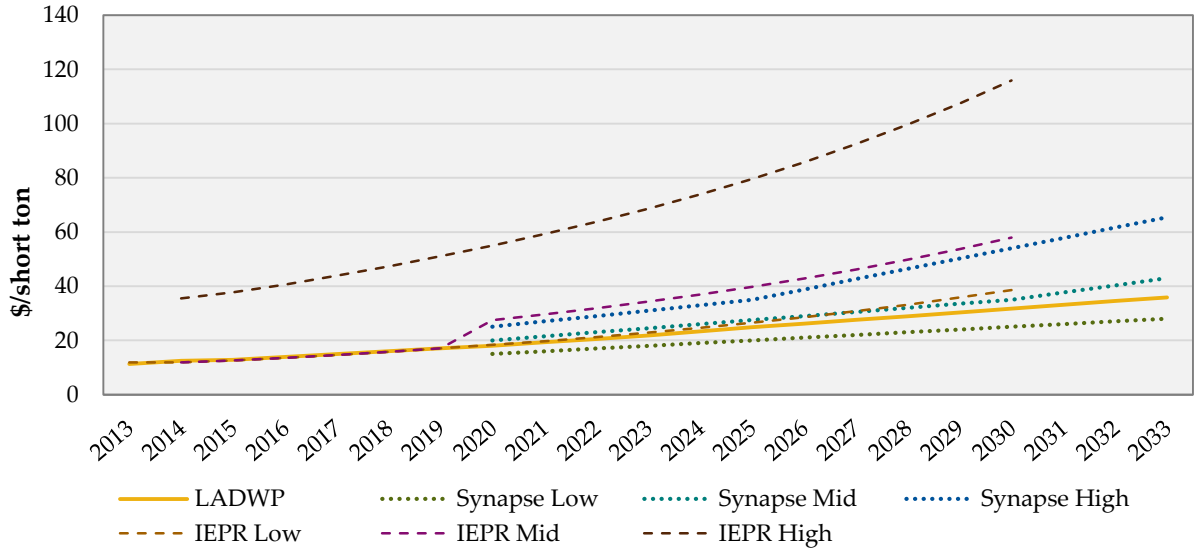
*Sources: LADWP 2014 IRP, Lazard*[48]
*Note: Low and high end levelized cost of energy corresponds with +/-25 percent fuel price fluctuations.*

Wind projects and LADWP-built and owned solar PV have much higher LCOEs than Lazard's estimates. These impact the generation portfolio used in the IRP's recommended scenario and drive up overall costs; however, the high LCOE for wind may be attributable to older projects, as wind was the Department's primary renewable resource in past years. LA Solar and Owens solar are assumed to be LADWP-built and owned, and also show high LCOEs. While these projects are not as cost-effective as third-party PPAs, the Department has a goal to own at least 50 percent of its eligible renewable energy resource portfolio, to maintain full control of its assets and avoid market price fluctuations. Navigant believes the City should revisit this policy as it may be contributing to higher rates and unfavorable work rules that further escalate costs.

#### *2.3.3.5 Carbon Prices*

Navigant benchmarked LADWP's carbon price assumptions against an industry expert forecast range,[49] shown in the figure below.

**Figure 2-6. $CO_2$ Cost Forecast Benchmarking**




[48]LADWP 2014 IRP, p. 121; Subsidized LCOE, Lazard's Levelized Cost of Energy Analysis – Version 8.0, 2014, p. 4.
[49]Based on an analysis of proposed federal regulatory measures, auctions under California's AB 32 Cap-and-Traded program, and 115 recent utility filings.

*Sources: LADWP 2014 IRP, Appendix N; Synapse Energy Economics, Inc.[50]; California Energy Commission[51]*
*Note: The Synapse forecast begins in 2020 assuming the federal Clean Power Plan compliance is in effect.*

On August 16, 2013, the California Cap-and-Trade auction price was $12.22 per short ton. On August 18, 2014, the California Cap-and-Trade auction price was $11.50 per short ton. These numbers are similar to LADWP's modeled costs. LADWP's assumptions are in line with Synapse's mid scenario and the California Energy Commission's low preliminary IEPR forecast.

#### *2.3.3.6 Risk Analysis*

The 2014 IRP quantifies risk associated with natural gas price volatility by modeling high and low fuel price scenarios for each resource case. Specifically, the Department integrates its natural gas hedging program into its resource portfolio strategy by employing physical and financial hedges. These hedging strategies mitigate risk associated with replacing a significant portion of coal resources with natural gas. While fuel price risk is critical to model optimization, other risks should be considered. For example, PacifiCorp incorporates stochastic risk in its modeling process through Monte Carlo simulations that analyze random samplings of stochastic variables such as load, natural gas and wholesale electricity prices, hydro generation, unplanned thermal outages. PacifiCorp also assesses deterministic risk by modeling the impact of various planning assumptions on top performing resource portfolios. These additional analyses ensure that risk metrics are considered when selecting a resource portfolio.

### 2.3.4 Modeling Methodology Benchmarking

The Department's planning methodology is generally similar to that of other utilities, based on the following process:

- Identify model assumptions (e.g. fuel prices, load forecasts, coal replacement, RPS goals, etc.).
- Evaluate and rank resource possibilities based on lowest cost.
- Run model and assess reliability, resource adequacy, GHG emissions, and economic cost/benefit.
- Perform sensitivity analyses associated with various natural gas and coal prices.
- Incorporate public input.
- Recommend strategic case.
- Complete rate analysis and long-term planning.

Good practice in integrated resource planning includes detailed consideration of the following elements: load forecast, reserves and reliability, demand-side management, supply options, fuel prices, environmental costs and constraints, evaluation of existing resources, integrated analysis, time frame, uncertainty, valuing and selecting plans, action plan, and documentation.[52] The 2014 IRP includes all of these elements to a certain extent; however, it can still benefit from examining the IRP practices of other utilities. Arizona Public Service (APS), Public Service Company of Colorado (PSCC), and PacifiCorp produce examples of IRP best practice.

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[50]Synapse 2015 $CO_2$ price projections in 2014 dollars per short ton $CO_2$. "2015 Carbon Dioxide Price Forecast," Synapse Energy Economics, Inc., March 3, 2015 (www.synapse-energy.com/sites/default/files/2015%20Carbon%20Dioxide%20Price%20Report.pdf).
[51]Preliminary 2015 IEPR Nominal Carbon Price Projections for GHG emitting resources in California only.
[52]Rachel Wilson and Bruce Biewald. "Best Practices in Electric Utility Integrated Resource Planning." Synapse Energy Economics, Inc. for the Regulatory Assistance Project, June 2013.

Like LADWP, customer surveys showed that APS customers "favored an increase in the use of renewable energy resources, such as solar and wind, and were interested in both the environmental impacts and reliability of energy choices." APS used the PROMOD IV production simulation model, and included several sensitivity scenarios as well as its four resource portfolio options. Specifically, APS tested high and low assumptions for model variables such as fuel prices, production and investment tax credits for renewable resources, and monetization of $SO_2$, $NO_x$, PM and water. APS has a very clear outline of the four portfolios considered, including capacity of each type of resource in 2027 and its percentage of the energy mix. LADWP's IRP is quite similar to APS.

The PSCC 2011 IRP includes the retirement of base-load coal generation, fuel switch for coal to natural gas, and additional wind and solar. These changes are similar to those recommended and undertaken by LADWP. In addition to its least-cost baseline case, the utility designed eight alternative plans that evaluate increasing amounts of renewable and distributed generation resources. These portfolios were evaluated using the Strategic model form 2011-2050. PSCC also evaluated several sensitivity scenarios, including alternate prices of $CO_2$ emissions, natural gas prices, and level of sales. While the 2014 LADWP IRP model included sensitivity scenarios for various natural gas and coal prices, the next iteration should include additional sensitivity analyses. IRP best practice indicates that at least two additional load forecasts (low and high) should be included to account for load growth uncertainty. In interviews, the Department indicated that there are plans for adding sensitivity analysis in future IRPs.

In integrated resource planning, utilities often use resource optimization models to create resource portfolios that identify the number and type of resources to be added over time to make up the least-cost plan. PacifiCorp uses System Optimizer, a comprehensive portfolio modeling system with 67 input scenarios. This model determines capacity expansion plans, runs product cost simulations for each optimized portfolio, and performs risk assessments on these portfolios. Top resource portfolios consider both the lowest average portfolio cost and worst-case portfolio cost resulting from simulation runs. LADWP should incorporate a resource optimization model (with well-supported inputs) for its next IRP iteration. This would help the Department more fully evaluate alternate resource portfolios against a least-cost option, whereas the 2014 IRP evaluates alternate resource portfolios against the pre-designed base case, which does not represent the least-cost portfolio from a modeling standpoint. The lack of focus on least-cost resources is one of the more significant issues with this IRP and could create a false impression that the Department is insufficiently concerned with cost in its decision-making.

Sensitivity cases for the PacifiCorp IRP model include load forecast, distributed generation, energy storage, production tax credits, high $CO_2$ prices, solar resource costs, Class 3 DSM, and 111(d) restrictions. In addition to base, low, and high load forecast sensitivity analyses, PacifiCorp runs a 1-in-20 extreme weather scenario. High and low distributed generation sensitivities adjust annual reductions in technology costs, technology performance levels, and retail electricity rates. Energy storage sensitivities force large scale energy storage into the resource portfolio. In total, PacifiCorp defines 15 sensitivity cases in its IRP.[53] As mentioned above, the Department should investigate increasing its model sensitivity testing. PacifiCorp also uses an in-house spreadsheet based modeling tool, the 111(d) Scenario Maker, to facilitate modeling of the EPA's proposed rule to regulate $CO_2$ emissions from existing generating units. However, PacifiCorp does not include an analysis of the company's coal fleet, which makes up almost two-thirds of its generation. It also does not account for the large increase in

[53] 2015 PacifiCorp IRP, Vol. I.

operating costs due to compliance obligations. LADWP reported reading PacifiCorp's IRP and identifying ideas for improvements—this is good awareness of other practices, although it is not a formalized activity in the group.

Navigant also compared the LADWP IRP to the assumptions used in the Long Term Procurement Plans (LTPPs) filed by California IOUs. These plans include modeling similar to LADWP's IRP. The LTPPs include a variety of sensitivity testing including at least three load scenarios, five EE saving scenarios, and three solar PV projections, among others. The LTPP uses an RPS Calculator that incorporates four weighted policy priority metrics: permitting (10%), lowest cost (10%), least environmentally harmful (10%), and commercial interest (70%). A Scenario Tool is used to create RPS portfolios based on the RPS Calculator results. The LTPP identifies seven RPS portfolios and each portfolio is modeled twice to account for a 2024 target year and a 2034 target year.[54]

Overall, the Department evaluated fewer scenarios and metrics in its analysis than other utilities, including IOUs and those considered to be examples of IRP best practices. More scenarios will enable the Department to prepare for unexpected economic, environmental, and political changes. In addition, optimized portfolios would help ensure that LADWP identifies the lowest cost portfolio. Navigant recommends in future IRPs that the Department take these steps to increase the rigor and depth of its analysis. In addition, we recommend including financial modeling for the full economic costs of owning resources versus contracting via PPAs, to increase the transparency around the costs of these decisions.

### 2.3.5 Conclusions on IRP Methodology & Modeling

LADWP is in line with IRP best practices in a number of areas. The Department has improved its IRP development process with regard to stakeholder engagement; for the 2014 IRP, the Department convened a stakeholder advisory group, held public meetings open to all interested parties, and provided a public draft. The Department also uses an accepted hourly chronological unit commitment and dispatch model to simulate the power system under different scenarios. And for most inputs to the model, assumptions are in line with peers and industry standards.

Navigant recommends that LADWP consider adding the following items to its next iteration of the IRP:

- Load forecast sensitivity analyses.
- Energy efficiency assumptions beyond 2020.
- Additional scenarios and scenario optimization to identify the lowest cost portfolio.
- Financial modeling for the full economic costs of owning resources versus contracting via third-party PPAs.

[54]Further information on LTPP planning assumptions and scenarios available at: docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M091/K181/91181771.PDF.

## *2.4 The 2014 IRP Recommended Strategic Case*

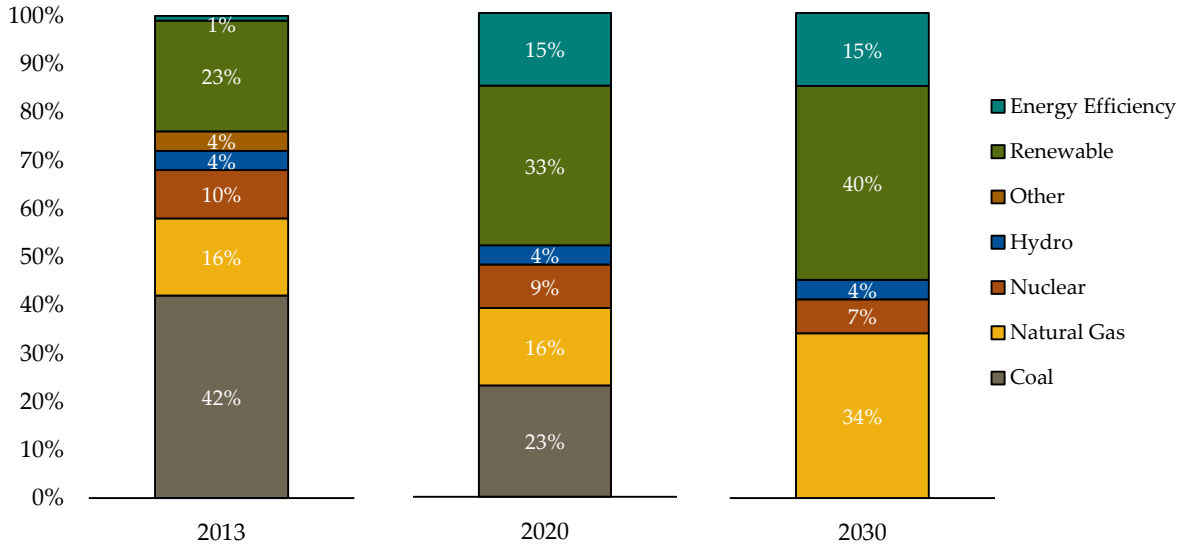
Here Navigant presents its evaluation of LADWP's Recommended Strategic Case, representing the preferred mix of power generation and related resources including both supply and demand-side resources. The 2014 Recommended Strategic Case comprises the scenarios in the following table.

**Table 2-8. The 2014 IRP Recommended Case**

| Attribute | Case | Year |
|---|---|---|
| Coal Replacement | Navajo pre-contract end date divestiture<br>IPP pre-contract end date replacement | 2015<br>2025 |
| Energy Efficiency | 15 percent less electricity usage (2010 baseline); "advanced" | 2020 |
| RPS | 25 percent of retail electricity sales<br>33 percent of retail electricity sales<br>40 percent of retail electricity sales | 2016<br>2020<br>2030 |
| Local Solar | 800 MW | 2023 |
| Transportation Electrification | 2,344 GWh for 580,000 electric vehicles; "high" | 2030 |
| Demand Response | 506 MW | 2026 |
| Energy Storage | 178 MW | 2021 |

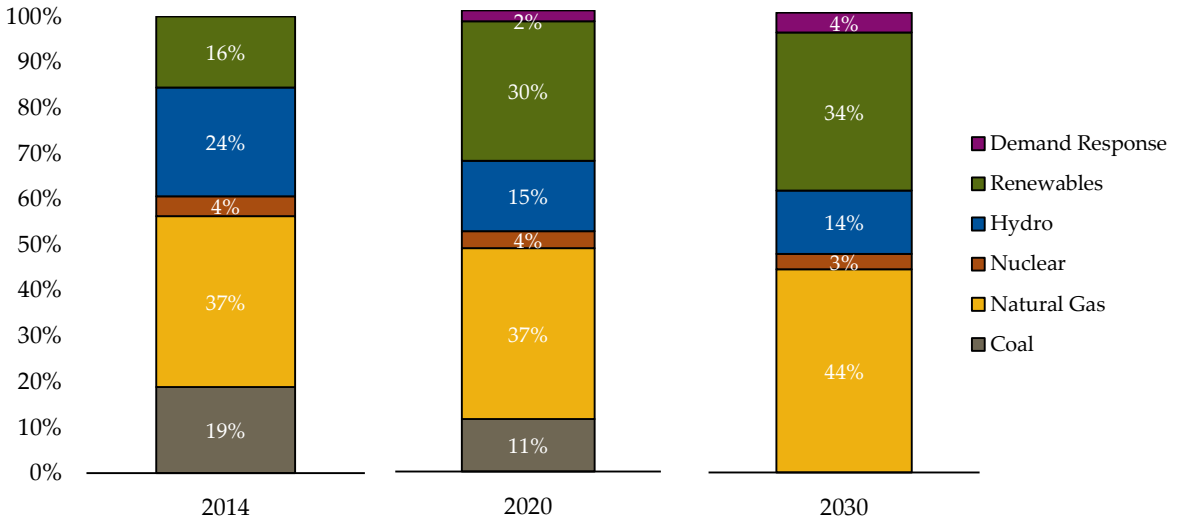
The Recommended Strategic Case includes a decrease in GHG emissions 60 percent below 1990 levels by 2030 (74 percent after including transportation sector emissions savings from fuel switching/electrification). LADWP's smart grid activities also impact the portfolio and are discussed in this chapter. Under the Recommended Case, the energy mix and portfolio resource capacity will change significantly as shown in Figure 2-7 and Figure 2-8.

**Figure 2-7. LADWP 2014 IRP Recommended Energy Mix**




*Source: Navigant analysis of LADWP 2015 Briefing Book.*

**Figure 2-8. LADWP 2014 IRP Recommended Portfolio Capacity**




*Source: Navigant analysis of LADWP 2014 IRP and 2014 IRP model data.*

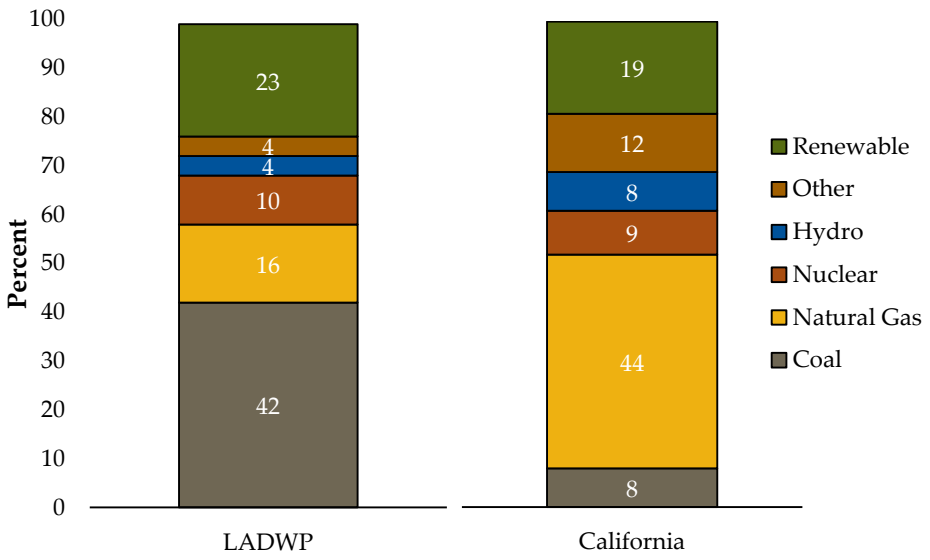
The remainder of this section is divided into the individual components of the Recommended Strategic Case, in the following order:

1. Overall Resource Mix
2. Greenhouse Gas Emissions
3. Once-Through Cooling
4. Coal Replacement
5. Energy Efficiency
6. Renewable Portfolio Standard
7. Local Solar
8. Electrification of the Transportation Sector
9. Demand Response
10. Energy Storage
11. Smart Grid

### 2.4.1 Overall Resource Mix

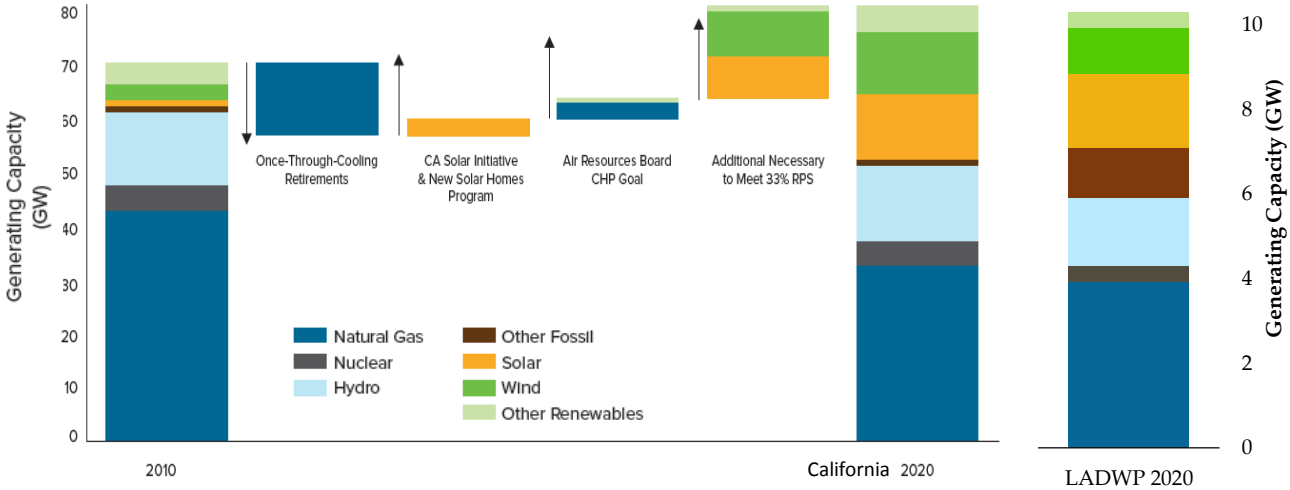
In 2013, LADWP was slightly ahead of California as a whole in terms of renewable energy, but still relied heavily on coal for its power supply (Figure 2-9). Figure 2-10 shows the change in generation capacity expected to occur across the state by 2020. These changes to installed capacity apply largely to LADWP and are reflected in LADWP's projected energy mix as well, though with a lag due to Los Angeles' dependence on coal-fired generation, which will not be entirely replaced until 2025 according to the Recommended Strategic Case.

**Figure 2-9. 2013 Energy Mix Comparison, LADWP and California**




*Sources: LADWP 2015 Briefing Book and California Energy Commission*[55]
*Note: LADWP mix excluding energy efficiency. California in-state generation is reported generation from units 1 MW and larger, data from QFER and SB 1305 Reporting Requirements.*

**Figure 2-10. 2020 Generating Capacity Comparison, California and LADWP**

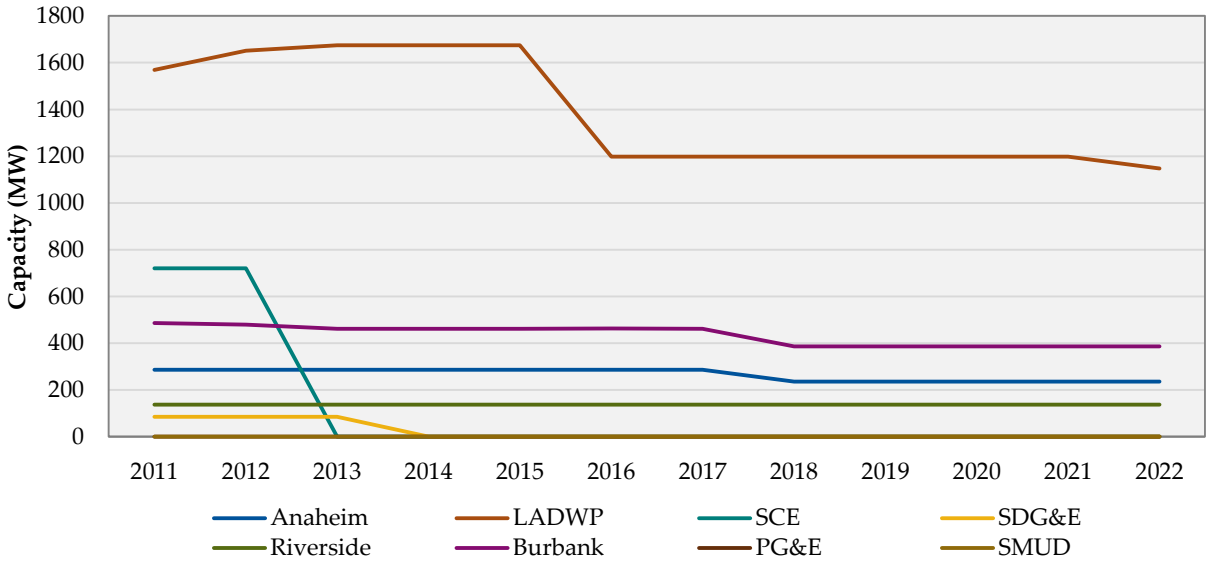



*Sources: Rocky Mountain Institute,*[56] *LADWP 2014 IRP, LADWP IRP model data*

[55]Total Electricity System Power, Energy Almanac, California Energy Commission (energyalmanac.ca.gov/electricity/total_system_power.html).
[56]"Net Energy Metering, Zero Net Energy and the Distributed Energy Resource Future," Rocky Mountain Institute, 2012 (www.rmi.org/Content/Files/RMI_PGE_NEM_ZNE_DER_Adapting_Utility_Business_Models_for_the_21st__Century.pdf.pdf).

However, the 2014 IRP eliminates coal completely by 2030 and recommends a higher RPS. The 2030 resource mix reasonably represents LADWP's interest in becoming a leader in clean energy without deviating dramatically from the rest of the state. Other California utilities historically used less coal-fired capacity, and some–like SCE–divested sooner than LADWP (Figure 2-11).

**Figure 2-11. California IOU and Large POU Coal Capacity**




*Source: California Energy Commission Power Almanac*[57]
*Note: LADWP's coal capacity includes the maximum capacity authorized from the Intermountain Power Project.*

However, several of the POUs are close or equal to LADWP's coal percentage in terms of energy generation. Burbank and Anaheim each have coal-fired generation making up approximately 35 percent of the portfolio. Like LADWP, the IPP coal plant supplies these utilities and they are in the same contract situation; coal power in California will decrease dramatically when IPP is no longer used for coal.

### 2.4.2 Greenhouse Gas Emissions

The California Global Warming Solutions Act of 2006 requires LADWP to reduce GHG emissions to 1990 levels by 2020.

In the 2014 IRP, LADWP reports having already accomplished the goal of reducing its GHG emissions below 1990 levels; specifically, 20 percent lower than 1990 levels with emissions of 14.3 MMT in 2013 (compared to 17.9 MMT in 1990). Achievements so far are credited to the elimination of power from the Mojave and Colstrip coal plants and the completed repowering of units at the Haynes and Valley generation stations, as well as the increase in renewable generation.

#### *2.4.2.1 Approach to Greenhouse Gas Emissions*

One of the major focus areas of the 2014 IRP is evaluating multiple resource strategies to reduce GHG emissions. There are no alternate cases for GHG emissions reduction targets because they are mandated

[57]Electricity Supply Forms (S-2 and S-5) submitted by Load Serving Entities for the California Energy Commission 2009, 2011, and 2013 Integrated Energy Policy Reports available at: energyalmanac.ca.gov/electricity.

by state law. Accordingly, the resource cases are designed to help achieve the long-term GHG emissions reduction target (the near-term target has already been met). The Recommended Strategic Case is considered to be the scenario that makes the most progress towards the 2050 target while maintaining reasonable costs and system reliability.

#### *2.4.2.2 Greenhouse Gas Emissions Outlook*

The 2015 Briefing Book reports that LADWP has now achieved $CO_2$ emissions 23 percent below 1990 levels and expects to be 55 percent below 1990 levels in 2025 and 60 percent below 1990 levels by 2030. Although LADWP's 2013 emissions were slightly higher than a targeted emissions allowance from the California Air Resource Board (CARB), the IRP Recommended Case reduces emissions below the allowance in 2015 (largely due to divesting from Navajo Generating Station). If LADWP is able to promote the electrification of the transportation sector and receive the associated GHG savings credit, by 2034 it theoretically could be within less than 1 MMT of meeting the 2050 goal. This depends in large part on the rapid electrification of the transportation sector, which is not the most robust foundation for GHG projections at this time.

The Recommended Case is similar to the IRP Case 4 (early Navajo divestiture in 2015, early IPP replacement in 2025, 40 percent RPS, advanced energy efficiency, and high electrification of the transportation sector), which is shown in the 2014 IRP to approach the 80 percent below 1990 emissions goal rapidly before 2026, but then cease to improve (and even increase slightly). In later years, the IRP does not lay out a plan yet to bridge the remaining emissions reduction. One missing element is the lack of energy efficiency improvements beyond 2020. Fortunately, there is ample time to create a plan for the full 80 percent reduction that should be reflected in future IRPs.

### 2.4.3 Once-Through Cooling

Once-through cooling (OTC) is regulated by the Environmental Protection Agency (EPA) Clean Water Act section 316(b) and administered in California by the California State Water Resources Control Board (State Water Board). LADWP is required to eliminate OTC in its coastal power plants by 2029 (Scattergood Generating Station in Playa Del Rey, Haynes Generating Station in Long Beach, and Harbor Generating Station in Terminal Island).

Additionally, the SCAQMD issued a Stipulated Order for Abatement[58] that requires LADWP to reduce local air emissions through repowering of its less efficient in-basin generating facilities (Haynes and Scattergood Generating Stations). Repowering is being conducted in-sync with the elimination of OTC.

#### *2.4.3.1 Approach to OTC*

Like the GHG emissions mandate, LADWP has only one allowable OTC scenario and did not model alternatives in the 2014 IRP.

The State Water Board implemented the "Use of Coastal and Estuarine Waters for Power Plant Cooling" policy, effective on October 1, 2010, which established technology-based standards to reduce the harmful

[58]A Stipulated Order for Abatement requires a company operating out of compliance to take specific actions or to shut down its operations. This has the same legal effect as a regular Order for Abatement, with two differences: the Hearing Board is not required to find a violation of any rule or regulation, and the conditions of the order are agreed upon in advance by the parties (www.aqmd.gov/home/about/hearing-board/about-orders-for-abatement).

effects associated with cooling water intake structures on marine and estuarine life.[59] The policy was amended to include existing power plants on June 18, 2013.[60] The Clean Water Act Section 316(b) originally required the elimination of OTC by 2020, while LADWP had sought a deadline of 2045 based on its preferred replacement cycle. The schedule was negotiated to adapt to the Department's unique system configuration and reliability requirements (no unit can be removed from service before its replacement is online, necessitating a step-wise process), which resulted in an extension to 2029 under the following schedule:

**Table 2-9. LADWP's Once-Through Cooling Reduction Schedule**

| Station Units | Year | OTC Reduction |
|---|---|---|
| **Haynes 5, 6** | 2013 | 42% |
| **Scattergood 3** | 2015 | 56% |
| **Scattergood 1, 2** | 2020 | 68% |
| **Haynes 1, 2** | 2023 | 82% |
| **Harbor 1, 2, 5** | 2026 | 87% |
| **Haynes 8, 9, 10** | 2029 | 100% |

*Note: Percentage reduction is compared to 1990 levels. The percentage is eliminated OTC generation as a percentage of total OTC generation; 100 percent denotes full compliance.*

The Power System internally tracks OTC and repowering projects in detail according to this schedule. It also reports to the State Water Board on how the schedule and progress is expected to impact grid reliability.

### *2.4.3.2 OTC Outlook*

So far, the Department reports being on schedule. Haynes Units 5 and 6 began commercial operation in June 2013. The Haynes Generating Station Repower Project replaced two older, inefficient large electric generating utility boilers (Units 5 and 6) with six smaller, more efficient gas turbines, along with OTC elimination (before the OTC compliance date of December 31, 2013). From FY 2012-13 to FY 2013-14, LADWP did a commendable job of finishing the project under budget.

Scattergood 3 broke ground in June 2013 and is expected to reach substantial completion on schedule in December 2015. The Scattergood Generating Station Repower Project will replace the existing 460 MW boiler generator Unit 3 (in operation since 1974) with a new, more efficient gas turbine system which will also reduce the generating capacity of the existing boiler. The project will be equipped with the Best Available Control Technology (BACT) air pollution control equipment. The SCAQMD issued its notice of intent to issue permits for the Scattergood Repower Projects on December 17, 2012.[61] The Unit 3 project, along with OTC elimination, is scheduled for December 31, 2015 with final commissioning in January 2016.[62] Budget information provided by LADWP indicates the project is below the original budget so far (possibly based on procurement and labor schedule modifications).

[59] www.swrcb.ca.gov/water_issues/programs/ocean/cwa316

[60] www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/otc_2014.pdf

[61] Notice of Intent to Issue Permits Pursuant to AQMD Rules 212, 1710, 1714, and 3006. South Coast Air Quality Management District, December 17, 2012.

[62] "L.A.'s Power Transformation." 2014 Integrated Resource Plan Public Outreach Presentation. Los Angeles Department of Water and Power, October/November 2014.

### 2.4.4 Coal Replacement

SB 1368 requires LADWP to eliminate its two coal plants from the generation portfolio in 2019 and 2027. LADWP's Recommended Strategic Case divests from Navajo Generating Station in 2015 and converts the IPP contract to natural gas by 2025. The 2014 IRP describes the primary considerations for accelerating compliance with SB 1368. LADWP must:

- Resolve contractual issues;
- Evaluate the cost of alternatives and LADWP's ability to cover costs; and
- Address any other legislative and regulatory factors.

The Department has already accomplished the early divestiture of Navajo by finalizing its sale, and has replaced most of its capacity with the natural gas-fired Apex Generating Station. LADWP now faces more potential difficulties in converting IPP from coal to natural gas before 2027.

#### *2.4.4.1 Approach to Coal*

The coal cases analyzed in the 2014 IRP consider two replacement sequences. Case 1 analyzes the baseline contract expiration dates of Navajo in 2019 and IPP in 2027. Case 2 (the recommended case) analyzes early divestiture of Navajo by 2015 and replacement of IPP by 2025. Both cases include fuel cost sensitivity analyses as well as alternate RPS, energy efficiency, and local solar cases.

The IRP compares modeled resource shortfalls between the two cases, quantifying capacity deficits over time under each case and coming up with a resource replacement strategy for each. Resource shortfall is not a concern in either case. Navajo Generating Station's capacity has already successfully been replaced by the Apex Generating Station and LADWP has time to ensure adequate resources for IPP replacement under its current or an alternate plan.

Case 2 for early coal elimination incurs higher costs than Case 1. The additional costs include gas-fired generation fuel and operations and maintenance costs; however, the IRP anticipates $CO_2$ emissions savings will offset this and result in reasonable net costs. And despite Case 1 appearing to be the least-cost option while meeting minimum regulatory mandates, it fails to make significant progress toward LADWP's required reduction of GHG emissions. However, using GHG emissions goals as the basis for case selection begs the question: why not replace IPP sooner than 2025? In the 2014 IRP, LADWP ruled out "IPP by 2020" for various reasons described in the following sub-chapter on IPP.

#### *2.4.4.2 Navajo Generating Station*

LADWP previously had a 21.2 percent (477 MW) ownership of Navajo Generating Station.[63] According to a Board of Commissioners presentation from July 2015, LADWP finalized the Navajo sale this year, in line with its Recommended Strategic Case for divestiture in 2015. Navajo Generating Station has been replaced with Copper Mountain 3 Solar (210 MW in service), Moapa Solar (250 MW under construction), and Apex Generating Station (521 MW in-service). Divesting from Navajo is estimated to reduce 5.59 MMTons of $CO_2$ emissions for LADWP, which will help to reach GHG emissions reduction goals.

Not only does early divestiture of Navajo contribute to GHG emissions goals, but the Department estimates it received a better sales price in 2015 than waiting until the 2019 deadline. LADWP evaluated

[63]2015 Briefing Book. Los Angeles Department of Water and Power.

the offer with Goldman Sachs and had it further reviewed by an independent financial advisory company. LADWP negotiated terms with the Salt River Project (the Operating Agent), and calculated that the transaction would result in the lowest impact on retail electricity rates. In the analysis, LADWP estimated that the power plant sale would result in a 0.5 percent rate increase, whereas selling Navajo power output (the alternative to divesting) would results in a 2 percent rate increase.[64,65]

The 2014 IRP lists a comprehensive set of reasons for the early divestiture of Navajo:

1. A better sales price than waiting until the 2019 deadline.
2. Avoids the risk that pending federal regulations could add expensive mitigation requirements.
3. Better availability of replacement options.
4. Reduced $CO_2$ emissions.
5. Additional transmission capacity for importing solar and geothermal resources.
6. Maximizes the value of the plant to help pay for renewables and energy efficiency.
7. Provides time to handle contingencies and ensure competition will benefit customers.
8. Provides the opportunity for remaining Navajo owners to close one of the unit by 2019, reducing emissions.

Although the IRP focused on these technical reasons, early divestiture is also aligned with public feedback. Accomplishing the Navajo sale and acquisition of Apex Generating Station in 2015 is a notable accomplishment for LADWP, and thus far LADWP appears to have realized the benefits listed above.

#### *2.4.4.3 Intermountain Power Project*

LADWP is currently entitled to 875-1,202 MW capacity from the Intermountain Power Project (IPP). IPP is located near Delta, Utah, has a rated capacity of 1,800 MW, and is owned by 23 municipal utilities in Utah.[66] A total of 36 participants purchase power from IPP, including six Southern California utilities under long-term power purchase contracts that began in 1990 and will expire on June 15, 2027. LADWP receives the majority of the exports (44.6 percent) and has recently been taking its entire 1,202 MW entitlement.

By collaborating with the other participating utilities, LADWP plans to convert IPP to a smaller natural gas generating station by 2025 at the latest, with efforts to begin the transition project by 2020. The small gas plant is also intended to be supplemented by new renewable projects in the area (utilizing the same transmission line). Reducing IPP plant capacity by at least one-third makes this extra transmission capacity into Los Angeles available.[67] With the Navajo sale complete this year, IPP is the last coal-fired plant in Los Angeles' portfolio. Critically, any repowering of IPP requires a comprehensive, joint agreement with all of the participants. LADWP cannot act unilaterally—any changes to the Power Sales Contract require approval by all 36 participants.

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[64]Presentation on Coal Divestiture from Navajo Generating Station, Board of Water and Power Commissioners, May 8, 2015.

[65]Both options results in a rate increase because power prices declined 40 percent while LADWP worked to divest from Navajo. This means that in 2014, the net value of the plant in 2019 went negative. In April 2015, the net value of Navajo in 2018 was -$102 million.

[66]www.ipautah.com/participants/index.asp.

[67] Board Presentation – Intermountain Power Projects Repowering Plan and Renewal Agreements, Board of Water and Power Commissioners, May 28, 2015.

"IPP by 2020" was found infeasible in the 2013 IRP, which concluded there would be an unfavorable high-cost impact of replacing IPP by 2020 (in part, high outstanding debt service obligations). Despite the costs, LADWP could theoretically make earlier IPP replacement a top priority with sufficient support from ratepayers. However, there is a more fundamental issue. Reaching an agreement between all IPP participants was not possible by 2020 based on agreement delays. Finding a replacement resource option on the 2020 accelerated timeline would also have been a challenge.

After ruling out IPP by 2020, according to interviews, the Department calculated that 2023 was the earliest realistic option for eliminating coal from the portfolio. LADWP and other participants are contractually obligated to continue debt payments through 2023. But although LADWP should strive for 2023 replacement, it may be challenged to meet the Recommended Strategic Case of replacement in 2025 for several reasons.

According to interviews, there has been an approximately two-year delay for participants to take action on the contract amendment to allow for IPP to be repowered with natural gas rather than coal. LADWP negotiated the agreement but then had to wait for two years for the other participants' approval. A re-negotiation for the amendment among all parties is expected by the end of the year. Hence, by the end of 2015, the participants are expected be in a position to work on the natural gas option. However, the delay poses a risk for the gas repowering timeline (e.g., having adequate time to build a natural gas pipeline to the site).

The Department has considered solutions other than natural gas repowering as well, such as using an alternate power plant altogether, but it would reportedly take 10 years to build transmission to a new site. Generally, LADWP considers a 10-year window to be the minimum timeframe to plan for any alternate solution to converting IPP. Ideally, engineering work would begin in 2017 followed by financing in 2018. Alternate options considered by Power System leadership include:

- Build two more units at Apex Generating Station. This location has sufficient land and right-of-way. However, this option would still likely require new transmission capacity and negotiations for water supply.
- Build a new natural-gas fired generation plant at the Mojave Station, which would also require negotiations for water supply.
- Build a new power plant along the Victorville-L.A. path.

Alternatively, LADWP could purchase wholesale power. However, purchasing power from the California Independent System Operator (CAISO) could result in significant costs and expose the Department to wholesale energy price fluctuations, while purchasing from the Pacific Northwest using the Pacific DC Intertie would increase the Department's largest contingency. And as mentioned, LADWP has also begun to consider renewable additions to the smaller natural gas-powered IPP, including innovative replacement options such as compressed air energy storage to store intermittent wind energy, but the final replacement mix has not yet been determined.

Choosing the optimal IPP replacement strategy and exit date requires complex and highly nuanced analysis. Navigant recommends that, now that the Navajo solution is complete, LADWP turn its resources to focus on IPP replacement solutions and formulate a final preferred strategy. The City and LADWP should also consider retaining an independent expert to assist in the analysis and modeling of all alternatives.

#### *2.4.4.4 Coal Outlook*

Because contract revisions are already underway for natural gas and the site has existing transmission capacity, Navigant agrees that natural gas repowering of IPP is a reasonable replacement plan. But if participants somehow cannot move forward on repowering, the coal contract will be in place until 2027 and the participants will have to implement alternative non-coal plans at that time. LADWP has wisely considered various contingency plans and has additional time to continue to evaluate them. It should now focus on fully outlining these alternative plans and, now that Navajo's divestment is concluded, take a closer look at a 2023 replacement date. Because the Department will ideally begin engineering work on the IPP replacement in 2017, the 2016 IRP should include its proposed best replacement plan and timeline.

### 2.4.5 Energy Efficiency

The 2014 IRP Recommended Strategic Case for energy efficiency is that 15 percent of Los Angeles' electric needs will be met through customer energy efficiency measures by the end of 2020. The 2014 IRP establishes energy efficiency as a key element in planning efforts, recommending the "advanced" energy efficiency case. In the 2014 IRP the goal is also presented in the Fiscal Year calendar as 14.8 percent energy savings by FY 19-20 compared to a FY 2010-11 baseline.

The Department is required to report its current 10-year energy efficiency target to the California Energy Commission, and so the Recommended Strategic Case includes savings of 13.7 percent from FY 2013-14 to FY 2022-23. This is equivalent to energy savings of 3,596 GWh and exceeds the AB 2021 state target of 10 percent. During the current 10-year period, energy efficiency programs will be accelerated so that the majority of total savings is achieved before the end of 2020; these energy savings will be added to savings already achieved from 2010 to 2013 to achieve the 15 percent goal in 2020.

#### *2.4.5.1 Approach to Energy Efficiency*

LADWP's Efficiency Solutions group oversees the design and implementation of both energy and water efficiency programs. Efficiency Solutions owns the whole energy efficiency portfolio including budget, but shares water efficiency responsibilities with the Water System. In addition to the energy efficiency sections of the 2014 IRP, the Efficiency Solutions group prepares an Efficiency Solutions Portfolio Business Plan, which provides more specifics on guiding principles behind the program, as well as portfolio and program-level funding and energy and emissions impacts.

The basis for the energy efficiency Recommended Strategic Case in the 2014 IRP is the 2013 Energy Efficiency Potential Study, which provides a number of scenarios compliant with AB 2021. From these scenarios, LADWP sought one that yielded a high level of total savings across the ten-year planning period while maintaining reasonable estimated expenditures. The basic scenarios were "low" (10.2 percent by 2020), "moderate" (12.2 percent by 2020), "high" (13.2 percent by 2020), "advanced" (14 percent by 2020 or an accelerated 15.8 percent by 2020), and "extreme" (14.3 percent by 2020 or an accelerate 17.5 percent by 2020). The savings potential encompasses residential, commercial, institutional, and industrial customer sectors in Los Angeles.

The Department selected a specially optimized scenario which became the 2014 IRP recommended "advanced energy efficiency" case for 15 percent by 2020. For the entire 20-year period of the 2014 IRP (2014-2034), energy efficiency measures are expected to reduce energy consumption 4,283 GWh.

However, according to interviews, estimates are only really accurate through 2020 because the 2013 Energy Efficiency Potential Study did not study the period after 2020 and another study has not yet been conducted.

The Department has guiding principles for its approach to energy efficiency above and beyond energy savings targets:

- Promote energy efficiency programs for all customer sectors.
- Target "hard-to-reach" customers (i.e. low-income residents, small businesses).
- Achieve tangible economic benefits for low-income customers.
- Leverage programs to support jobs for local workforce.
- Work collaboratively with partner agencies on outreach and education, and to reach broad and diverse customer base (i.e. Southern California Gas Company partnership).
- Operate transparently and report results regularly.

These principles are motivated by the Department's role as a municipal utility serving the public of Los Angeles. They were developed through an ongoing collaborative stakeholder process and have helped craft an efficiency portfolio that meets the needs of a diverse set of customers. From a pure business perspective, the energy efficiency portfolio would consist solely of industrial and commercial programs; however, through its guiding principles, LADWP has indicated its willingness to achieve larger equity and sustainability objectives.

#### *2.4.5.2 Background on LADWP's Energy Efficiency*

LADWP first set an energy efficiency target in response to AB 2021. In December 2011, the Department set an interim energy efficiency goal to reduce 2010 energy consumption by 8.6 percent by 2020. The 8.6 percent goal was determined by a previous energy efficiency potential study that was later determined to have certain methodological issues.[68]

On May 24, 2012, LADWP's Board of Commissioners adopted a goal of 10 percent savings as recommended under AB 2021. According to interviews, at the time the 10 percent goal was adopted on faith because a new energy efficiency potential study had not yet been conducted. But by this time, the Department had recognized that energy efficiency is the least-cost compliance strategy with California regulation and requirements, and will support RPS, GHG emissions, and coal replacement goals.

LADWP conducted the 2013 Energy Efficiency Potential Study to update its goals. The study by Nexant, Inc. presents a number of scenarios compliant with AB 2021 requirements.

#### *2.4.5.3 Energy Efficiency Portfolio Cost-Effectiveness*

AB 2021 requires a cost-effectiveness assessment of POU energy efficiency programs. The Total Resource Cost (TRC), Program Administrator Cost (PAC), Ratepayer Impact Measure (RIM), and Participant Cost Test (PCT) are common tests that assess the costs and benefits of a program from different stakeholder perspectives.[69] The primary measurement of energy efficiency cost-effectiveness in California is the TRC. The TRC addresses the total costs of energy in the utility service territory, and compares program

[68]LADWP reported that the 2010 energy efficiency potential study used an obsolete approach, calculating the potential by applying high levels of incentives to measure costs.

[69]www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/Cost-effectiveness.htm

administrator and customer costs to utility resource savings (benefit-cost ratio). A TRC of 4.0, for example, shows that overall benefits are four times greater than total cost. [70,71]

The 2013 Energy Efficiency Potential Study found that the Total Resource Cost (TRC) ratio would range from 1.55 for the low scenario (10.2 percent savings by 2020) to 0.9 for the extreme scenario (14.3 percent savings by 2020). However, in its Efficiency Solutions Portfolio Business Plan for FY 2014-15 through FY 2019-20, the Department calculated a TRC score of 2.4. The Efficiency Solutions group determined the TRC score of 2.4 for the portfolio using the E3 calculator provided to POUs by the California Energy Commission, for this purpose (this is a similar, though simpler, tool to the one provided to IOUs by the California Public Utilities Commission).

Any TRC score above 1.0 demonstrates more benefits than costs, hence LADWP's portfolio is cost-effective. A score of 2.4 is also in line with past scores reported to the California Energy Commission in recent years, shown in Table 2-10 below. It is reasonable that program costs increase over time—reflected by a lower TRC score—because the most cost-effective measures are accomplished sooner (the "low-hanging fruit").

**Table 2-10. LADWP Reported Total Resource Cost, 2007-2012**

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|
| **TRC** | 3.72 | 3.5 | 3.77 | 3.12 | 2.50 | 2.45 |

*Source: California Energy Commission*[72]

On a levelized basis, the Department's planned efficiency portfolio has an estimated cost of $50 per MWh. This is in line with other estimates of the levelized cost of electricity (LCOE) for energy efficiency. As shown in the figure below, Lazard calculates energy efficiency to be the lowest-cost energy resource with an LCOE of $0 to $50 per MWh.

**Figure 2-12. Unsubsidized Levelized Cost of Energy in 2014 ($/MWh)**




[70] www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf

[71] The TRC test calculates the present value of the benefits produced by the programs at the marginal cost compared to the total program and customer costs incurred to invest in the increased levels of efficiency, reflecting the cost-effectiveness of a utility's energy efficiency at the portfolio level. Savings are estimated by multiplying the number of installed measures by an agreed-upon estimate of savings per measure, which is derived from the Database for Energy Efficient Resources (CEC).

[72] Giyenko, Elena, Doug Kemmer, Sandra Fromm, Cynthia Rogers. 2014. *Achieving Cost-Effective Energy Efficiency in California: 2013 Status Update.* California Energy Commission, Electricity Supply Analysis Division. CEC-200-2014-002.

*Source: Lazard*[73]

Energy efficiency has additional value to LADWP in avoided costs for compliance with AB 32 and contributing to a smaller denominator in RPS calculations (less total retail electricity sales). And as mentioned previously, cost-effectiveness is not the only metric by which the Department values its energy efficiency portfolio. Individual programs that are less cost-effective than others are still included in the portfolio when they achieve multiple goals related to the guiding principles (equitable access for all customers, local job creation, etc.), but the investment in those programs is necessarily somewhat limited. Although they are not quantifiable, the guiding principles are discussed in ongoing engagement with the community.

#### *2.4.5.4 Energy Efficiency Implementation*

Because LADWP plans to make energy efficiency a significantly more important part of the resource mix going forward, it is important to consider the Department's ability to implement the portfolio. According to interviews and supporting documents, 2009 was a strong energy efficiency year due to several important programs, but was followed by several slow years. Since 2012, the Department appears to have regained its footing, making a more sustained commitment to energy efficiency and ramping up programs. However, there has still been underspending on the energy efficiency program budget since 2012.

The table below shows LADWP's energy efficiency expenditures over the past several years, as reported to the California Energy Commission.

**Table 2-11. LADWP Energy Efficiency Total Expenditures, 2006-2012**

| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| **Budget ($1,000s)** | $10,908 | $12,550 | $35,940 | $67,564 | $44,451 | $49,529 | $37,276 |

*Source: California Energy Commission*[74]

The above numbers are significantly lower than the planned budget. In 2012, LADWP's energy efficiency annual funding was $138 million.[75] In the California Energy Commission's 2014 Status Report,[76] the Department reported an annual budget $120 million; in the 2015 Status Report,[77] the Department reported an annual budget of $115 million. In part, this is due to inexperience and errors in estimating what the Department could actually spend and staffing issues. It is also part of a larger trend observed by Navigant of underspending and underperforming on capital programs.

Past spending is even more limited compared to future expenditures planned in the Energy Solutions Portfolio Business Plan for FY 2014-15 through FY 2019-20 (below). Promisingly, FY 2013-14 showed a significant improvement from past years, and the year-over-year growth is strong. In the current Fiscal

[73] Lazard's Levelized Cost of Energy Analysis – Version 8.0, September 2014 (www.lazard.com/media/1777/levelized_cost_of_energy_-_version_80.pdf).

[74] Giyenko, Elena, Doug Kemmer, Sandra Fromm, Cynthia Rogers. 2014. *Achieving Cost-Effective Energy Efficiency in California: 2013 Status Update.* California Energy Commission, Electricity Supply Analysis Division. CEC-200-2014-002.

[75] Adopted Board Resolution 013 053, September 12, 2012

[76] Energy Efficiency in California's Public Power Sector: A 2014 Status Report. California Municipal Utilities Association. Available at: www.ncpa.com/~ncpa/wp-content/uploads/2015/02/FINAL_SB1037_Report.pdf.

[77] Energy Efficiency in California's Public Power Sector: A 2015 Status Report. California Municipal Utilities Association. Available at: www.ncpa.com/wp-content/uploads/2015/05/2015-FINAL-SB-1037-Report.pdf.

Year, the Efficiency Solutions group hopes to break $100 million. However, the Department will have to maintain an even sharper increase over multiple years to accomplish its energy efficiency goals. Its success will depend in large part on improved staffing, contracting, and program management. Promisingly, interviews indicate that LADWP is prepared to sustain its focus on energy efficiency and providing these resources.

**Table 2-12. Efficiency Solutions Portfolio Business Plan Expenditures, 2014-2020**

| Fiscal Year | FY 2013-14 (Actual) | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2019-20 |
|---|---|---|---|---|---|---|---|
| **Budget ($1,000s)** | $78,000 | $101,493 | $144,848 | $177,779 | $193,792 | $189,822 | $171,872 |
| **Savings (%)** | 3.7% | 5.0% | 6.8% | 8.8% | 10.9% | 12.8% | 14.5% |
| **Savings (GWh)** | 251.6 | 310.0 | 442.0 | 515.0 | 541.0 | 520.0 | 471.0 |

Similarly, in the past the Department has set aggressive energy savings goals (in line with its optimistic budgets). From 2007 to 2012, LADWP reported to the California Energy Commission electricity savings of just 49 percent of its target over the period. For comparison, SMUD reported meeting 92 percent of its target—due rather to realistic target-setting than significantly more energy savings (.

Table 2-13).

**Table 2-13. Large POU Reported Electricity Savings and Savings Targets, 2007-2012 (MWh)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Cumulative | % Target |
|---|---|---|---|---|---|---|---|---|
| **LADWP** | | | | | | | | |
| **Actual Savings** | 61,641 | 115,519 | 287,574 | 147,963 | 127,246 | 89,487 | **845,991** | **-** |
| **Savings Target** | 275,000 | 315,000 | 300,000 | 280,000 | 255,000 | 252,000 | **1,677,000** | **49%** |
| **SMUD** | | | | | | | | |
| **Actual Savings** | 95,950 | 114,662 | 148,028 | 155,651 | 170,641 | 162,381 | **932,276** | **-** |
| **Savings Target** | 70,000 | 107,000 | 145,000 | 196,000 | 200,000 | 205,000 | **923,000** | **92%** |

*Source: California Energy Commission, 2014.*[78]

Nevertheless, there have also been significant gains in energy savings: the Department achieved approximately 60 percent more savings in FY 2012-13 than FY 2011-12 and 27 percent more energy savings in FY 2013-14 than in FY 2012-13.[79] Overall, LADWP has doubled its energy efficiency attainment in the last several years.

In terms of program performance, there is a range of success across LADWP's portfolio. Typically, about 20 percent of the programs account for 80 percent of the savings. This is because of the balance between social equity objectives and implementing a cost-effective portfolio that saves the most energy. Portfolio performance for FY 2014-15 is summarized in the table below.

[78]Giyenko, Elena, Doug Kemmer, Sandra Fromm, Cynthia Rogers. 2014. *Achieving Energy Efficiency in California: 2013 Status Update.* California Energy Commission, Electricity Supply Analysis Division. CEC-200-2014-002.

[79]57 percent for FY 2012-13 vs. FY 2011-12 according to a presentation in 2013 (David Jacot. "Next Century Power: Energy Efficiency for LA." Los Angeles Department of Water and Power, October 7, 2013. Available at: www.labusinesscouncil.org/files/LADWP.pdf).

**Table 2-14. LADWP Efficiency Solutions FY 2014-15 Status**

| Program | FY 2014-15 Goal | FY 2014-15 Accomplishment (April 2015) |
|---|---|---|
| **Mass Market** | 82.51 GWh | 49.56 GWh |
| | $35.21 million | $32.36 million |
| **CII** | 88.16 GWh | 71.0 GWh |
| | $26.80 million | $15.55 million |
| **Crosscutting** | 69.34 GWh | 79.02 GWh |
| | $7.79 million | $4.70 million |

*Source: LADWP – Efficiency Solutions Fiscal Year 14-15: Cumulative and Monthly Status.*
*Note: General program support is over-budget at $6,881,420 of the $2,341,667 budgeted through April 2015.*

Certain energy efficiency programs have performed particularly well, including the Small Business Direct Install Program[80] which is expecting to double its annual savings accomplishments and introduce a second contractor to operate the program to introduce additional competition in procurement. In addition to the Small Business Direct Install Program, the Home Energy Improvement Program,[81] CII Custom Performance Program,[82] and Commercial Lighting Incentive Program[83] received the most funding in FY 2013-14 and will continue to receive the most going forward. The Codes, Standards and Ordinances cross-cutting program[84] has been hugely successful in terms of cost-effective energy savings, as has the Refrigerator Turn-in & Recycle Program.[85]

The Technical Assistance Program has had tremendous customer demand but has yet been unable to meet its potential. This program is an intake to the CII Custom Performance Program, by way of completing a deep energy audit for customers. Because throughput capacity has not been able to keep up with the level of interest, the Efficiency Solutions group is working to streamline some program requirements.

The Efficiency Solutions group also has a noteworthy partnership with Southern California Gas Company for joint electric and gas saving programs. The partnership operates under a Master Utility Agreement which makes collaboration much simpler, since task orders for new programs are issued under the existing umbrella agreement. There are 12 joint programs in place currently, with 2-3 more rolling out. The partnership has been viewed as a great success, bringing down costs through economies of scale, rounding out some programs, and receiving regional and national attention.

#### *2.4.5.5 Energy Efficiency Outlook*

According to interviews and Navigant's analysis, the Efficiency Solutions group is on track to come back from a period of underspending and underperforming and make good progress towards goals going forward. The primary barrier to ramping up LADWP's energy efficiency programs has been a lack of

[80]Retrofits the existing lighting of qualifying business customers to new, high efficiency lighting systems.
[81]Offers residential customers energy efficiency and water conservation upgrades by qualified Department staff.
[82]Offers savings-based incentives for the installation of energy savings measures, equipment or systems that exceed Title 24 or minimum industry standards.
[83]Provides menu-based rebates for energy efficiency lighting technologies.
[84]A resource program that conducts advocacy activities to improve building and appliance efficiency regulations, with the principal audience of L.A. City Department of Building Safety and the L.A. City Council.
[85]Provides free pick-up and recycling of old, inefficient refrigerators, along with a cash incentive.

resources other than funding. Specifically, hiring staff and contracting have been challenging for the Efficiency Solutions group (several years ago, the civil service list for the group expired). Now, the hiring issue has mostly been resolved; however, the Department should ensure that the group has adequate resources to roll out programs to achieve 15 percent savings by 2020. Fundamentally, the group appears to have a well-designed structure that promotes synergies between all customer efficiency solutions including electricity, gas, and water; further, LADWP has reportedly realized that energy efficiency is the least-cost compliance strategy for California regulations and is firmly in favor of expanding it.

Several near-term activities by the Efficiency Solutions group include a new residential service for consumer electronics and upstream LEDs, as well as further advancements in the water-energy nexus. The group has quantified embedded energy in water for the LADWP system (resulting in a blended city-wide 611 kWh per acre-foot) and has a current engagement to provide more granular locational values.

In the longer term, SB 350 calls for doubled building efficiency by 2030. This will impact the Department's energy efficiency targets after 2020, which should now be developed and included in the next IRP. For future goals, it is also important to distinguish between traditional loads and nontraditional loads. Traditional loads include buildings, processes, etc. Nontraditional loads include the electrification of the transportation sector, which is expected to double demand. The Efficiency Solutions group is aware of this and should include it in future work.

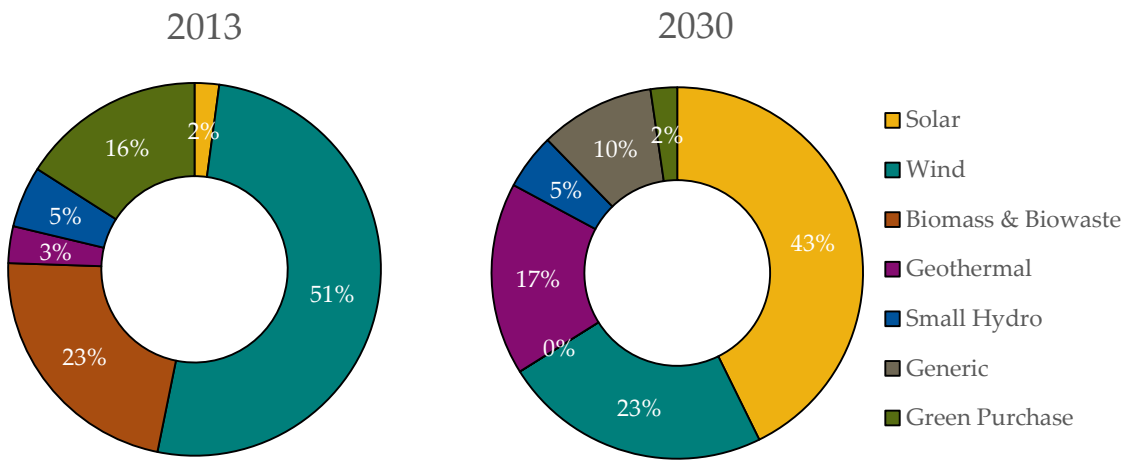
### 2.4.6 Renewable Portfolio Standard

The 2014 IRP Recommended Case calls for a 40 percent RPS by 2030, after achieving 33 percent by 2020 as mandated under SBX1-2. Although LADWP achieved 20 percent RPS by 2010 (earlier than the requirements for 20 percent RPS over 2011-2013), the Department acknowledged that significant challenges lie ahead for increasing renewable penetration to 33 and then 40 percent.

LADWP achieved 23 percent renewable electricity sales in 2014 (up from only 3 percent in 2003). As part of this, the Department relied on wholesale renewable energy purchases to maintain its renewable Power Content Label above 20 percent.[86,87] Purchases will also be needed going forward to manage LADWP's RPS eligible renewable energy resources portfolio effectively based on prevailing wholesale practices; however, this is expected to decrease in the future. The figure below shows the development of LADWP's recommended renewable energy mix from 2013 to 2030.

[86]AB 162 and SB 1305 require retail electricity suppliers to disclose information about the energy resources used to generate the electricity they sell (www.energy.ca.gov/sb1305/power_content_label.html).
[87]LADWP's Power Content Label: www.ladwp.com/ladwp/faces/ladwp/aboutus/a-power/a-p-powercontentlabel?_adf.ctrl-state=az3oc3vey_4.

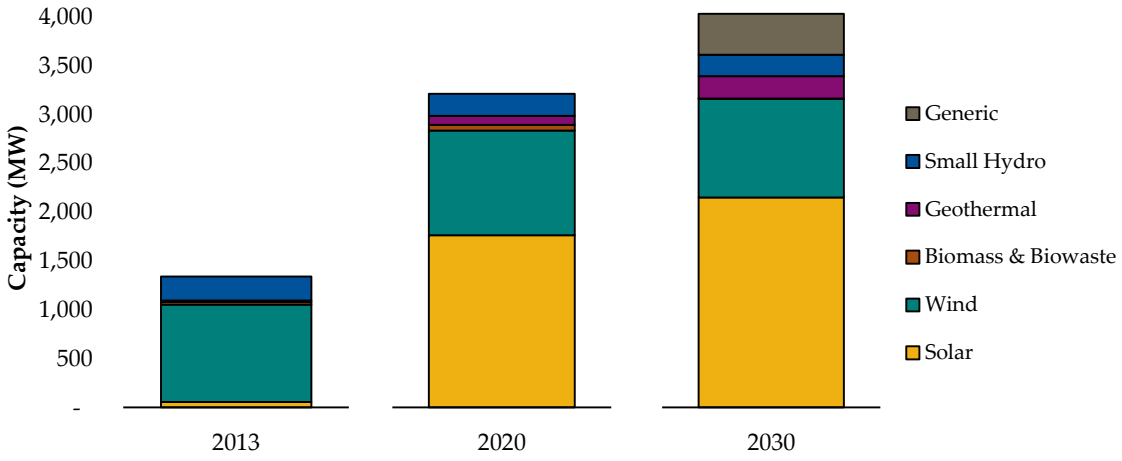
**Figure 2-13. LADWP 2014 IRP Recommended Renewable Energy Mix**




*Sources: Navigant analysis of 2014 IRP Appendix D, 2014 IRP model data*

In terms of installed capacity (shown in Figure 2-14, below), wind power dominated the Department's portfolio in 2013, followed by small hydroelectric plants. Because of relatively low capacity factors (more variability in resource availability), wind and small hydroelectric resources make up a larger percentage of installed capacity than they do electricity generation (the opposite applies to biomass & biowaste and geothermal which serve as baseload generation resources).

**Figure 2-14. LADWP 2014 IRP Recommended Renewable Portfolio Capacity**




*Sources: Navigant analysis of 2014 IRP Appendix F, 2014 IRP model data*

During the 2014-2030 period, LADWP intends to add over 1 GW of new solar power purchase agreements (PPAs) for large-scale utility solar and nearly 800 MW of new local solar – the majority of new renewable capacity, despite the low historical percentage of solar. This dramatic ramp-up of solar

energy is clearly apparent in Figure 2-14. Resources that are required for the 40 percent RPS but have not yet been planned are labeled "generic" resources.

#### *2.4.6.1 Approach to RPS*

The 2014 IRP includes LADWP's plan to ramp up to required levels of renewables: 25 percent renewable energy in 2016 and 33 percent in 2020. The resource cases in the IRP then 1) maintain 33 percent RPS through 2030, 2) increase to 40 percent RPS by 2030, and 3) increase to 50 percent RPS by 2030. LADWP selected the Recommended Strategic Case of 40 percent based primarily on compliance with AB 32 and in response to public feedback.

Modeling the cases for the IRP involves determining resource adequacy for the power system. Based on the percentage of renewable energy required for each scenario, modelers plot available generation capacity and discount renewable capacity at an assumed rate (due to variability). Actual planned renewable projects are factored in, as well as projected new capacity that will be needed to meet the RPS. Renewable wholesale purchases are included on a limited basis to meet small generation deficits. The 40 percent RPS met the Department goals above, and was determined by the IRP model to be relatively economical and meet resource adequacy requirements with little overgeneration.

#### *2.4.6.2 Background on LADWP's RPS*

On June 29, 2004, the Los Angeles City Council (City Council) passed Resolution 03-2064-S1 requesting that the Board adopt an RPS Policy of 20 percent renewable energy by 2017, setting applicable milestones to achieve this goal, and incorporating it into a future Integrated Resource Plan. On May 23, 2005, the Board adopted the RPS Policy that established the goal of increasing the amount of energy LADWP generates from renewable power sources to 20 percent of its energy sales to retail customers by 2017, with an interim goal of 13 percent by 2010. On June 29, 2005, the City Council approved the LADWP RPS Policy.

On April 11, 2007, the Board amended LADWP's RPS Policy by accelerating the goal that 20 percent of retail sales be generated from renewable resources, with a new target date of December 31, 2010. In addition, the amended policy established a Renewable Resource Surcharge and also established renewable energy procurement ownership targets. The Board subsequently approved an RPS Policy, as amended in April 2008, which included an additional RPS goal of requiring that 35 percent of energy sales to retail customers be generated from renewable resources by December 31, 2020, expanding the list of eligible renewable resources, and providing new energy delivery criteria. In 2010, LADWP achieved its RPS goal of 20 percent.

The RPS Policy was amended and subsequently adopted in December 2011 as a result of the adoption of the California Renewable Energy Resources Act (Act or SB 2 [1X]) and its requirement for the governing boards of local publicly owned electric utilities (POUs) to adopt "a program for the enforcement of this article" on or before January 1, 2012, for 25 percent RPS by 2016 and 33 percent RPS by 2020. On August 30, 2013, the California Office of Administrative Law approved the regulations, which became effective as of October 1, 2013.[88] In 2011, the Board adopted the RPS procurement targets in the Act, under its Renewables Portfolio Standard Policy and Enforcement program. LADWP and the Southern California

[88]Renewables Portfolio Standard Policy and Enforcement Program. Los Angeles Department of Water and Power, amended December 2013.

Power Authority, of which LADWP is a member, have issued multiple Requests for Proposals since 2001 for renewable resources.

LADWP also has a power content label goal, to achieve over 20 percent RPS on the power content label. This means that on years that have no state mandate, LADWP prioritizes obtaining 20 percent renewable power. When cost-effective, the Department purchases wholesale renewable power (for example, the large purchase in December 2014), but expects fewer and fewer of these purchases going forward as more large-scale renewable generation projects come online.

#### *2.4.6.3 Current RPS Projects*

LADWP has installed primarily wind capacity in the past, with some small hydro, geothermal, and biowaste resources as well. It has also relied on renewable energy wholesale purchases for the required 20 percent RPS from 2011-2013 and to maintain the 20 percent renewable Power Content Label in 2014. The monthly RPS Board of Commissioners update from May 14, 2015 shows that monthly renewable energy from LADWP's generation resources fluctuates between 10 and 23 percent over the year. In December 2014, the Department made a major wholesale market purchase to achieve 45 percent renewable energy for the month, to close out 2014 with renewables above 20 percent for the year. LADWP will likely continue to make cost-effective wholesale renewable power purchases going forward as it did in 2014, however, this will decrease as there is significant new renewable capacity ahead.

Based on RPS reports, there appear to be sufficient projects to meet the 2016 requirement of a 25 percent RPS. From projects on LADWP's RPS Master Project List in May 2014, there are reportedly finalized contracts for an RPS of 30.64 percent in 2020. Projects still under negotiation at this time are expected to make up another 5.7 percent in 2020, for a projected total of 36.3 percent. 11.8 percent will be owned by LADWP, 12.8 percent will have an option to own, and 11.7 percent will be contracted under power purchase agreements. LADWP expects to have no problems obtaining contracts for projects "under negotiation" since approximately 300 projects entered the PPA queue.

In order to support new large-scale renewable projects, the Department is building and/or upgrading new transmission capacity, specifically the Barren Ridge Renewable Transmission Project. According to a capital budget report provided by LADWP, this project has been very significantly underspending for the past three years, which merits an additional status report for explanation.

Recent accomplishments according to LADWP's 2015 Briefing Book are listed in the following table, followed by in-progress and planned projects to meet the recommended RPS. Navigant was unable to verify progress on a number of these projects without project status updates versus original capital budgets and schedules. However, in interviews, LADWP leadership reported that major projects are on schedule. The Department is confident that the 33 percent RPS will be met by 2020.

**Table 2-15. LADWP's Recent RPS Project Accomplishments**

| Project Name | Description | Completion Date |
|---|---|---|
| **Adelanto Solar Project** | 10 MW in Victorville, California | July 2012 |
| **Pine Tree Solar Power Project** | 8.5 MW co-located with the Pine Tree Wind Farm in the Tehachapi Mountains | March 2013 |
| **Manzana Wind** | 39 MW 10-year PPA in Kern County | May 2013 (approved) |
| **Don A. Campbell Geothermal Power Plant** | 14 MW in Mineral County, Nevada | January 2014 |

| | | |
|---|---|---|
| **Sempra Copper Mountain 3 Solar Project** | 210 MW PPA in Boulder City, Nevada | April 2015 |

**Table 2-16. LADWP's In-Progress RPS Projects**

| Project Name | Size | Description and Status | Planned COD |
|---|---|---|---|
| **Moapa Southern Paiute Solar Project** | 250 MW | LADWP will receive energy under an approved PPA. The project requires LADWP to buy several miles of transmission. The project developer is still working to finance the project and construction is on schedule. | June 2016 |
| **Beacon Solar** | 250 MW | Construction began in early 2015 and appears to be over the budget so far – possibly ahead of the schedule. | July 2016 |
| **Springbok I Solar** | 100 MW | Project was approved in September 2014; no other update available. | September 2016 |
| **Barren Ridge Solar I** | 60 MW | Construction began in 2014; no other update available. | End of 2016 |
| **Heber I Geothermal** | 34 MW | PPA from an existing geothermal plant in Imperial County. | December 2016 |

**Table 2-17. LADWP's Planned RPS Projects**

| Project Name | Size | Description | Modeled COD |
|---|---|---|---|
| **Solar Projects 2016** | 197 MW | Undetermined solar PPAs. Springbok II Solar (150 MW) may make up the majority of this, based on an approved contract for COD in December 2016.[89] | January 2017 |
| **Geo PPA 2016 OD** | 16 MW | Undetermined geothermal PPAs. | January 2017 |
| **WSHydro** | 4 MW | Undefined small hydro. | July 2018 |
| **Pine Canyon Wind** | 70 MW | To begin development in 2016. | January 2019 |
| **Geo-Imperial** | 25 MW | LADWP is exploring the geothermal potential in Imperial Valley. | 2020-2023 |
| **Owens Community Solar** | 194 MW | Large-scale community solar concept. | 2021-2024 |
| **Geo_Generic** | 100 MW | Undetermined geothermal. | 2022-2024 |
| **Geo-Imperial_Ext** | 50 MW | If the initial exploration is successful, 50 MW more is targeted. | 2025-2028 |
| **Solar_Projects** | 98 MW | Undetermined solar. | January 2026 |
| **Wind_STS** | 200 MW | Undefined wind. | January 2027 |
| **Generic_RPS** | 419 MW | Undetermined renewable resources. | 2027-2034 |

*Note: Projects do not include local solar (Solar Incentive Program, feed-in tariff, or local community solar).*

As LADWP develops its projects, preference is given to those located within the City of Los Angeles or on City-owned property and owned and operated by LADWP. As of January 1, 2011, a minimum of 75 percent of all new eligible renewable energy resources procured by LADWP is required to either be owned or procured by LADWP through an option-to-own (either directly or indirectly) until at least half of the total amount of eligible renewable energy supplied is owned by LADWP. In short, LADWP's goal is to own (either directly or jointly) at least 50 percent of its eligible renewable energy resource portfolio. LADWP prioritizes ownership in order to maintain control over its assets and to protect customers from

[89]Presentation to the LADWP Board of Water and Power Commissioners, May 19, 2015.

market price fluctuations. The 50 percent target is expected to be met in 2015 and exceeded moving forward (approximately 68 percent of projects are expected to be LADWP-owned in 2020).

In part, the market has driven opportunities for LADWP ownership versus third-party PPAs. The Department identifies various locations that would not make sense for ownership, like the Pacific Northwest. The Eastern Sierras, on the other hand, are attractive because Department water and power crews already operate there. Generally, the Department looks to cluster LADWP-owned projects together in areas where they make the most sense. The Department is also adding the option to curtail generation under PPA contracts; otherwise it would be required to buy the agreed amount of electricity at all times. Especially for projects working on creative financing strategies that take more time and effort, LADWP had been able to negotiate increased curtailable rights.

Navigant recommends an independent review be conducted to look at the economics of the LADWP ownership strategy as fully loaded costs may be creating unnecessary rate and cost issues, for both RPS and non-RPS projects.

One concern from LADWP and other electric utilities operating throughout the U.S. is the possible expiration of the Federal Investment Tax Credit (ITC) in 2016. The 30 percent tax credit is scheduled to expire, which will drive up PPA prices for a time. Currently, LADWP reports being able to obtain solar PPAs in the $50 per MWh range and below, especially in remote regions. PPA prices would likely be higher for several years, which would impact the cost of renewable procurement to meet the RPS.

#### *2.4.6.4 Reliability Impacts of Renewables*

Integrating the amount of renewable resources required for a high RPS is expected to pose a number of challenges for electric utilities and grid operators. LADWP must prepare for the 33 percent RPS by 2020 and now for a 50 percent RPS by 2030 (according to SB 350). This section begins to address the following critical questions:

1. How does variable and localized generation impact the power system and what are the key challenges for LADWP?
2. What is the cost associated with variable and localized generation?
3. What is the Department doing to address these challenges?

The information included here is intended to frame the issue and provide a high-level evaluation of the Department's activity in this area. It is not an exhaustive literature review or analysis of work done in this area, as the subject is extremely complex and is currently the focus of numerous technical and policy papers and ongoing utility studies.

*How does variable and localized generation impact the power system and what are the key challenges for LADWP?*

The impacts to the power system discussed here include the following topics:

- Generation requirements and system flexibility
- Overgeneration and curtailment
- Transmission and distribution capacity

LADWP is required to meet the operational, planning reserve and reliability criteria, and resource adequacy standards of WECC and NERC. Resource adequacy is the procurement of sufficient flexible demand or generation capacity to meet future loads, or the availability of generation resources to meet

energy needs plus reserves.[90] The Department's dominant renewable resources going forward—wind and solar—are variable and therefore their full capacities cannot be counted towards dependable generation. The dependable capacity of wind is assumed to be 10 percent of nameplate capacity and that of solar PV to be 27 percent of nameplate capacity.[91] This affects the makeup of the generation portfolio as well as its operation.

A resource's flexibility or "dispatchability" is very important to resource planning and grid operation. According to the CAISO, dispatchability is determined by how fast the power plant can ramp up or down, how long it can sustain an upward or downward ramp, how quickly it can change its ramp direction, how far it can reduce output and not encounter emissions limitations, how quickly it can start, and how frequently it can be cycled on and off. Dispatchability is desirable because it enables generation to match the load profile. Continuously matching the demand for electricity with supply is critical for maintaining reliability. Large amounts of variable energy resources present operational challenges because they cannot be dispatched.

Wind and solar power, as variable energy resources, are not dispatchable (unless paired with energy storage), and neither is run-of-river hydropower. Geothermal and biomass operate continuously and are therefore also not dispatchable. Hence, the system requires additional flexible generation and quicker ramp-up and ramp-down times for conventional dispatchable resources. CAISO and the CPUC are working to develop specific requirements for flexible generation capacity needed to integrate increasing amounts of intermittent renewable generation into the system. In early 2014, the CAISO Board approved a proposed tariff filing regarding flexibility requirements and resource adequacy capacity, intended to help ensure that there is sufficient flexible capacity to address the added variability and uncertainty of variable energy resources.[92,93]

Overgeneration is another challenge resulting from a high penetration of renewables. Overgeneration occurs when "must-run" generation (which includes non-dispatchable renewables, combined heat and power, nuclear, run-of-river hydro, and thermal generation needed for grid stability) is greater than system loads plus exports. A large portion of the generation fleet is inflexible and cannot respond quickly to dispatches or adjust output levels, and many power plants have contractual obligations limiting how often they can be curtailed, ramped, started, or stopped. As more renewables interconnect to the grid, there is a greater the risk that at times they will cause overgeneration.

To manage persistent overgeneration, the system operator must curtail production. Curtailment, or curbing renewable generation to limit overgeneration, means that more natural gas-fired power plants may have to ramp up and down, negating some of the greenhouse gas reduction that would otherwise result from increased renewable capacity. A recent study on the effect of increasing the RPS in California by Energy and Environmental Economics, Inc. (E3)[94] found that the largest integration challenge is

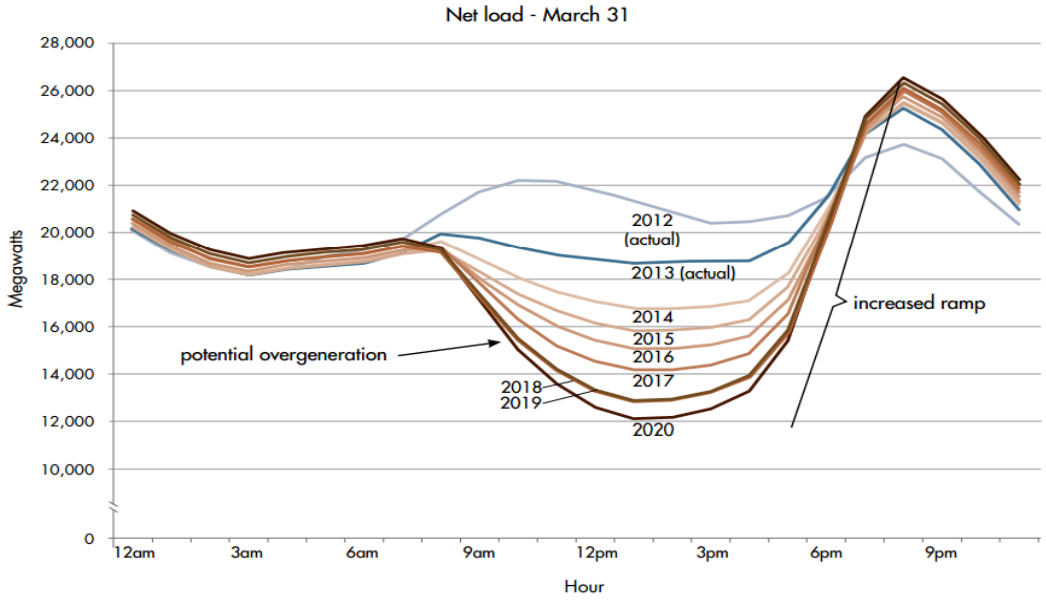
[90]Mass Market Demand Response and Variable Generation Integration Issues: A Scoping Study," Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, October 2011 (eetd.lbl.gov/sites/all/files/publications/lbnl-5063e.pdf).
[91]Ibid.
[92]More information available at: publications.caiso.com/StateOfTheGrid2014/GridResiliency.htm.
[93]"Flexible Resource Adequacy Criteria and Must-Offer Obligation," California ISO, February 7, 2014 (www.caiso.com/Documents/DraftFinalProposal-FlexibleResourceAdequacyCriteriaMustOfferObligation.pdf).
[94]"Investigating a Higher Renewables Portfolio Standard in California Executive Summary." Energy and Environmental Economics, Inc., January 2014.

overgeneration. From this study, overgeneration occurs even at a 33 percent RPS, especially when the portfolio is dominated by solar resources. For a 40 percent RPS large solar case,[95] 1.8 percent of renewable energy is overgeneration and occurs in 8.6 percent of the hours in a year. In the 50 percent RPS large solar case, 8.9 percent is overgeneration and occurs in 23 percent of the hours in a year.

Increased curtailment of renewables puts meeting RPS requirements at risk despite how much renewable capacity is installed, because the standard is based on the percent of utility retail sales served. Procurement of a more diverse portfolio of renewable resources, which includes less solar and disperses the renewable generation over more hours of the day, is expected to reduce daytime overgeneration.

CAISO agrees that the occurrences of overgeneration events increase under a higher RPS scenario. The CAISO's "duck curve" shows overgeneration from renewables and other resources during the middle of the day, followed by a massive ramp from traditional power plants in the late afternoon in the absence of renewables (mostly solar). Wind and solar forecasts must be incorporated into scheduling in order for utilities to manage these ramping needs, and uncertainty in forecasts will require the additional commitment of spinning reserves.

**CAISO "Duck Curve" for Renewable Overgeneration and System Ramping**




*Source: California Independent System Operator*[96]

Large-scale wind and solar are also often remote from load centers, requiring new or upgraded transmission capacity. The new transmission capacity will have to be suited for resources with low capacity factors. Distributed generation (e.g. local solar) also has the potential to put stress on the transmission and distribution systems. Assembly Bill 528 requires the California Public Utilities Commission to submit to the legislature a biennial report on the impacts of distribution generation on California's transmission and distribution systems. Black & Veatch developed the latest report on this

[95]Meets a 50 percent RPS in 2030 by relying mostly on large, utility-scale solar PV resources.
[96]publications.caiso.com/StateOfTheGrid2014/RenewablesIntegration.htm

topic in May 2013.[97] Expected impacts would occur first on the distribution system and then roll up to the transmission system as penetration increases. However, impacts have not yet been fully quantified. At current penetration levels for most utilities, the interconnection process and requirements by utilities have mitigated effects.

Quantifying impacts is difficult in part because they are highly locational. A report by the Rocky Mountain Institute highlights the fact that distributed generation in the right place at the right time can create significant value, while additional electricity supply in the wrong place at the wrong time could result in added costs to the system.[98] Each distribution circuit has a different capacity to accommodate distributed generation, so impacts are highly dependent on the local feeder configuration and loading level.

The Black & Veatch report recommends further detailed investigation of the current and future impacts and benefits of distributed generation on the electric grid. Transmission system impacts from customer-side distributed generation installations have not been observed yet, but are expected to appear at higher penetration levels. To further quantify these impacts as customer-sided distribution generation increases, utilities will need to monitor, evaluate, and associate impacts with distributed generation systems.

*What is the cost associated with variable and localized generation?*

Addressing the challenges posed by variable renewable generation to system operators requires additional resources and often more complex control systems, which incur additional costs. These are typically called renewable integration costs. There are costs associated with each of the impacts summarized above. Additional flexibility required from conventional generation and additional spinning reserves will increase capital and operations and maintenance costs. New and upgraded transmission lines to large solar and wind projects will be costly and have some additional costs associated with the need to accommodate low capacity factors. Costs related to upgrading to the distribution system for distributed generation may also be required.

The study by E3 on the effect of increasing the RPS in California calculates the total cost and average retail rate for 50 percent RPS scenarios, but does not include grid operating costs. Higher RPS scenarios result in an increase in average electric rates, and rate impacts are expected to be significantly higher under than 50 percent RPS scenario than the 40 percent RPS scenario. The 40 percent RPS scenario could lead to an additional 0.7 percent rate increase over the 33 percent scenario, and the 50 percent RPS scenarios could increase rates by 5.8-11.3 percent relative to the 33 percent scenario. Revenue requirements could increase 3.2 percent under the 40 percent RPS scenario and 9.1-23.4 percent under the 50 percent RPS scenarios.

Distributed generation typically incurs higher costs than remote, large-scale renewables. The E3 study found that small solar and rooftop solar scenarios are found to be costlier than the large solar and "diverse" scenarios. Although transmission costs are reduced relative to larger systems located in remote

[97]Biennial Report on Impacts of Distributed Generation, California Public Utilities Commission, May 2013 (www.cpuc.ca.gov/NR/rdonlyres/BE24C491-6B27-400C-A174-85F9B67F8C9B/0/CPUCDGImpactReportFinal2013_05_23.pdf).

[98]"Net Energy Metering, Zero Net Energy, and the Distributed Energy Resource Future: Adapting Electric Utility Business Models for the 21st Century," Rocky Mountain Institute, March 2012 (www.rmi.org/Content/Files/RMI_PGE_NEM_ZNE_DER_Adapting_Utility_Business_Models_for_the_21st__Century.pdf.pdf).

areas, distribution costs are higher. All scenarios assume that significant investments and upgrades to both the California electrical grid and the state's fleet of thermal generators have already occurred between 2013 and 2030 (including the development of a newer, more flexible fleet of thermal generation), which helps make the integration of remote, large-scale renewables less expensive.

A report for the California Energy Commission[99] explores the cost impacts cited by Southern California Edison for integrating 4,800 MW of distributed generation in a study from May 2012. The study concluded that the cost of integrating 4,800 MW of distributed generation depended highly upon locational factors; this makes sense given the locational nature of the system impacts discussed above. Southern California Edison defined two cost components associated with distributed generation. The first is the cost of interconnection (new lines and equipment to connect to the utility distribution system) and the second is system upgrades, which include enhancements of the existing system or applicable mitigation measures designed to remedy deficiencies or violations. In that study, total integration costs for distributed generation ranged from $190 per kilowatt to $270 per kilowatt.

Although good progress has been made to quantify costs in these studies and others, renewable integration costs have still not been fully quantified and will vary by individual service territory.

*What is the Department doing to address these challenges?*

LADWP addressed several of the above impacts and costs in its 2014 IRP, and then determined the recommended 40 percent RPS scenario to have manageable impacts on the grid. However, there are a number of impacts that are not yet understood. The Department acknowledges the importance of understanding these impacts and states that this will be a key issue to be addressed in the 2015 update to the IRP.[100] Additionally, California has now adopted a 50 percent RPS under SB 350 which will need to be included in the next Recommended Strategic Case.

The area that LADWP analyzed in the most detail in the 2014 IRP is overgeneration. It calculated the amount of overgeneration expected from the recommended 40 percent RPS case to be 155 GWh in 2030 (1 percent) and 587 GWh from a 50 percent RPS (3.5 percent). The base RPS case of 33 percent is expected to be manageable with the Department's current resource mix. LADWP expects its overgeneration to be lower than for other California utilities due to developing an RPS portfolio with a diverse mix of renewable resources and having the Castaic Pumped Storage Plant; this expectation is reflected in the 1 percent overgeneration calculation compared to the 1.8 percent calculation by E3 for California overall.

LADWP calculates that overgeneration under the 40 percent RPS case will potentially result in $16 million increased costs by 2030. The analysis spot-checked forecasted daily generation in all seasons of 2020, with preliminary results indicating that generation will exceed system load during certain hours, especially in the spring season. However, the Department reports that it is conducting more detailed studies to determine what percentage of hours of overgeneration are forecasted to occur overall. Potential solutions to overgeneration discussed at a high level include managed energy curtailment (demand response, energy storage, etc.) and the flexibility of new repowered gas units.

The 2014 IRP mentions that greater amounts of regulating and spinning reserves will be needed to help integrate high levels of variable energy resources, and that further study will also be required for this

[99]Shlatz, Eugene, Nathan Buch, and Melissa Chan. 2013. *Distributed Generation Integration Cost Study: Analytical Framework*. California Energy Commission. Publication Number: CEC-200-2013-007-REV.
[100]LADWP 2014 IRP, Preface.

topic. Overall, a detailed reliability analysis has yet to be performed to determine whether higher levels of RPS can be supported. Interviews with Department staff indicate that a study on the maximum renewable generation that can be added to the grid in terms of generation resources is underway with an outside consultant. The Department has also begun studying the impact in terms of distribution system capacity. The 2015 update and 2016 IRP should show progress and results for these studies. Interviews report that most of the modeling activity is complete and the Department expects to issue drafts in the October 2015 timeframe. This is a very important element for discussing the 40 percent and especially 50 percent RPS going forward. Until the full costs of integration are fully understood, any future rate increase related to new generation resources should be tied to the results of such studies and increases should be phased based on the strategies adopted and progress against them.

One other area to investigate is coordination between increasing renewables under the recommended RPS scenario and the Power System Reliability Program (PSRP). LADWP must thoroughly understand distributed renewable impacts on the reliability of the distribution system in particular, and undertake a cohesive planning effort to ensure its system upgrades meet multiple Department goals (for both renewables and reliability). The timeline for PSRP upgrades may impact the timeline for allowable levels of renewable integration in certain areas of the distribution system. Local solar installations may impact PSRP priorities on an evolving basis as interconnection applications are received, and other renewables may dictate which new forms of infrastructure replace aging assets. The Department's planned substation automation is one step toward integrating distributed generation; however, otherwise there is simply a "hope" among Department leadership that PSRP activities will catch up in time to support the higher RPS and local distributed generation. Rather, this should be an explicit plan with coordinated costs and schedules in the next IRP.

LADWP is far from being alone in its work to better understand the reliability impacts of renewables on the grid. There are similar ongoing studies in California by the IOUs, research institutions, and CAISO and the CPUC. In the Distributed Resource Plans required by the CPUC, the IOUs included timelines for additional studies evaluating capacity and load forecasting scenarios, determining optimal locations for distributed energy resources, deploying communications infrastructure, and other activities. Outside of California, most utilities with increasing amounts of renewable energy and distributed generation are increasingly looking to better understand the amounts that can be accommodated and at what costs. LADWP does not appear to be behind peers in this regard, but it is no less critical to find answers to the important reliability questions.

#### *2.4.6.5 RPS Outlook*

According to interviews, LADWP is on track to meet the 33 percent RPS in 2020, based on existing contracts in development and project under construction, as well as upcoming contract awards. Because many projects are currently ongoing without comprehensive status tracking, the Department should provide an updated RPS project completion report in the 2015 IRP update and 2016 IRP. The 2016 IRP should also show that LADWP has met the required 25 percent RPS. As a rule, the IRP report should more clearly present progress on RPS projects and institute clear project metrics.

Critically, Senate Bill 350 recently instituted a 50 percent RPS in 2030. According to interviews, LADWP explored various options for complying with the 50 percent requirement in anticipation of the bill's approval. LADWP has prepared the groundwork for meeting the new standard by including the 50 percent RPS case in the 2014 IRP, although it is not the Recommended Strategic Case. In the next IRP, 50

percent must be the Recommended Strategic Case. Completing the ongoing renewable integration reliability studies is even more critical for the Department to be able to achieve a 50 percent RPS by 2030.

### 2.4.7 Local Solar

The Recommended Strategic Case for local (distributed) solar is a slightly modified Case 4 in the IRP, including 800 MW local solar by 2023 rather than 1,000 MW. However, recommending this case does not preclude expansion to 1,000 MW or 1,200 MW by 2029 (the highest cases). Expanded local solar could account for the "generic RPS" category left in the resource plan to allow greater flexibility. LADWP's Recommended Strategic Case for local solar is the following:

- 310 MW customer net metered solar (including the Solar Incentive Program) by 2020;
- 450 MW feed-in tariff solar (375 MW more than required under SB 32), with 150 MW by 2018 and the expanded 300 MW program by the end of 2023; and
- 40 MW community solar on city-owned properties by the end of 2020.

#### *2.4.7.1 Background on Local Solar*

California has a long history of encouraging the development of smaller generation facilities that connect directly at the distribution level of the electricity system (distributed generation). For example, in response to the 2001 energy crisis the CPUC initiated the Self-Generation Incentive Program (SGIP), which provides incentives to qualifying distributed energy systems and at the time, included solar PV.[101] In 2007 due to SB 1, state support for solar PV shifted to the Go Solar California campaign,[102] which encompasses the California Solar Initiative (CSI) program for IOU customers, the New Solar Homes Partnership specifically for new homes in IOU areas, and various programs under POUs like LADWP. The overarching goal is for Californians to install 3,000 MW of distributed solar by the end of 2016.

As of 2011, PG&E had installed 558 MW, SCE had installed 297 MW, and SDG&E had installed 111 MW of customer solar PV. Together, the POUs had installed 110 MW of customer solar PV; LADWP with 32 MW and SMUD with 31 MW.[103] LADWP has shown significant improvement since that time and currently offers two local solar programs: the long-standing Solar Incentive Program and a newer Feed-in Tariff (FiT) Program. The expansion of local solar is primarily based on comments received in public workshops indicating that local solar should be a priority in LADWP's renewables procurement strategy, but will also contribute to meeting LADWP's RPS goal.

#### *2.4.7.2 Solar Incentive Program*

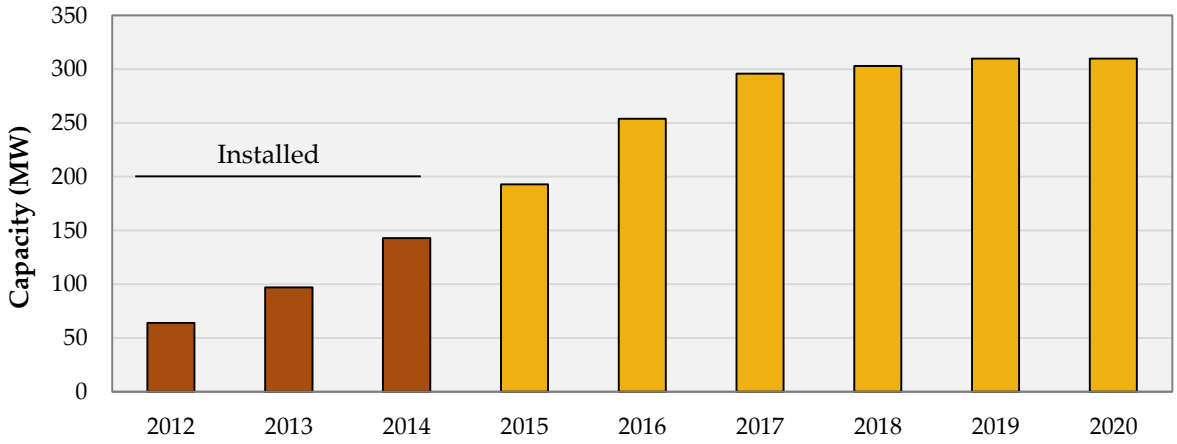
Customer net metered solar installations from 1 kW to 1 MW in size qualify for the Solar Incentive Program.[104] As of June 22, 2015, the Solar Incentive Program Dashboard reported approximately 135

[101]Summary of the Self-Generation Incentive Program available at: www.cpuc.ca.gov/PUC/energy/DistGen/sgip.
[102]www.gosolarcalifornia.ca.gov.
[103]"Biennial Report on Impacts of Distributed Generation," California Public Utilities Commission, May 2013. www.cpuc.ca.gov/NR/rdonlyres/BE24C491-6B27-400C-A174-85F9B67F8C9B/0/CPUCDGImpactReportFinal2013_05_23.pdf.
[104]LADWP Feed-in Tariff Master Conditional Use Permit. City Planning Commission, February 26, 2015.

MW, or 16,000 customer systems.[105] According to the 2014 IRP, LADWP has 143 MW total net-metered solar installed as of March 2015 (including the current Solar Incentive Program installations). The program has a goal to provide 280 MW in total by 2016 and 310 MW by 2020, which is reflected in the IRP Recommended Case. Although incentive funding is likely to be fully allocated to projects by 2016, there is significant interest from LADWP customers in net metering and solar developers are not expected to be put off by the lack of local incentives once program funding runs out.

The Solar Incentive Program experienced rapid growth over the 2009-2011 period and maintained capacity growth of approximately 20 MW per year for FY 2011-2012 through FY 2013-2014. The 2014 IRP plans for net-metered local solar to reach 193 MW cumulative installed capacity by the end of 2015; with 143 MW installed as of March 2015 the Department is approaching this target. The RPS report to the LADWP Board in April 2015[106] gives a total of 33.05 MW confirmed reservations and 23.05 MW installed by the beginning of May 2015 for FY 2014-15. If all of the confirmed reservations are installed before the end of the year, the Department is likely to meet it 2015 goal. Overall, recent installation data reflects that LADWP is on track to reasonably meet its goals in the next few years, as depicted by the figure below.

**Figure 2-15. 2014 IRP Cumulative Net-Metered Solar, Historical and Projected (MW)**



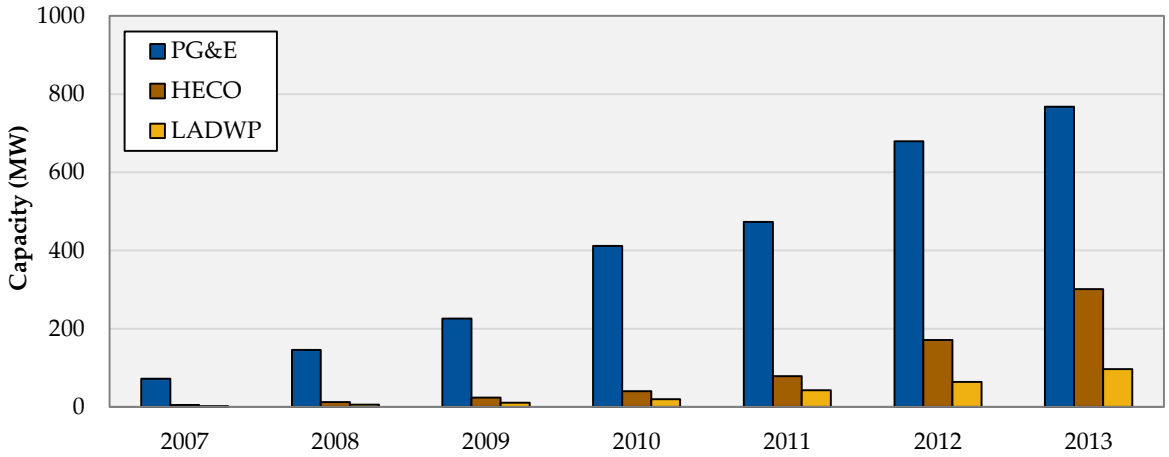

*Source: 2014 IRP, Appendix N*

Compared to two of the leading U.S. utilities for distributed customer solar, Pacific Gas & Electric (PG&E) and Hawaiian Electric Companies (HECO), LADWP's increase in net-metered customer solar is moderate. The figure below shows data from HECO and the California Solar Initiative for PG&E:

[105]Solar Incentive Program Dashboard available at: www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB395923&RevisionSelectionMethod=LatestReleased.

[106]Renewable Portfolio Standard (RPS) Projects Update – April 2015 from May 14, 2015.

**Figure 2-16. Cumulative Installed Customer Net-Metered Solar Comparison**




*Sources: LADWP 2014 IRP, LADWP SIP Report (April 2015), California Solar Initiative,[107] and HECO[108]*

In terms of growth rate, PG&E's installed customer net-metered solar capacity increased by more than a factor of 10 over the six-year period from 2007 to 2013. Dramatically, HECO's installed customer net-metered solar capacity increased by more than a factor of 150 over the same period. While this resulted in a number of complications for the Hawaiian grid, LADWP is not planning for such rapid growth. The Department's projected increase is less than a factor of five over the six-year period from 2012-2018, while HECO underwent similar growth in MW in one-third of the time (two years from 2011-2013). And given the high LCOE of local distributed solar compared to utility-scale solar, it makes sense to not more dramatically ramp up the more expensive resource.

LADWP's anticipated increase in customer net-metered solar is also reasonable given the motivation for solar developers to install projects before 2016 when the residential Investment Tax Credit (ITC) is scheduled to be reduced from 30 percent to 10 percent and the commercial ITC is scheduled to expire. Hence, the forecast in Figure 2-15 increases through 2017, when projects receiving the ITC are completed, and then levels out for the next several years. Additionally, the Solar Incentive Program funds are expected to have mostly been exhausted by that time.

The program has undergone several process improvements including proactively monitoring applications, restructuring the inspection group, simplifying inspections, and increasing call center staff. The total time of for customers participating in the program (including reservation, construction and permitting, inspection, and payment) decreased significantly over 2014 and the beginning of 2015, from 59 weeks in February 2014 to 22 weeks for the first half of April 2015. Without including customer construction and permitting, times went from 46 weeks to 18 weeks.[109]

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[107] Program Totals by Administrator, Go Solar California, July 29, 2015 (www.californiasolarstatistics.ca.gov/reports/agency_stats/).

[108] "Rooftop PV enjoys another strong year in Hawaii," HECO, January 22, 2014 (www.heco.com/heco/_hidden_Hidden/CorpComm/Rooftop-PV-enjoys-another-strong-year-in-Hawaii?cpsextcurrchannel=1).

[109] Solar Incentive Program: Update on Process Improvements. Presentation to LADWP Board of Water and Power Commissioners, May 5, 2015.

### *2.4.7.3 Feed-in Tariff Program*

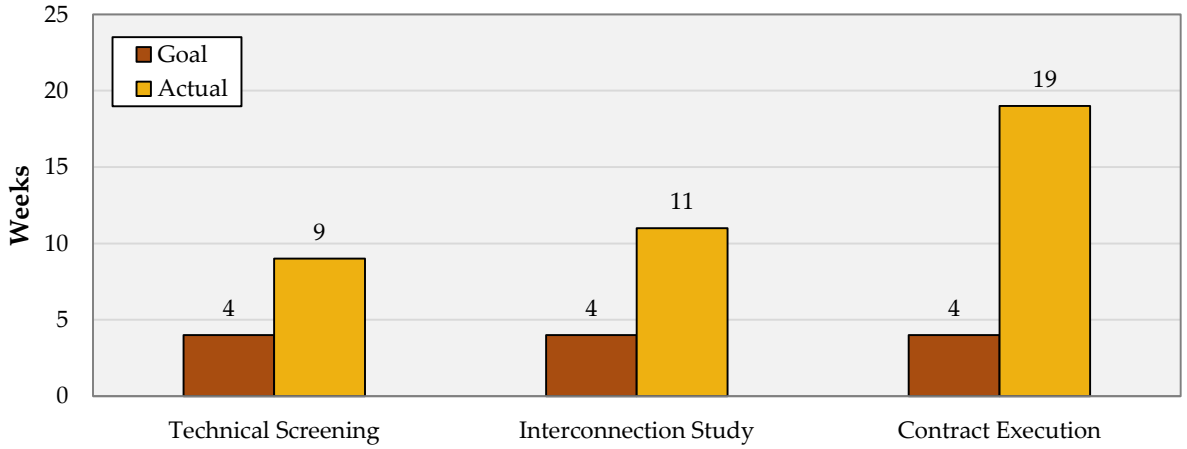
SB 1332 requires LADWP to offer a 75 MW feed-in tariff (FiT) program; in the 2014 IRP, the Department has gone significantly above this amount based on contribution to its recommended RPS and community feedback in support of local solar. LADPW's Recommended Case includes 450 MW under from feed-in tariff projects by 2023. Projects are 30 kW to 3 MW in size under 20-year contracts.

The Department's current FiT was launched in three segments: a 10 MW demonstration program, a 100 MW set-pricing program, and a 50 MW program that bundles small local solar installations with a large-scale solar project on LADWP-owned land in the Mojave Desert (Beacon Solar).[110] The "FiT 100" program is currently underway, though near its end. The program was designed with a declining price tier system in five allocations. The base price for energy is the following:

- Large capacity projects (150 kW-3 MW): Prices decline by $0.01 from $0.17/kWh to $0.13/kWh
- Small capacity projects (30-150 kW): Prices decline by $0.01 from $0.17/kWh to $0.15/kWh
- Time-of-delivery multipliers are applied to the above prices

The fifth FiT 100 allocation for 25 MW opened on March 16, 2015. As of June 4, 2015, the program had received nine applications for 5.6 MW. For the FiT 100 as a whole, 14 projects totaling 7.1 MW have been commissioned and 28 projects totaling 11.25 MW are awaiting construction. 53 MW are "active" of the 85 MW offered through the program in the demonstration phase and the 1st through 4th allocations.[111] The program dashboard, LADWP's public-facing tracking tool,[112] reports these statistics and also that the program has suffered from a high rate of project cancellations and delays in reaching installed targets. Delays are illustrated in the figure below.

**Figure 2-17. LADWP Feed-In Tariff Processing Durations**




*Source: LADWP FiT Dashboard*

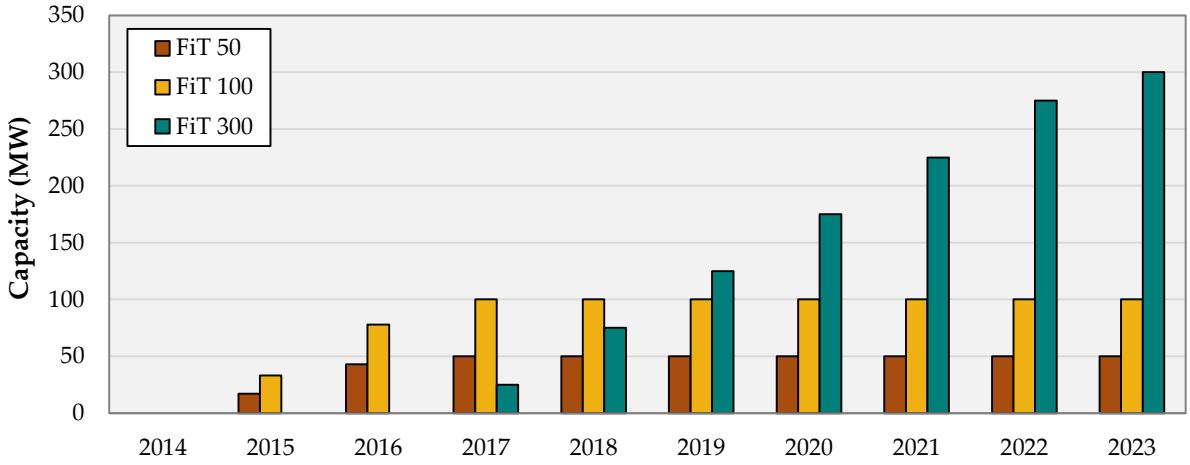
[110]The "FiT 50" was approved by the Board in early 2013 and has awarded two contracts to SunEdison and Hecate for 22 MW and 28 MW, respectively.

[111]Feed-in Tariff, 5th Allocation, Board of Water & Power Commissioners, February 17, 2015 (www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB423806&RevisionSelectionMethod=LatestReleased).

[112]FiT program dashboard: www.ladwp.com/ladwp/faces/wcnav_externalId/r-gg-fitp-dashboard?_adf.ctrl-state=1c6htvhmzb_17.

The expanded 300 MW program is projected to reach 300 MW by 2023 and cost $52 million per year.[113] The program forecast is shown below, and has total installed FiT capacity reach 450 MW in 2023.

**Figure 2-18. 2014 IRP Cumulative Feed-In Tariff Program Capacity**




*Source: 2014 IRP, Appendix N*

Navigant predicts that the FiT program will continue to be a significant challenge if additional resources are not provided. The Recommended Strategic Case of 450 MW of FiT projects by 2023 will require approximately 50 MW of FiT installations per year (since the current 150 MW program has only 7 MW complete). Despite the FiT 150's low installation rate and issues with delays, the FiT 300 had been expected to be launched in 2015.[114] Instead, the program will likely begin in 2016. FiT program issues were the subject of a report last spring and have garnered some media attention.[115]

To help streamline the process, the Department obtained a Master Conditional Use Permit (MCUP), reduced the allowed construction period to 12 months, and added administrative support to expedite review.[116] LADWP submitted an application for the MCUP on December 11, 2014 after consulting with the Department of City Planning. The MCUP allows rooftop and carport projects in multifamily, commercial, public facility, and industrial zones to be permitted by administrative clearance.[117] Results from this improvement have not yet been documented.

LADWP also recently cleared inactive projects from the wait list, resulting in the program being under-subscribed. The Department should now evaluate pricing improvements and other ways to attract more participants. Overall, it is unclear how the Department will approach the expanded FiT 300 program while attempting to install the vast majority of the previous program's installation target. Navigant recommends that, after addressing current project pipeline challenges, LADWP should institute a project management office to help improve performance.

[113]"Growing Local Solar Through Expanded Feed-In Tariff." LADWP Management Report, December 2, 2014.
[114]Ibid.
[115]"Report: LADWP's Rooftop Solar Energy Program Failed to Meet Goals," CBS Los Angeles, March 27, 2015 (losangeles.cbslocal.com/2015/03/27/report-ladwps-rooftop-solar-energy-program-failed-to-meet-goals).
[116]More information available at: www.ladwp.com/FiT
[117]LADWP Feed-in Tariff: Master Conditional Use Permit. City Planning Commission, February 26, 2015.

#### *2.4.7.4 Community Solar Program*

The Community Solar Program is still under development. The goal for community solar in-basin projects is for a total 40 MW aggregated over various LADWP and City of Los Angeles properties to be installed by 2020. The Board of Commissioner's May 2015 RPS status report mentions that LADWP is currently evaluating over 100 different properties and will aggregate the best 40 MW for the portfolio. The search for land and city agency property opportunities is still underway.

The program is intended for customers who are otherwise unable to share the benefits of solar energy.[118] Projects will be owned by the Department and community solar participants will buy into the project. Customers will lock in a subscription fee for a "block" of solar energy produced from the community array and receive a proportionate energy credit on their electric bill. LADWP plans to use the Customer Care and Billing system for program tracking and reporting.

LADWP has drafted a business plan outlining next steps for the program. Initially, the Department will offer 2 MW by 2016 as a pilot program.

- Q3-Q4 2015: Finalize Community Solar Program documentation.
- Q4 2015-Q1 2016: IT programming for the Customer Care and Billing System.
- Q2-Q3 2016: Seek Board and Council approval of the program.
- Q3 2016: Offer initial phase of the program.

The plan discusses program eligibility, subscription details and preliminary costs, and challenges. This shows good preparation for the pilot program, but little information has been provided on customer interest and outreach thus far. When the Community Solar Program is finalized, it should also include a recruitment strategy and confirmation that the program can be handled through the Customer Care and Billing System.

The program will be a good step forward in aligning LADWP with greater City of Los Angeles goals; for example, those described in the Mayor's pLAn. As a POU, LADWP values the Community Solar Program for reaching low income customers and other Los Angeles residents who cannot participate in other local solar opportunities. According to NREL, POUs have taken the lead in deploying community solar projects to serve member- or citizen-customers. In its overview of utility solar business models, NREL found that utility-sponsored community solar projects typically involve customers contributing a payment to support the project and then receiving a payment or credit on their electric bill that is proportional to 1) their contribution and 2) how much electricity the solar array produces.[119]

Sacramento Municipal Utility District was an early adopter of community solar with its SolarShares program, in which customers pay a fixed monthly fee based on the amount of the solar subscription and their average electricity consumption, and receive monthly energy credits for the output of the solar subscription. The first 1 MW program was fully subscribed with approximately 700 residential customers and SMUD has plans to expand up to 25 MW in the next few years.[120] Generally, this model is similar to LADWP's plan. One difference is that SMUD contracted with a solar developer under a power

[118]Low income customers, Lifeline customers, renters, multi-family units, and any other residential customers. LADWP anticipates allowing low income and Lifeline customers to use the current subsidy for participation.
[119]"A Guide to Community Solar: Utility, Private, and Non-profit Project Development," National Renewable Energy Laboratory, November 2010 (www.nrel.gov/docs/fy11osti/49930.pdf).
[120]Ibid.

purchase agreement for a single 1 MW array, whereas LADWP plans to build a number of smaller projects itself, possibly leading to higher costs.

#### *2.4.7.5 Local Solar Outlook*

Overall, customer net-metered solar capacity and the related Solar Incentive Program appear to be growing in line with expectations. However, the FiT program is facing implementation challenges and a low installation rate to-date. On the positive side, LADWP reports on FiT progress transparently with the online dashboard. And importantly, it has also undertaken several process improvements. The Solar Incentive Program has also undergone several process improvements, which will be helpful as customer net-metered solar must increase significantly to meet its goals, even though it appears to be on track at this time. Hopefully, the FiT program will see at least as much progress going forward with additional pricing analysis, process improvements, and project management.

One interesting aspect of the FiT program is that customers who have already participated in the Solar Incentive Program can also use any excess roof or property space to participate in the FiT. This could be an attractive business case for many large entities in Los Angeles and may be an outreach channel for the program going forward.

The Community Solar Program is limited in scale and has not yet opened to customers, so updates on this new program should be featured in the 2015 IRP update (regarding final program design) and the 2016 IRP (regarding the status of Board approval and customer outreach).

### 2.4.8 Electrification of the Transportation Sector

The 2014 IRP Recommended Strategic Case includes high transportation electrification equivalent to 2,344 GWh added sales by 2030, or 290,000 electric vehicles in Los Angeles by 2020 and 580,000 by 2030.

#### *2.4.8.1 Approach to Electrification*

The California Energy Commission's Integrated Energy Policy Report (IEPR) forecasts over 1,300 GWh of plug-in electric vehicle load in California in 2034. LADWP used this report to deduce 127,000 plug-in electric vehicles by 2020 and 290,000 by 2030 in the Los Angeles. This is equivalent to an annual electricity demand of 1,172 GWh in 2030.

The IRP Advisory Committee approved a base case (the IEPR forecast), medium case (1.5x the IEPR forecast or 435,000 electric vehicles), and high case (2x the IEPR forecast or 580,000 electric vehicles). In the 2014 IRP the base, medium, and high electrification cases were paired with the 33 percent, 50 percent, and 40 percent RPS levels, respectively. The 2013 IRP recommended the base case, whereas in the 2014 IRP, the Recommended Case is for 580,000 electric vehicles by 2030. LADWP used a production cost model to determine that the high case would have a beneficial effect in lowering electricity rates through increased sales while reducing GHG emissions. In addition to approval by the Advisory Committee, the high case was supported by public feedback.

The high forecast was cross-checked against a Navigant Research Report on Electric Vehicle Geographic Forecasts for North America (Q2 2014). The Navigant Research forecast is still only approximately 80 percent of LADWP's high forecast for the comparison year 2023, but the Department considers the high scenario to be reasonable based on aggressively incentivizing and promoting electric vehicle charging.

#### *2.4.8.2 Background on Electrification*

The State of California achieved a cumulative 118,000 plug-in electric vehicles in 2014, with approximately 11,000 in Los Angeles. The United States reached 250,000 electric vehicles in 2014.[121] The City of Los Angeles contains approximately 10 percent of California's population, so the penetration of electric vehicles is proportional to the population.[122]

LADWP provided an electric vehicle program update to the City of Los Angeles in May 2015,[123] reporting on the Department's two-year EV program ("Charge Up LA! EV Home Charger Rebate Program") that began in April 2011 and provided customer rebates up to $2,000 towards the purchase and installation of EV home charging systems. After the first program ended in June 2013, LADWP implemented a second two-year year program in July 2013. The "Charge Up LA! Home, Work and On the Go" program expands charging infrastructure for businesses and all other customer sectors. According to the LADWP 2015 Briefing Book, as of December 2014, the Department paid over $2 million in EV home charger rebates for 1,300 chargers. Currently, the program offers $750-1,000 for the purchase of a Level 2 charger and a $250 credit toward electricity for installing a separate time-of-use meter.

LADWP has also retrofitted and installed over 300 legacy chargers on City Property, including LADWP, City Hall, Convention Center, LAX, and City parking structures. It is also installing 17 DC fast chargers in Los Angeles (13 installed as of May 2015).

#### *2.4.8.3 Electrification Outlook*

The California Energy Commission's forecast for electric vehicles supports Governor Brown's Executive Order which calls for infrastructure development to support one million zero emission vehicles in California. Governor Brown's final goal is 1.5 million electric vehicles by 2025; proportionally, this would result in approximately 150,000 electric vehicles in Los Angeles. In comparison, LADWP's case of 290,000 electric vehicles in 2020 and 580,000 in 2030 appears aggressive since it is double the California Energy Commission forecast.

However, LADWP is not alone in making a high forecast. In addition to the referenced 2014 Navigant Research Report on Electric Vehicle Geographic Forecasts, the Southern California Plug-in Electric Vehicle Readiness Plan[124] predicts a relatively similar number for Los Angeles with a high forecast of 278,207 electric vehicles by 2022. The Mayor's pLAn is similarly calls for 10 percent of cars and light-duty trucks to be plug-in electric vehicles by 2025, equivalent to approximately 250,000 electric vehicles (despite only 0.06 percent plug-in electric vehicles in March 2014).

Although the forecast may prove ambitious, it was created with appropriate consideration of other sources and modifications based on the Department's goals. However, to meet its forecasted numbers, LADWP must significantly expand certain capabilities. So far, the Department has not outlined a plan to

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[121]California Plug-In Electric Vehicle Collaborative 2014 Annual Report (www.pevcollaborative.org/sites/all/themes/pev/files/CPEV_annual_report_web.pdf).

[122]The annual estimate of the resident population of California in 2014 was 38.8 million and the annual estimate of the resident population of the City of Los Angeles in 2014 was 3.9 million (U.S. Census Bureau).

[123]"LADWP's Electric Vehicle Charger Program Update," All City Meeting, Los Angeles Department of Water and Power, May 11, 2015.

[124]Southern California Plug-in Electric Vehicle Readiness Plan, UCLA Luskin School of Public Affairs, December 2012 (www.pevcollaborative.org/sites/all/themes/pev/files/docs/reports/SouthCoast_PEV_Readiness_Plan_Main.pdf).

effectively incentivize electric vehicle charging to encourage and then manage the massive projected growth. As of May 2015, LADWP had only 1,000 plug-in electric vehicles on a time-of-use discount rate. Further, 89 percent of electric vehicle charging is done at home and 80 percent is done at off-peak times.

The Department recognizes that it needs a new rate design to send the proper price signals to customers and encourage electric vehicle charging at valuable times, but requires significant additional work on this topic. Electric vehicle program tracking, reporting, and project management will also be critical to managing both increasing electric vehicle penetration and expectations. Without these foundations, LADWP's electric vehicle integration vision is mostly conceptual. LADWP has just begun to look at these matters in its Smart Grid Demonstration Project (2.4.11).

The conceptual vision is in line with the State of California. In its Electric Vehicle Program Update, the Department communicates a far-reaching vision of the future: technology integration of plug-in electric vehicles with on-site solar PV, demand response, load shifting, outage mitigation, and energy storage. According to the 2013 Update to the Integrated Energy Policy Report by the California Energy Commission,[125] greater attention to vehicle and electric grid integration will be needed in the future. The California Energy Commission agrees that electric vehicles have the potential to benefit the grid by using their batteries to help manage electricity loads throughout the day to help integrate renewable solar and wind energy, with smart charging that incorporates the flexibility to communicate with customers and electric utilities.

### 2.4.9 Demand Response

The Department's demand response plan calls for 506 MW of capacity by 2026 (481 MW dispatchable), with 208 MW by 2020.

#### *2.4.9.1 Approach to Demand Response*

Demand response is an important energy management tool that facilitates the reduction in energy use over a given time period in response to a price signal, financial incentive, or other triggering mechanism (compared to energy efficiency, demand response reduces load for a targeted peak period while energy efficiency reduces the overall load shape). One key objective of demand response programs is to cost-effectively reduce the summer peak and thereby avoid long-term investment in natural gas power plants designed to operate at system peaks.

LADWP published its Demand Response Strategic Implementation Plan in 2013, which serves as the near and long-term plan for developing the demand response portfolio. The Department's vision is to "enroll a realistically achievable quantity of a dispatchable, demand-side resource within LADWP's service territory that is both reliable and cost-effective." LADWP plans to handle its demand response program ramp-up internally, operating out of the Energy Control Center managed by the Power System. Demand response will be treated as a resource and the Demand Response Strategic Implementation Plan is supposed to be updated each year and incorporated in the IRP.

[125] *2014 Draft Integrated Energy Policy Report Update*, California Energy Commission, CEC-100-2014-001-CMF, 2015 (www.energy.ca.gov/2014publications/CEC-100-2014-001/CEC-100-2014-001-CMF.pdf).

The Department also intends to integrate demand response with the billing and customer information systems. One goal is for demand response to be customer-friendly, meaning an easy enrollment process, flexibility to change participation, transparent incentives and rates, and inclusive of all rate classes.

#### *2.4.9.2 Demand Response Strategic Implementation Plan*

The following programs will be the principal sources of load curtailment:

- Commercial, Industrial, and Institutional (CII) Curtailable: Participants receive monthly capacity payments for guaranteed load reduction of at least 100 kW when requested.
- Residential & Small Commercial Direct Load Control (DLC): Participants with less than 30 kW peak load receive an annual payment that varies based on reducing power consumption from equipment including air conditioning, pool pumps, etc.
- Critical Peak Pricing: Participants of all classes and sizes given a dynamic time-of-use (TOU) rate that includes a high "critical peak" price during periods of high energy prices, high customer demand, or emergencies.
- Electric Vehicle Rider: Participants will have an EV charging station with a separate meter installed. During a demand response event, usage may be curtailed in exchange for a discounted charging rate.
- Alternative Maritime Power (AMP): CARB is requiring large vessels docked at the Port of Los Angeles to be connected to electric power through LADWP's grid to reduce emissions from diesel generation. In cases of emergencies, system operations may temporarily disconnect AMP customers.

The benefits of the Demand Response Pilot Program, as identified by LADWP are the following:

- Defer generation capacity investments.
- Provide local transmission and distribution support.
- Provide ancillary services – contingency reserves, regulation reserves, and load following.
- Facilitate renewable integration.
- Reduce power production and/or wholesale power purchase costs.

For the Pilot 1 program, 26 of 30 site walk-throughs were reported complete in a May 2015 executive update.[126] Additionally, customers had been engaged to sign the pilot program agreement, and the Billing and Rates group had been engaged on the incentive rate process. At that time, the program was on track to launch operations in June 2015. Black & Veatch technical services for the program were begun in January 2015 and are expected to run through July 2016, with 27 of work percent complete as of the May 2015 update. URS services began in December 2014 and are expected to run through June 2016, with 64 percent of work complete as of the update. All of the main tasks for Pilot I are reported to be "On Track" or "Completed" in the latest update.

Pilot 2 is scheduled to roll out in 2016 with residential A/C load control technology and customer perception, with approximately 200 participants. Pilot 3 is scheduled for 2017 with a residential Time-of-Use (TOU) rate for approximately 500 participants.

[126]Demand Response Pilot Program Executive Update. Los Angeles Department of Water and Power, May 2015.

However, LADWP is behind the IOUs by approximately four years in terms of rolling out pilot programs. The IOUs and SMUD have already implemented Automated Demand Response (Auto DR) programs, while LADWP is piloting its CII Curtailable Load Program in 2015 and including an Auto DR component in 2016. LADWP's incentive rates[127] are comparable with other utilities but may be too low to bring enough customers on board to meet the aggressive 208 MW by 2020 goal.

#### *2.4.9.3 Demand Response Outlook*

LADWP has taken good first steps by laying out a detailed implementation plan with the help of an outside consultant and contracting with technical service providers to launch a pilot program.

So far, the Pilot I is reported to have received high interest from customers, timely and informed guidance from the Program Manager, candid feedback, good web support for data, and support from Premiere Account Leads and Representatives. Challenges have included unattractive incentives, a manual Rates & Billing process, and customer curtailment process integration (semi-auto and manual).

However, despite Pilot I successes, going from zero MW of demand response in 2014 to 200 MW in 2020 and 506 MW in 2026 will be a challenging undertaking. LADWP is currently behind other utilities, particularly the IOUs, in implementing demand response. Further, incentive levels may be too low to attract sufficient customers to meet goals and should re-evaluated in an update to the Demand Response Strategic Implementation Plan. In particular, the Department should define the incentive it will provide to customers installing Auto DR enabling technology. The current Demand Response Strategic Implementation Plan states that LADWP will help reimburse Auto DR Program participants but does not yet determine the incentive level. For example, PG&E's Auto DR Program provides an upfront[128] $200-$400/kW incentive based on the amount of load reduction controlled by the technology. The Department should ensure these updates are included in the 2016 IRP.

In the future, California's Title 24 Building Energy Efficiency Standards will also impact on demand response capabilities. Title 24 Standards are updated on an approximately three-year cycle. The 2013 Standards were effective July 1, 2014, with a requirement for Auto DR readiness.[129,130] On January 1, 2017, the updated 2016 Building Energy Efficiency Standards will go into effect.[131] Advanced Auto DR can also help integrate renewables by enabling customer loads to respond to fluctuations in the output of variable energy resources. The Department should continue to investigate these applications (in the near term, this will be under its Smart Grid program).

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[127]$5/kW-month capacity payments for the CII Curtailable Load Program and $8/kW-month for Auto DR. HECO's incentive for Fast Demand Response is also $5/kW-month, while PG&E's Base Interruptible Program provides incentives of $8-9/kW-month (however, this program also has a penalty for failing to participate in an event, unlike LADWP's program).
[128]60 percent upon successful verification of equipment installation and 40 percent upon verification of performance in the DR season (www.pge.com/en/mybusiness/save/energymanagement/adrp/index.page).
[129]2013 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, California Energy Commission, May 2012 (www.energy.ca.gov/2012publications/CEC-400-2012-004/CEC-400-2012-004-CMF-REV2.pdf).
[130]Any new building larger than 10,000 square feet and any existing building replacing 10 percent or more of existing luminaries must enable lighting fixtures to be controllable by a building management system capacity of receiving Auto DR signals via the internet. HVAC in non-critical zones must also be responsive to Auto DR signals.
[131]More information on Title 24 available at: www.energy.ca.gov/title24.

### 2.4.10 Energy Storage

Under AB 2514, LADWP is required to set energy storage procurement targets for 2016 and 2021. The 2014 IRP Recommended Case includes the targets adopted under the Department's Energy Storage Development Plan[132] for 24 MW by the end of 2016 and an additional 154 MW by the end of 2021.

#### *2.4.10.1 Approach to Energy Storage*

To conform to AB 2514, LADWP developed a framework to calculate appropriate energy storage targets with two approaches:

1. Selected Location Energy Storage Evaluation: Identifies a specific location in the power system when energy storage may be the most useful (targets for 2016). LADWP contracted with Black and Veatch and the Electric Power Research Institute, and consulted with the Southern California Public Power Authority.
2. Whole Power System Energy Storage Evaluation: Investigates whether energy storage can be integrated at all levels of the power system (targets for 2021). At the time of the Plan's publication, LADWP has issued study task scopes to third parties and studies are expected to be complete by the end of 2015.

After each evaluation, the Department will conduct further cost-benefit and feasibility assessments. This is a reasonable approach and can be commended for working closely with parties and perspectives external to LADWP; innovation in this area should be encouraged by collaborating outside the utility.

#### *2.4.10.2 Energy Storage Development Plan*

The primary components of the plan are as follows:

**Table 2-18. LADWP Energy Storage Procurement Targets**

| System | Storage Technology | Location | Capacity | Applications | Schedule |
|---|---|---|---|---|---|
| **Generation** | Pump Hydro Storage | Castaic Power Plant | 21 MW | • Expand capacity of existing large system providing peak load | Complete in 2013 |
| | Thermal Energy Storage | Valley and Apex Generating Stations | 60 MW | • Increase output during hot weather<br>• Peak shifting<br>• Defer or eliminate new plant<br>• Ramping capability | 2017-2019 |
| **Transmission** | Battery Energy Storage | Beacon Solar and Q09 Solar Projects | 50 MW | • Ramping capability<br>• Solar output leveling<br>• Peak shaving | 2020 |
| **Distribution** | Battery Energy Storage | Distribution and Receiving Stations | 4 MW | • Peak shifting<br>• Distributed solar PV integration | 2019-2020 |

[132] Los Angeles Department of Water and Power Energy Storage Development Plan, September 2, 2014; shared with Navigant Consulting on June 10, 2015.

| | | | | | |
|---|---|---|---|---|---|
| | | | | • Defer distribution infrastructure | |
| **Customer** | Thermal Energy Storage | LAX | 3 MW | • Load shifting<br>• Peak shifting<br>• Defer distribution infrastructure<br>• Support Demand Response | 2016 |
| | Thermal Energy Storage | Large Customers on 34.5 kV | 40 MW | | 2020 |
| **LADWP** | Battery Energy Storage | John Ferraro Building Parking Lots | 1 MW | • Peak shaving<br>• Peak shifting<br>• Incorporate Energy Management System<br>• EV charging stations<br>• Solar output leveling | June 2015 |

*Note: Thermal energy storage uses conventional air conditioning equipment and a storage tank to shift the majority of electricity used for space cooling in customer facilities from peak to off-peak periods.*

Castaic Power Plant is a seven-unit Pump Storage Hydroelectric plant owned and operated by LADWP with a 1,500 MW nameplate capacity. The Castaic 21 MW in the table above designates an upgrade on one 250 MW unit of the plant.

LADWP also has two small pilot projects for battery energy storage. One is a 25 kW project called the "Garage of the Future" located at UCLA, and the other is a 50-200 kW project called "La Kretz Innovation Campus Project" located in downtown Los Angeles.

#### *2.4.10.3 Energy Storage Outlook*

LADWP's plan includes a diverse mix of storage technologies and applications resulting from detailed evaluations. Energy storage for increasing the reliability of the grid with a high penetration of renewables is an especially important application that is being investigated and implemented on the transmission system. The 50 MW at Beacon Solar and additional future utility-scale solar plants, found to be cost-effective by Black and Veatch, is a good first step in this direction.

The 2015 IRP update and 2016 IRP should show progress toward achieving the first energy storage procurement target in 2016, with status updates for the projects listed in the current plan. For example, results of the system studies for planned generation and transmission sited storage from the LADWP Energy Storage System Roadmap.

### 2.4.11 Smart Grid

The 2014 IRP discusses LADWP's smart grid strategy and lists smart grid program implementation as one of its goals. Generally, the smart grid will assist in the procurement and integration of technology to support energy forecasting and scheduling, customer metering, high speed communication and information systems, and energy storage. It is also intended to help increase system efficiency, reduce losses, improve outage response, and enable better management of the Power System. These advancements will also facilitate the integration of local solar generation and other variable renewable resources.

#### *2.4.11.1 Approach to the Smart Grid*

The Department has established a comprehensive smart grid strategy through an implementation roadmap, architecture, and supporting business plan. It has defined "smart grid" as intelligent data gathering and advanced two-way digital communication overlaid on electric distribution networks to provide real-time data that enhances the utility's ability to optimize energy use. The Smart Grid Investment Program, as described in the 2014 IRP, is the foundation of LADWP's smart grid strategy. In addition to this, LADWP is participating in a grant-enabled Smart Grid Regional Demonstration Program (Smart Grid L.A.).

LADWP summarizes the drivers for the smart grid program as the following:

- Increasing costs impacting customer rates;
- Customer choice and experience;
- Outage management capability;
- Increasing solar, other distributed energy resources, and electric vehicles impacting reliability;
- Managing peak energy demand; and
- System efficiency and energy losses.

The smart grid strategy appears to be well thought out and in line with current smart grid advancements in California and the U.S. For example, according to the National Energy Technology Laboratory, a smart grid must meet six essential goals by achieving the following:[133]

- A more reliable grid that provides power in the manner and of the quality demanded by customers.
- A more secure grid that is more resilient to physical and cyber attacks from both natural and intentional causes.
- A more economic grid that facilitates real-time pricing and adequate supplies.
- A more efficient grid that optimizes investments for reduced operating costs, fewer instances of electric loss, and improved asset utilization.
- A safer grid that reduces harm to the public and grid workers.
- A more environmentally friendly grid that reduces the impacts of electricity generation, transmission, distribution, and consumption on the environment.

From LADWP's plan, described further below, it appears that Los Angeles' smart grid is on track to be designed to meet goals similar to these. Additionally, the California Independent System Operator (CAISO) similarly considers electric vehicles an important opportunity to leverage smart grid technologies to support grid reliability throughout the west. Along with other California entities, CAISO published the *Vehicle-Grid Integration Roadmap: Enabling Vehicle-Based Grid Services* in 2013 which identifies pathways for electric vehicles to benefit grid reliability.[134] For LADWP, this is a particular focus of Smart Grid L.A.

[133] www.sce.com/NR/rdonlyres/EAEDC3E5-F596-40E7-8075-349840F24546/0/Smart_Grid_Development_Vision.pdf
[134] publications.caiso.com/StateOfTheGrid2014/SmarterGrid.htm

#### *2.4.11.2 Smart Grid Investment Program*

The Smart Grid Investment Program (SGIP) consists of 12 projects planned over a period of 10 years. One particularly important effort, which is necessary to the deployment of several SGIP projects, is Advanced Metering Infrastructure (AMI). The Department is undertaking the procurement and installation of the AMI components necessary to provide smart grid metering functions. AMI will initially be deployed on a limited scale (to both power and water customers) as a demonstration project, and there is not yet a plan for rolling it out to all customers.

**Table 2-19. Smart Grid Projects Dependent on Advanced Metering Infrastructure**

| | Program | Description |
|---|---|---|
| Customer Service | Customer pre-payment | Customers pre-pay for electric and water service; LADWP is able to send automated messages and provide account balance and usage data. |
| | Demand response for small customers | Residential and other small customers earn benefits by reducing load during peak load situations. |
| | Electric vehicle charging management | Electric vehicle charging is controlled/optimized during periods of high demand or reliability programs; potential to use electric vehicles as a source of energy storage and ancillary services in the future. |
| Grid Management | Distributed generation monitoring and management | Interval and voltage measurements provide LADWP with data at the distribution-system level that assists in measuring distribution generation impacts. |
| | Advanced Voltage, Power Quality, and Volt/VAR Control | Meter data provides LADWP with a detailed view of the voltage profile of distribution lines, providing greater visibility at high penetration levels of solar and other distributed energy resources. |
| | Distribution modeling and planning | Meter data provides LADWP with detailed information about the distribution system, used to improve transformer utilization, forecast load growth, and manage circuit loading. |

*Source: LADWP 2014 IRP, Section 2.4.5.1*

SGIP projects that do not depend on AMI include the following:

- Large customer demand response: Commercial and industrial customers with greater than 100 kW demand are dispatchable and visible resources to LADWP system operators.
- Enhanced system operations: Enables existing energy management system to provide power system operators with more detailed, accurate, and real-time information about power flow.
- System voltage/VAR control: Distribution automation devices improve the measurement and control of voltage and VAR (Precursor to the AMI-dependent project).
- Asset condition monitoring: Advanced sensors and communication devices provide information on the health of assets in the power system.
- Enhanced forecasting of renewable generation: Mature weather forecasting tools provide localized data for generation scheduling and the control and dispatch of solar and wind generation.

In October 2013, the Power System Engineering Division prepared a deployment plan for the smart grid program (Appendix L of the 2014 IRP), in which it calculates a total implementation cost of $1.19 billion. By far, the largest individual projects are the initial AMI effort at $650.7 million and the small customer

demand response project at $324 million. Net benefits are more difficult to quantify than costs, due to qualitative environmental and customer benefits, but the Department includes a benefit analysis as well, featuring the following benefits over a 20-year period:

- Up to $363.5 million in revenue enhancement
- Up to $144.1 million in avoided capital costs
- Up to $1.066 million in demand response benefits
- Up to 4.25 million efficiency labor hours
- 3.7M metric tons GHG emissions reduction
- 8,660.3 GWh electricity savings
- Customer incentives of up to $221.4 million

#### *2.4.11.3 Smart Grid Regional Demonstration Program*

The Smart Grid Regional Demonstration Program, or Smart Grid L.A., is a demonstration led by LADWP and conducted by a group of local research institutions. The program was awarded a five-year, $60 million Department of Energy grant (matched by LADWP) in 2009 through the American Recovery and Reinvestment Act. The program includes pilot projects in five interrelated areas: AMI, demand response, consumer behavior, cybersecurity, and electric vehicle integration. LADWP's research partners are the University of Southern California, University of California Los Angeles, and NASA Jet Propulsion Laboratory.

According to the 2015 Briefing Book, the Department has installed 51,000 two-way digital meters (smart meters) in three communities in Los Angeles – the areas around UCLA and USC, and Chatsworth – as part of Smart Grid L.A.

#### *2.4.11.4 Smart Grid Outlook*

Although strategically well-directed, the Department's plan is behind other utilities on smart grid implementation; specifically, the installation of advanced metering infrastructure. In 2012, 74 percent of California IOU customers already had advanced metering infrastructure installed.[135] Additionally, although the Smart Grid Program Deployment Plan illustrates the project sequentially from Year 1 to Year 10, there is no calendar year associated with the timeline. LADWP needs to present its plan such that progress can be more easily tracked against dates and milestones. Because the 2014 IRP focuses so much on the electrification of the transportation sector, the vehicle-to-grid integration aspect of the demonstration program is especially critical and should have regular updates going forward.

A good initial effort has been made to quantify benefits; LADWP should continue to refine its estimates as the Smart Grid Regional Demonstration Program makes new advances and as it rolls out projects in the Smart Grid Investment Program. An update to costs and benefits should be provided in the next IRP.

[135] "Net Energy Metering, Zero Net Energy and the Distributed Energy Resource Future," Rocky Mountain Institute, March 2012.

# 3. Conclusion

## *3.1 Accomplishments*

LADWP's 2014 IRP is a strong planning document based on Navigant's assessment of goals against regulatory mandates and policy objectives and the comparison of planning and modeling procedures to industry practices. Further, the Department has achieved a number of key accomplishments in line with its goals and the Recommended Strategic Case, described below.

- The 2014 IRP created a stakeholder Advisory Committee and three public outreach workshops, in line with best practice for IRP stakeholder engagement.
- The Department reports being on schedule for the elimination of OTC at in-basin plants. Haynes Units 5 and 6 began commercial operation in June 2013, and Scattergood Unit 3 broke ground in June 2013 and is still expected to be complete by the end of 2015.
- In 2014, LADWP had reduced GHG emissions 23 percent below 1990s levels, already meeting the AB 32 mandate for 2020.
- The Department achieved pre- contract end date divestiture from Navajo Generating Station (coal) in 2015 and replaced it with Apex Generating Station (natural gas), reducing 5.59 MMTons of $CO_2$ emissions.
- The Efficiency Solutions group achieved 60 percent more energy savings in FY 2012-13 than FY 2011-12 and 27 percent more energy savings in FY 2013-14 than FY 2012-13, has increased staff levels, and is close to meeting current annual targets.
- The energy efficiency partnership with Southern California Gas Company for joint electric and gas saving programs has received positive regional and national attention.
- Contracts for a 30.64 percent RPS in 2020 are already in place.
- As of March 2015, LADWP had 143 MW of customer net-metered solar.
- Both the Solar Incentive Program and the feed-in tariff have undergone process improvements to speed up project processing times.
- The demand response Pilot I program is underway reported to be on track.
- The Department has installed 51,000 smart meters as part of Smart Grid L.A.

## *3.2 Areas of Improvement*

Certain programs do need further definition and refinement in future IRPs. For example, the plan to replace the coal-powered Intermountain Power Project (IPP) has encountered challenges due to contractual issues with other participants. After Navajo, LADWP must now take the opportunity to focus on IPP and make it a high priority to overcome these challenges with more creative replacement plans. Additionally, the Community Solar Program, demand response, and smart grid-related initiatives are early-stage programs that must be further developed. As they are, LADWP should actively communicate with stakeholders about the direction and status of the programs.

Despite the strength of the 2014 IRP as a planning document, implementation may prove to be a challenge. There are complex issues at the heart of LADWP's renewable energy and grid modernization efforts which will require careful management by the Department and City. Potential issues include maintaining power system reliability with a high penetration of renewables; requiring additional staffing resources, contracting ability, and project management; and lacking clear project metrics and oversight tying performance to rates. These areas have the potential to be significant risks.

The reliability impact of a high penetration of renewables is not yet fully understood. Goals for a high RPS and increased local solar are potentially at odds with the core objective to maintain power system reliability–at least, without careful implementation and specific, well-executed plans. The Department is currently studying this topic and will address it in more depth in the 2015 IRP update and 2016 IRP. LADWP must thoroughly understand distributed generation impacts on the reliability of the distribution system in particular, and undertake a cohesive planning effort with the PSRP. It is critical that any recommendations from these studies be implemented to ensure system operational reliability.

Most of the plans laid out in the 2014 IRP describe significant program ramp-ups over the next several years. This is also the case for the PSRP, which is discussed in the Power Infrastructure Report, Part B. However, the Department has struggled with capital underspending, reportedly due to staffing and contracting issues. Several programs have failed to achieve annual targets in recent years. These trends are a concern for LADWP's growth plans. Without sufficient support for struggling programs, there is little evidence the Department will be able to establish and maintain aggressive growth. Specifically, the Power System should meet needed staffing levels and adopt a more rigorous project management approach or hire a project management firm to support project contracting, execution, and tracking. Additionally, the Department would benefit from a review and redesign of its procurement practices. Navigant found proof of the ability to grow in the Efficiency Solutions group, which has increased staffing and spending towards the program budget—this should be emulated in other areas of the Department. Overall, the program escalation challenge is a Department-wide issue and is further discussed in the Governance report.

Capital program underspending is further complicated by opaque reporting of results and the restatement of project and annual budgets. In a number of cases, Navigant observed a lack of clarity in reporting on program progress toward specific goals and around the use of leftover funds from underspent capital programs. Complete information on the whole lifecycle of a project, including comparisons to original budgets, is often not readily available. Because achieving the clean energy transformation will come at a cost and LADWP's funding requirements will continue to increase, it is especially important to track program metrics on performance and spending. Tying progress and achievements to rates in some way would establish more transparency and accountability for the Department's budgets and plans. This would trigger more open discussions between the City and LADWP around program success and funding. For example, until the full cost of renewable integration is fully understood, future rate increases related to new renewable generation resources should be tied to the results of such studies and phased based on the strategies adopted and progress against them.

## *3.3 Recommendations*

Based on these findings, Navigant makes the following recommendations. Some are already underway, but others will require additional attention and resources from the Department and City.

High Priority Recommendations

- Formalize current IRP practices and link the IRP more closely to rates, requiring by ordinance an update to the IRP to be submitted with proposed rate actions and annual written updates to be submitted to the rate-approving authority reporting on key performance metrics for IRP programs and goals. Establish specific milestones for programs to be reflected in the reported metrics. In this way, the IRP will remain an engineering document produced by the Power System but be more effectively leveraged for rate decisions.
- Prepare for a significantly higher level of activity and spending in capital programs by:
    3. Ensuring that Power System divisions have the necessary staffing and contracting resources. LADWP should follow Navigant's recommendations regarding the structural changes to hiring processes made in the Governance report.
    4. Adopting a more sophisticated project management business discipline with project management specialists reporting more detailed and transparent project metrics to key stakeholders on a monthly basis. Enhance tools and processes to centrally and comprehensively manage programs throughout procurement, construction, and commissioning.
- Place a high priority on completing the renewable integration reliability studies and implement critical recommendations from these studies. The Department should continuously update these studies, assess the resulting impacts on the Power System, and identify potential policy changes. Each IRP should incorporate the latest results.

Medium Priority Recommendations

- Include additional IPP replacement scenarios and updated timelines in the next IRP. LADWP should conduct an in-depth assessment of alternative non-coal scenarios, evaluate pros and cons, and present its best proposed strategy for complete IPP replacement in the 2016 IRP.
- Form a new, longer-term energy efficiency goal now that there is guidance from SB 350. Coordinate IRP modeling efforts with the Efficiency Solutions group to improve energy efficiency estimates past 2020 over the timeframe of the IRP, backed by an updated Energy Efficiency Potential Study as needed.
- Continue to prioritize finalizing new customer-focused programs (community solar, demand response, and smart grid-related programs) and as they are developed and refined, actively communicate with and hold discussions among stakeholders. Regularly communicate costs and benefits, timelines, and program milestones and include updates in each IRP.

- Conduct an assessment of the solar feed-in tariff program and make changes to support installation targets. As part of this, analyze pricing and program attractiveness to participants as well as streamline the program with process improvements.
- Create a preliminary rate design to send price signals to customers with electric vehicles. LADWP's plan to eliminate renewable overgeneration issues with electric vehicle charging will require new rates that incentivize customers to align their vehicle charging time with peak output from renewable generation. IRPs should include this work as it develops.

Low Priority Recommendations

- Include additional sensitivity and risk analysis in IRP modeling beyond fuel price scenarios and the natural gas hedging program; specifically, incorporate a load forecast sensitivity analysis with high and low scenarios, a wholesale electricity price sensitivity analysis, hydroelectric generation risk scenarios based on water availability, and unplanned thermal outage risks.
- Add a scenario optimization model to the IRP process to determine the least-cost portfolio.
- Conduct an independent third-party review of the economics of the LADWP project ownership strategy for all generation resources to determine the most cost-effective approach. For example, assess LADWP-built utility-scale solar PV projects versus third-party PPAs.
- Establish a preliminary strategy in the next IRP to reduce GHG emissions fully 80 percent below 1990 levels by 2050 and refine this strategy during annual IRP updates as conditions change.

# Appendix A. List of Interviews

| Name | Title/Topic | Interview Date |
|---|---|---|
| Michael Webster | Oversight of Fuel and Power Purchase Division, Power Planning and Development, Power Integrated Support Services, and Power Engineering | July 9th |
| Minh Le | Interim Director – Fuel and Power Purchase | July 29th |
| John Dennis | Director - Power Planning and Development | July 16th and 28th |
| Michael Coia | Director - Power Integrated Support Services | July 29th |
| Marvin Moon | Director - Power Engineering | July 27th |
| Andrew Kendall | Oversight of Power Transmission & Distribution, Power Construction and Maintenance, and Power Supply and Operations | July 29th |
| Jay Puklavetz | Interim Director - Power Transmission & Distribution | July 29th |
| Robert Gonzalez | Assistant Director - Power Construction and Maintenance | July 30th |
| Kenneth Silver | Director - Power Supply and Operations | July 31st |
| David Jacot | Director – Efficiency Solutions | July 30th |
| Jan Lukjaniec | 2013 Power System Reliability Program | July 30th |
| John Hu | 2014 Long-Term Transmission Assessment | July 30th |
| Mukhlesur Bhuiyan | 2013 Power System Reliability Program and Long-Term Transmission Assessment | July 30th |
| Loren Nguyen | 2013 Power System Reliability Program | July 30th |
| Matt Hone | 2013 Power System Reliability Program | July 30th |
| Faranak Sarbaz | 2014 Long-Term Transmission Assessment | July 30th |
| Bingbing Zhang | 2014 IRP modeling | July 31st |

## Appendix B. List of Documents

Navigant submitted a series of document data requests to LADWP which were provided via a secure file sharing site. The primary documents are summarized as the following and listed in detail below.

- 2014 Integrated Resource Plan
- Power System Reliability Program
- Ten-Year Transmission Assessment
- Presentations and reports to the Board of Water and Power Commissioners
- Program business plans
- Program status reports
- Fiscal Year budgets

| Documents Provided by LADWP | |
|---|---|
| 1 | 2014 Power Integrated Resource Plan (December 2014) |
| 2 | 2014 IRP Public Outreach Presentation - L.A.'s Power Transformation (October/November 2014) |
| 3 | 2015 Briefing Book |
| 4 | Presentation on Coal Divestiture from Navajo Generating Station (May 8, 2015) |
| 5 | Los Angeles Department of Water & Power Efficiency Solutions Portfolio Business Plan FYs 2014/15-2019/20 (May 18, 2015) |
| 6 | LADWP - Efficiency Solutions Fiscal Year 14-15 - Summary of Programs (May 2015) |
| 7 | Renewable Portfolio Projects Update - April 2015 (May 14, 2015) |
| 8 | LADWP's Electric Vehicle Charger Program Update (May 11, 2015) |
| 9 | 2014 IRP Electric Vehicle Recommended Case - Methodology (August 5, 2015) |
| 10 | LADWP Solar Incentive Program (SIP) Dashboard (June 1, 2015) |
| 11 | Mayor's Dashboard - LADWP Feed-in Tariff (FiT) Program (June 4, 2015) |
| 12 | Community Solar Program (CSP) - In-Basin Projects (40 MW) (June 3, 2015) |
| 13 | LADWP Community Solar Program Quick Overview- Draft (August 5, 2015) |
| 14 | Demand Response Pilot Program Executive Update (May 2015) |
| 15 | Energy Storage Development Plan Summary (September 16, 2014) |
| 16 | Proposed Resolution for the Haynes Generating Station Units 5 and 6 Repowering Project (April 2, 2010) |
| 17 | Proposed Resolution for the Scattergood Generating Station Unit 3 Reporting Project (April 25, 2012) |
| 18 | 2013 Power System Reliability Program [Data Room] |
| 19 | 2014 Long-Term Transmission Assessment (December 5, 2014) [Data Room] |
| 20 | Comprehensive PSRP Evaluation and Benchmarking Report (December 16, 2013) |
| 21 | Power System Reliability Program Board Presentation (September 16, 2014) |
| 22 | PSRP Meeting Materials (June 1, 2015) |
| 23 | 2015-16 Power System Capital Priority List (May 2015) |
| 24 | Power Revenue Fund - Capital Improvement Program 2015-2016 |
| 25 | LADWP FY 15-16 Final Budget (May 19, 2015) |

| | |
|---|---|
| 26 | Department of Water and Power of the City of Los Angeles Power System Revenue Bonds - 2015 Series A |
| 27 | Natural Gas Hedging Program Status Update - Proposed Five-Year Stair Step Plan (September 16, 2014) |
| 28 | Overhead Power Distribution Construction Standards - Aluminum Conductors (February 23, 2012) |
| 29 | Overhead Power Distribution Construction Standards - Areas Requiring Polymer Silicone Insulators (January 31, 2012) |
| 30 | Underground Power Distribution Construction Standards - DWP Electrical Lines Crossing Railroad, Light Rail and Busway (May 20, 2013) |
| 31 | Power Distribution Division Construction Standards - Material List for Padmount Switchgear Unit (Rev. January 12, 2009) |

# Volume II

# Power Infrastructure – Part B

NAVIGANT

# 2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

## Power Infrastructure Report, Part B
## Volume II

**Prepared for:**
**The City of Los Angeles**

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## Executive Summary

**Objectives & Approach**

This report presents Navigant's findings on Power Infrastructure, Part B for the IEA Survey. Power Infrastructure is particularly important as LADWP enters a major transition period as it endeavors to simultaneously reduce greenhouse gas emissions and realize a cleaner energy future, repower in-basin units to eliminate once-through cooling, and deliver reliable electricity while supplying power to its customers at competitive prices. For the focus of the IEA Survey, Power Infrastructure encompasses:

- Power Generation Infrastructure (Part A)
- Power Transmission and Distribution (T&D) Infrastructure (Part B)

*Power Generation Infrastructure*: Power Generation Infrastructure comprises Part A of the Power Infrastructure focus area and is featured in a separate report. In the report, Navigant evaluated the Department's 2014 integrated resource planning effort, including resource goals, modeling methodology, and LADWP's recommended resource portfolio. In particular, Part A provides more context and discussion on the changing generation mix, including coal replacement, increasing renewable generation, and new demand-side resources.

*Power Transmission and Distribution (T&D) Infrastructure*: Part B (this report) focuses primarily on LADWP's asset management and the Power System Reliability Plan. LADWP, as it strives to make dramatic steps forward, is contending with aging infrastructure, sub-optimal contracting processes, a dysfunctional hiring and retention process, and budget pressures. Additionally, it must plan and manage the integration of increasing amounts of intermittent renewable generation resources and transformational technologies such as energy storage, electric vehicles, and other aspects of the smart grid. These challenges all put additional stress on the Department's existing T&D assets and will require further investment. Addressing these challenges while maintaining safe and reliable power supply at competitive rates requires a robust asset management function in the Power System.

Asset management can be characterized as making the smartest decisions possible to achieve desired asset performance through sound maintenance, repair, and replacement programs while minimizing unwarranted costs from failing to maintain and optimize the asset portfolio.

Navigant assessed the Department's T&D asset management function against industry best practice and stated objectives, identified gaps, and provided recommendations for improvement. Navigant leveraged its proprietary Asset Management Diagnostic Tool which explores 39 subject areas categorized in the following six asset management groups:

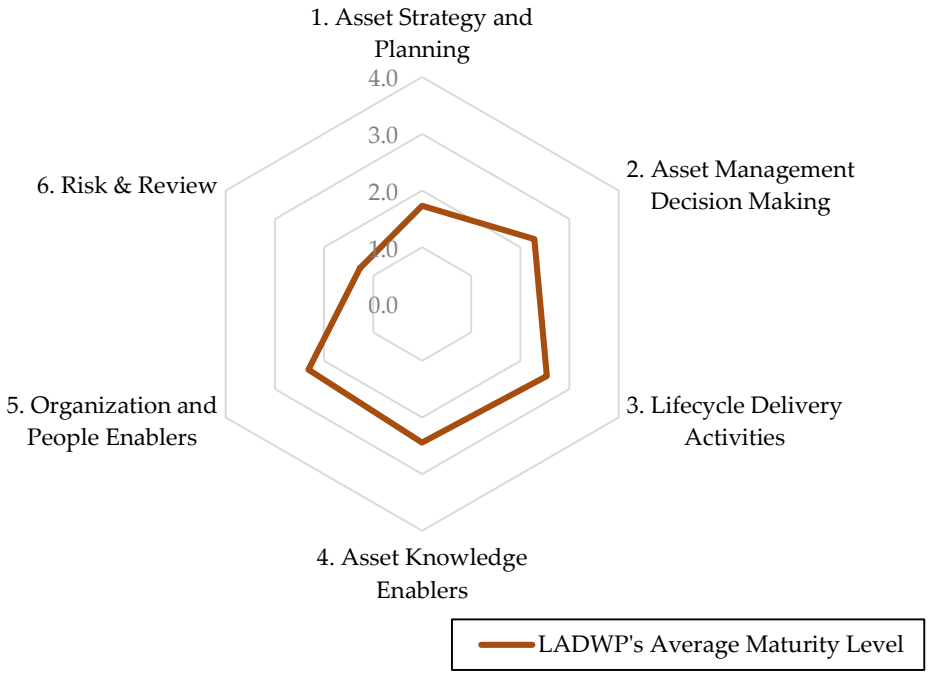
1. Asset Strategy and Planning
2. Asset Management Decision Making
3. Lifecycle Delivery Activities
4. Asset Knowledge Enablers
5. Organization and People Enablers
6. Risk and Review

The evaluation was conducted using the 2013 Power System Reliability Program (PSRP) and 2014 Long-Term Transmission Assessment, and was supported by interviews with LADWP leadership and subject matter experts, supporting documents, and Navigant's industry experience.

**Asset Management Diagnostics**

While not achieving what would be considered industry best practice, the Department's T&D asset management function appears to be in generally line with other U.S. utilities and provides sufficient governance and direction for LADWP to maintain, replace, and repair its aging infrastructure, while addressing the key challenges it faces. Results from the Asset Management Diagnostic Tool are shown below.

**Figure E-1. Assessment of LADWP's maturity level in six key aspects of Asset Management**




One strength of the Department is the way the organization makes operational decisions relative to its assets. LADWP is very good at situational awareness and managing operational risk, as are most utilities, and over the years has been implementing system enhancements to improve situational awareness. LADWP also appropriately forecasts the demand that it will place on T&D assets. The Department's planning process is mature and conservative, and takes into account all aspects of the business from generation to delivery.

One key achievement of the Department was the development of the 2013 PSRP. The PSRP outlines the Department's plan for the management of its generation, transmission, and distribution assets, with the objective of maintaining a high level of electric power service reliability and complying with North American Electric Reliability Corporation (NERC) and Western Electricity Coordinating Council (WECC) standards. Navigant's review of the PSRP shows that it represents a comprehensive plan for the management of the Department's generation, substation, transmission, and distribution assets, is well

aligned with the Department's stated objectives and to the organizational structure, and has been communicated well to stakeholders.

Finally, the Department appears to have a number of appropriate asset management processes in place. Areas addressed by LADWP's asset management processes include:

- Governance of asset maintenance and operation during the delivery phase of the life cycle.
- Maintenance and calibration of critical tools.
- Follow-up regarding failure or unexpected operation of assets.

Navigant also identified a number of areas of improvement requiring immediate attention. Key areas of improvement include the need for a formal asset management and continuous improvement framework, improvements to asset life estimates, the implementation of an outsourcing strategy, changes to the procurement process, and the development of a robust plan to address expected staff attrition. In particular:

- The Department has not formalized its asset management strategy. Furthermore, while risk is considered throughout the PSRP (mostly from a traditional utility perspective) risk and risk mitigation are not well documented in a manner consistent with best practices. LADWP should develop an asset management strategy document and implement a risk management framework, along with risk registers and mapping risk to objectives and mitigations across all areas of its asset management function.
- LADWP is very much like many utilities in that the asset management function has developed organically over time. Although this generally serves LADWP well, it often does not include many of the more structured approaches of asset management to risk management and optimization. For example, the Department often documents corrective and preventive actions; however, in many cases the process is ad-hoc. In addition, there has not been a formal process for asset management function audits. LADWP should develop a more formal, best practice asset management framework such as ISO 55000 and embed in it a structured continuous improvement process.
- The Department has a number of asset management processes in place; however, some may not be fully documented. LADWP should increasingly formalize its processes in order to consistently perform and capture institutional knowledge in a time of a rapidly changing workforce resources.
- LADWP's asset life estimates are largely based on age. Some of the age models, while sensible, do not align with best practice and may understate the expected lifespan of assets. Navigant recommends that LADWP evolve towards accurate end-of-life standards based on asset condition monitoring and improved end-of-life estimating techniques, including the development of asset health indices for each asset class.
- The PSRP does not fully consider the future requirements of assets, development of technology, or implementation of smart grid devices on the system. LADWP should assess the impact of changing smart grid technologies and include the implementation of those challenges in a roadmap that considers the requirements and timelines for updating the SCADA, OMS, EMS, and DMS systems, and outlines that implementation strategies for online monitoring and

distribution automation. The impacts on workforce and skills requirements should also be considered in the roadmap.

- While the PSRP will help LADWP better manage the middle and end-of-life of assets, too much emphasis is put on the lowest initial asset cost rather than whole life cycle cost. This approach is partly due to the characteristics of LADWP's procurement process, which focuses on the selection of the lowest cost bid at the time of acquisition as opposed to the lowest cost bid for the life cycle of the asset. This is a common issue for public power agencies and it tends to raise a utility's overall cost structure over time. Best practice recommends the implementation of a procurement process for "lowest evaluated cost" which properly considers the entire life cycle costs, including additional maintenance, life expectancy, spare parts requirements, interchangeability of parts, and other potentially significant costs.
- While LADWP has had success in its current limited outsourcing, neither the PSRP nor the Human Resources Plan incorporates a stated contracting strategy. LADWP should define a stated outsourcing strategy as part of its workforce resource planning.
- Much of the Department staff's operational knowledge is gained through experience and training. With the expected large staff attrition, LADWP needs to formalize its processes and focus on capturing the institutional knowledge of retiring employees.
- LADWP staff that were interviewed are experienced and competent. Employees appear to understand their roles and responsibilities, and expectations are clearly communicated. However, most levels at the Department are governed by seniority through the civil service system; therefore, it is not always clear that there are opportunities to introduce new skills and approaches from outside the company so that the most qualified person holds each position. LADWP should attempt to counter this issue through training, testing, and ongoing performance feedback. And since most levels of the company are essentially closed systems, LADWP should also focus on exposing its employees to industry changes and bringing in outside influences when possible.
- More attention on LADWP's implementation of the PSRP may be required. Even though it is a strong planning document supported by experienced staff, it appears to have been constrained by other factors that led to underspending and underperforming on the capital program. Like other important programs, the City should consider staging rates on PSRP achievements.

The implementation of these recommendations will require dedication and focus from the Department and possibly a culture change. However, as mentioned previously, LADWP is facing a number of challenges and addressing these challenges while minimizing the associated costs to ratepayers will require a transition to the implementation of best practices in asset management.

**PSRP Performance**

Despite the PSRP's merits as a strong planning document, Navigant heard feedback and found evidence of underspending on the capital program. This is a critical issue particularly because managing the PSRP is essential to advancement towards the Recommended Strategic Case in the 2014 IRP, as the Power System must be able to support a high penetration of renewables, distributed generation, storage, demand response, and smart grid technologies.

Navigant finds that in FY 2012-13, the PSRP spent of 72.7 percent of its budget; in FY 2013-14, the PSRP spent 69.8 percent of its budget; and in FY 2014-15, the PSRP spent 87.4 percent of its budget (table below). FY 2014-15 spending was $318.2 million, which is also a higher dollar amount than the two previous fiscal years. While this is a positive development, Navigant recommends giving additional attention to PSRP performance going forward—overall, actual expenditures were only 77 percent of the approved budget for the three-year period. Notably, the Transmission program spent only 56 percent of its approved budget over the period.

**Table E-1. LADWP PSRP Capital Budget and Actuals ($ thousand)**

| Program | FY 12-13 Approved | FY 12-13 Actual | FY 13-14 Approved | FY 13-14 Actual | FY 14-15 Approved | FY 14-15 Actual | % Variance |
|---|---|---|---|---|---|---|---|
| Generation | 15,280 | 18,317 | 14,284 | 16,772 | 1,358 | 2,175 | 121% |
| Distribution | 149,874 | 110,129 | 163,774 | 122,629 | 166,208 | 180,782 | 86% |
| Substation | 74,830 | 66,143 | 73,432 | 55,612 | 87,092 | 58,125 | 76% |
| Transmission | 39,385 | 13,604 | 97,058 | 51,5644 | 94,900 | 64,9610 | 56% |
| Info Appl. Sys. | 19,514 | 9,152 | 18,629 | 9,873 | 14,658 | 12,145 | 59% |
| **Total** | **298,882** | **217,345** | **367,177** | **256,451** | **364,216** | **318,189** | **77%** |

*Source: Power Capital Budget and Actuals, August 19, 2015.*

It also appears that the largest underspent items are related to contracting services and the purchase of materials (procurement). Specifically, 15 percent of the budget for construction services was spent over the three-year period and 46 percent of the budget for materials and supplies. The program also spent only 81 percent of its regular labor budget. These items highlight LADWP's challenges in hiring contractors and inefficiencies in procurement processes, leading to delays.

The Department should report more clearly to the Board on progress against well-defined milestones and outline a plan to ramp up program implementation effectively. This will likely require additional resource planning, including improvements to staffing and procurement processes which were reported to be obstacles. Navigant believes a further investigation of the actual expenditures on PSRP against authorized amounts from the City Council should be conducted in the upcoming rate review. Further examination of how underspent PSRP funds were reallocated is a key issue going forward to ensure funds allocated to specific programs are spent on those programs.

NAVIGANT

# 1. Introduction

Utilities in California and across the United States are faced with the need to comply with stringent regulatory mandates, transition to a greener generation portfolio, replace aging infrastructure, and improve system performance while continuing to supply customers with low cost energy. These objectives are often seen as being at odds, creating unique challenges for any utility. The challenge of consistently improving system performance is addressed through active asset management, the systematic and coordinated set of activities and practices through which an organization optimally manages its physical assets and associated performance, risks, and expenditures over their lifecycle for the purpose of achieving its organizational strategic plan. More simply put, asset management is making the smartest decisions possible to achieve desired asset performance through sound maintenance, repair and replacement programs.

Additionally, public power companies such as the LADWP are focused on optimizing value to ratepayers by appropriately balancing capital and O&M expenditures.

As part of its effort to improve reliability and take a more proactive role in maintenance in general, the Department launched the Power System Reliability Program (PSRP). The program was seen as a significant first step in addressing LADWP's aging infrastructure and a critical component of improving overall system reliability. The PSRP takes an end-to-end viewpoint of the power system that includes generation, transmission, substation, and distribution systems. Example target areas include failing lead cable, deteriorating poles, and overloaded pole-top transformers. The program also focuses on other aspects such as replacement of deteriorating vaults and power transformers.

Another key document driving LADWP's asset management function is the 2014 Long-Term Transmission Assessment, which evaluates transmission needs for the next 10 years and includes compliance studies on North American Electric Reliability Corporation (NERC) requirements.

This report provides an assessment of the Power System's asset management function against best practice, identifies gaps, and provides recommendations for improvement. Navigant's findings were informed by a detailed review of the PSRP and 2014 Long-Term Transmission Assessment documents, numerous interviews with LADWP's subject matter experts, as well as Navigant's extensive expertise and experience in utility asset management strategies and programs.

This report is organized as follows:

- A description of Navigant's approach and methodology.
- An assessment of the Power System's management of its assets against best practice and a discussion on gaps and recommendations for improvement.
- A review of LADWP's recent performance under the PSRP.
- Conclusion.

# 2. Approach and Methodology

## *2.1 Approach*

Navigant conducted a thorough evaluation and review of all the data and documents provided by the Department related to power system assets, including the PSRP and 2014 Long-Term Transmission Assessment documents. In addition, Navigant conducted a total of eight interviews with multiple LADWP staff focused exclusively on the asset management topic.

Insights derived from the review of key documentation and interviews were then compiled using Navigant's Asset Management Diagnostic Tool, which is described in detail in the next section. Navigant completed a gap analysis identifying specific areas of focus for the Department going forward and provided recommendations to support LADWP's transition towards best practice in asset management.

In addition to analyzing the strength of LADWP's asset management function, Navigant performed a high-level evaluation of the implementation of the PSRP. No matter the strength of the plan, the Department must be able to complete the plan according to set targets and manage risks around program implementation.

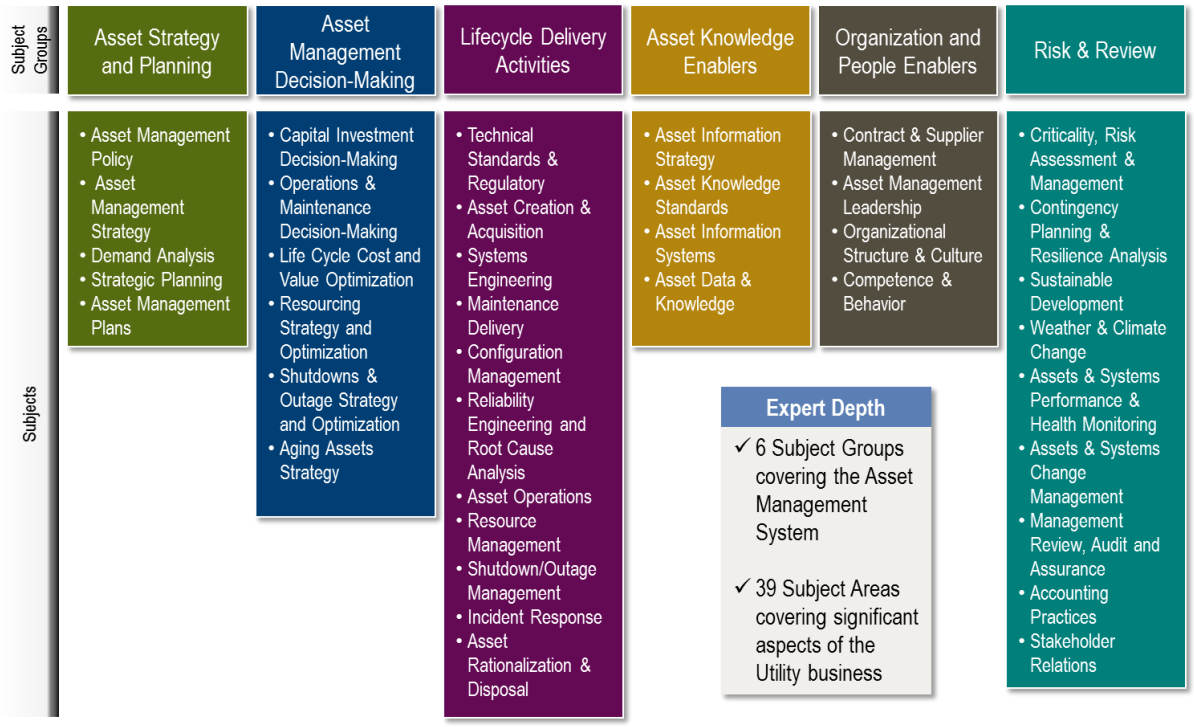
The remainder of this section includes a presentation of Navigant's Asset Management Diagnostic Tool and a description of the PSRP and 2014 Long Term Transmission Assessment documents.

## *2.2 Navigant's Asset Management Diagnostic Tool*

Navigant used its Asset Management Diagnostic Tool to evaluate LADWP's asset management practices against stated objectives and industry best practices. The Diagnostic Tool explores 39 subject areas in six Asset Management groups as described in Figure 2-1. N. The six Asset Management groups include:

1. Asset Strategy and Planning
2. Asset Management Decision Making
3. Lifecycle Delivery Activities
4. Asset Knowledge Enablers
5. Organization and People Enablers
6. Risk and Review

**Figure 2-1. Navigant's Asset Management Diagnostic Tool Groups & Subject Areas**




The Diagnostic Tool contains over 300 questions that are specifically designed to assess a utility's business processes against industry best practices. Answers to the 300 questions were developed from insights aggregated from interviews, documentation review, and Navigant's deep expertise in Asset Management. LADWP's performance against best practice in the 39 subject areas was then plotted on a spider chart (Figure 3-1), clearly highlighting areas of good performance and areas requiring improvement.

The findings derived from the Diagnostic Tool are discussed in detail in Section 3.

## *2.3 Key Documentation Reviewed*

### 2.3.1 Power System Reliability Program

The Department intends to maintain a high level of electric power service reliability through implementing the PSRP. LADWP goals for reliability are driven in part by NERC and WECC regulations regarding system reliability. The PSRP is an expansion of LADWP's Power Reliability Program (PRP), which addressed issues in the Distribution System only. The objectives of the PSRP are to:[1]

[1]Presentation – Power System Reliability Program – Board Meeting of August 5, 2014. Board of Water and Power Commissioners.

- Investigate and propose corrective actions designed to prevent future outages within the major functions of the electric power system, namely the distribution, substation, transmission, and generation systems.
- Analyze and evaluate LADWP's current asset replacement programs, their reliability improvement solutions, and effectiveness.
- Expand on the PRP program.

The PSRP focuses mostly on the management of the following type of assets: distribution transformers, poles, underground cables, and substructures. Equipment such as poles and underground cables is aging rapidly and will require increasing investment going forward. For example, the majority of LADWP's power poles were installed during the city's rapid growth from the 1940s through the 1960s: the majority of the Department's power poles are over 50 years old, with more than 40,000 poles or 12.9 percent of the total portfolio older than 80 years.[2,3]

The program's generation component comprises capital improvements at existing generation facilities. For instance, the replacement of a burner at an old in-basin natural power plant required to ensure operating reliability is addressed under the PSRP.

The Department has also already conducted an independent third party assessment of the PSRP, the "Comprehensive PSRP Evaluation and Benchmarking Report" by IEC Corporation in December 2013. Navigant also reviewed this report, which benchmarks the PSRP against industry best practices for levels of expenditure committed to the four major functions of the power system. At a high level, Navigant's review is aligned with the IEC's benchmarking report; however, it does not cover all of the issues described in detail in the benchmarking report.

### 2.3.2 Ten-Year Transmission Assessment

The 2014 Long-Term Transmission Assessment focuses primarily on assessing transmission needs for the next 10 years and the impact on transmission assets from LADWP's plan to eliminate coal from its generation portfolio by 2025. The assessment also describes the methodology, issues, and recommendations of NERC requirements compliance studies.

[2]LADWP's distribution system includes a total of 321,516 utility poles.
[3]2015 Briefing Book. Los Angeles Department of Water and Power.

## 3. Asset Management Diagnostics

Navigant leveraged its Asset Management Diagnostic Tool in order to compare LADWP's asset management function to industry best practice. The Diagnostic Tool provides an assessment of the Department's maturity level against the tool's six asset management groups and 39 subject areas, using maturity levels ranging from 0 to 4. A maturity level of 0 signifies that the organization is not considering the subject area in question, while a maturity level of 4 signifies that organization's processes surpass standard requirements and are likely a best practice, if performed cost-effectively.

The chart below presents LADWP's average maturity level for each of the six asset management groups.

**Figure 3-1: Assessment of LADWP's Maturity Level in Six Key Aspects of Asset Management**

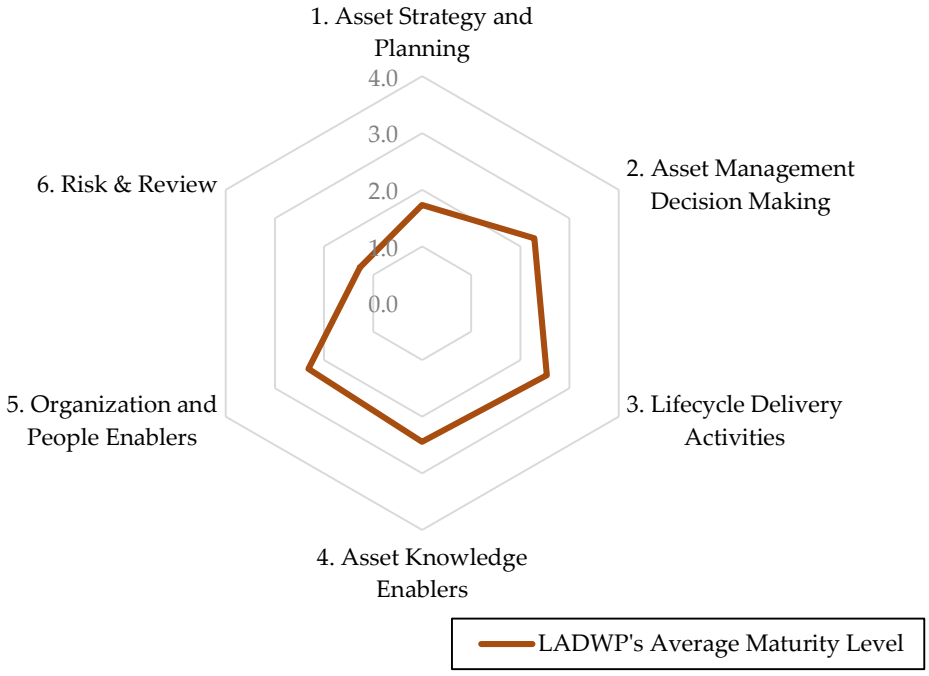



Figure 3-1 shows that the Department does not achieve best practice (maturity level 4) in any of the six asset management groups but performs relatively well in Asset Management Decision Making, Lifecycle Delivery Activities, Asset Knowledge Enablers, and Organization and People Enablers. However, there is room for significant improvement in the Asset Strategy and Planning and Risk and Review groups. Key findings related to these groups include:

- There is no documentation outlining the Department's asset management strategy and objectives and the associated risk management framework.
- There is no continuous improvement framework in LADWP's asset management processes.

- The PSRP identifies work to be performed but does not consistently outline or refer to implementation strategies.
- There is no common risk-based asset management prioritization framework across all aspects of the company.
- The PSRP does not fully consider future requirements of assets, development of technology, or a plan for implementing smart grid devices on the system.
- The approach and methodologies for managing assets are documented according to typical utility practice. However, as compared to best practices, several gaps exist in documentation of methodologies and there are different approaches in each asset class.
- The asset management strategy has been periodically reviewed in the past but, similar to many utilities, the scope and frequency appear to be somewhat ad-hoc.

The following sections outline Navigant's findings related to each of the six asset management groups and identify specific recommendations for improvement.

## *3.1 Asset Strategy and Planning*

Navigant's review of LADWP's Asset Strategy and Planning primarily focused on the following areas:

- Documentation of asset strategy and planning
- Continuous improvement
- Prioritization
- Improvements to the PSRP

A maturity level of 1.7 highlights a number of areas where the Department should make immediate changes. Most importantly, LADWP must create a robust asset management strategy document including risk, continuous improvement, and prioritization frameworks. Additionally, the Department should make several improvements to the strategic direction of the PSRP. Navigant's findings are discussed in detail in the following subsections.

### 3.1.1 Documentation of Asset Strategy and Planning

LADWP performs well on documenting the demand analysis for its assets and Navigant's review shows that LADWP appropriately forecasts the demand on its T&D assets. The Department's demand planning process appears to be mature and conservative, and takes into account all aspects of the business from generation to delivery.

Other Asset Strategy and Planning documentation requires more attention. The Department has documented its asset management objectives in the 2015 Power Infrastructure Plan, the PSRP, and publicly through Board of Commissioners meeting presentations. While these documents are comprehensive and provide direction and guidance to the Department, they should not be used as substitutes to a robust asset management strategy document. Additionally, interviews revealed that the Department's asset management documents have been periodically reviewed and updated in the past; however, like many utilities, the scope and frequency of the reviews appear to be somewhat ad-hoc. It is

of a paramount importance that LADWP create a comprehensive asset management strategy document and conduct a regular and structured review process.

In the Department's plan, the approach and methodologies for managing assets are documented according to typical utility practice. However, as compared to best practices, several gaps exist in documentation of methodologies and there are differences in the approach for each asset class. LADWP should develop a more formal, best practice asset management framework such as ISO 55000.

Interviews have also revealed that individual divisions have an undocumented set of working tasks that are appropriate and required for the implementation of the PSRP. All tasks required for the implementation of the PSRP should be documented.

Finally, while risk is considered throughout the PSRP (mostly from a traditional utility perspective), risk and risk mitigation are not documented in a manner consistent with best practices. As LADWP develops its asset management strategy document, it should also implement a risk management framework with risk registers and mapping risk to objectives and mitigations across all areas of its asset management function. Risk will be further discussed in the Risk and Review section.

### 3.1.2 Continuous Improvement

The Department should also focus on continuous improvement. Currently, the continuous improvement of underlying business processes is scattered; for example, the PSRP includes some elements of continuous improvement but other elements are informally present in individual parts of the organization. This arrangement appears to be extremely time-consuming. LADWP should adopt and embed a structured continuous improvement framework in its complete asset management plan.

### 3.1.3 Prioritization

LADWP appears to prioritize portions of the PSRP within organizational silos, but the prioritization is often informal and does not represent a common risk-based prioritization framework. The Department should adopt such a framework across all aspects of the company. That framework would initially value the priority and risk of generation, substation, transmission, and distribution assets. It should later be expanded to supporting infrastructure, IT systems, and customer operations.

In addition to a consistent risk-based prioritization framework, the Department should implement a consistent condition-based prioritization framework for corrective and emerging maintenance.

### 3.1.4 Strategic Improvements to the PSRP

The PSRP is the comprehensive plan for the management of the Department's generation, substation, transmission, and distribution assets, and as such merits specific strategic recommendations. Although the PSRP is aligned with the Department's stated objectives and with the organizational structure, and has been communicated well to stakeholders, there are a number of areas for improvement.

- In some cases, the alignment between the Department's stated objectives and the PSRP is not obvious. Future versions of the PSRP should clearly spell out the strategy, objectives, and the direct alignment of the program with the Department's objectives.

- The current version of the PSRP has not been fully funded by LADWP's leadership or the Board of Commissioners. The PSRP should be updated to reflect the current funding authorization along with an analysis of risks posed due to differences between the original plan and the authorized plan.
- The PSRP identifies work to be performed but does not consistently outline or refer to implementation strategies. LADWP should expand the PSRP to include implementation strategies as well as specific annual deliverables and metrics.
- While the PSRP identifies needs within the individual silos and has included a Human Resources Plan, cross-cutting coordination is not always apparent and IT challenges are not discussed in the document. As LADWP's asset management system matures, LADWP should strengthen the analysis of cross-cutting issues to optimize efficiency.
- The PSRP does not fully address a comprehensive long-term technology roadmap for the system, including the future requirements of assets, integration of new technology, and a plan for implementation of smart grid devices aligned with the Smart Grid Investment Program. LADWP should consider the requirements and timelines for updating the SCADA, OMS, EMS, and DMS systems and outline the implementation strategies for online monitoring and distribution automation. It should also consider impacts on workforce and skills requirements.

## *3.2 Asset Management Decision Making*

Navigant's review of LADWP's Asset Management Decision Making processes primarily focused on the following areas:

- Repair, maintenance, and replacement of T&D assets
- Capital project selection process
- Contracting strategy
- Outages management

With a maturity level of 2.3, the Department's Asset Management Decision Making is considered to be adequate; however, a number of improvements would bring LADWP closer to best practice. Specifically, LADWP should explicitly consider condition-based maintenance best practices and the life cycle costs of assets, develop a common portfolio framework for capital project selection, define a stated outsourcing strategy, and use written switching instructions. These findings are discussed in additional detail below.

### 3.2.1 Repair, Maintenance and Replacement of T&D Assets

LADWP's T&D asset management decision making is primarily governed by the PSRP. The PSRP provides replacement targets and focuses on management of end-of-life of asset categories, representing a great effort from the Department to move towards best practice in asset management. However, LADWP's asset life estimates are largely age-based and some of the age models, while sensible, do not align with best practice and may understate the expected lifespan of its assets. Navigant recommends that LADWP move towards accurate end-of-life standards based on asset condition and improved end-of-life estimating techniques including the development of asset health indices for each asset class.

LADWP appropriately considers the condition of assets in some maintenance decisions but, like most utilities, the maintenance program is largely time-based. In comparison, best practice has maintenance performed under a hybrid Reliability Centered Maintenance (RCM) and Condition Based Maintenance (CBM) systems. LADWP should periodically review its maintenance program and move towards the best practice approach. Notably, several aspects of substation maintenance at LADWP are very good examples that other areas of the company could emulate.

Additionally, while the PSRP will help LADWP better manage the middle and end-of-life of assets, too much emphasis is put on the lowest initial asset cost rather than whole life cycle cost. This approach appears to result from LADWP's procurement process, which focuses on the selection of the lowest cost bid at the time of the acquisition as opposed to the lowest cost bid for the life cycle of the asset. This is a common issue for public power agencies and tends to raise a utility's overall cost structure over time. Best practice recommends the implementation of a procurement process for "lowest evaluated cost" which properly considers the life cycle costs, including additional maintenance, life expectancy, spare parts requirements, interchangeability of parts, and other potentially significant costs.

### 3.2.2 Capital Selection Process

Interviews and the review of key documentation has shown that LADWP has a well-defined capital projects selection process but there may be some inconsistencies between segments of the business. These inconsistencies may have contributed to underspending in the Department's capital programs. LADWP should work towards a best practice common portfolio framework for capital project selection.

### 3.2.3 Contracting Strategy

While LADWP does appear to use contractors effectively, neither the PSRP nor the Human Resources Plan incorporate a stated contracting strategy. Additionally, many internal functions are continued without review. LADWP should define an explicit outsourcing strategy as part of its workforce resource planning in order to consistently implement and optimize its strategy.

### 3.2.4 Outages Management

Outages are coordinated in advance and the risks facing the power system are well-understood. However, LADWP does not use the industry best practice of written switching instructions when performing switching work.[4] LADWP should move towards the use of providing any field employee who is performing switching with written switching orders that are created, reviewed, and approved in advance. This means that, because of the complexity of switching in a metropolitan utility, any planned switching follows the following process:

1. Switching orders are either stored in a library from previous experience or are developed for the particular case at hand,
2. Switching orders are reviewed and approved by a second person in the operations center,
3. Switching orders are provided to the dispatcher and the field personnel at the time or on the day of the switching operations, and

[4]Switching represents the process of isolating and making a section of network safe before work is carried out.

4. Dispatchers direct each step of the switching operations.

Unplanned switching generally is dispatched step at a time over the radio or telephone. The use of written switching orders is a common practice across North America. Major metropolitan utilities that use written switching orders include New York and Chicago.

## *3.3 Life Cycle Delivery Activities*

Navigant's review of LADWP's Life Cycle Delivery Activities primarily focused on the following areas:

- Asset management processes
- Preventative and corrective maintenance
- Effective planning, design, performance, operations and maintenance
- Alignment with regulatory requirements

With a maturity level of 2.5, the Department's Life Cycle Delivery Activities are generally on track. However, Navigant identified several improvements for LADWP in this asset management group, including better documenting formal asset management processes, standardizing preventative maintenance actions, implementing a structured methodology to leverage root-cause analysis for incidents, and improving communication and collaboration between divisions on maintenance issues.

### 3.3.1 Asset Management Processes

Navigant's review shows that the Department has a number of good asset management processes in place; however, some of them may not be fully documented. Areas addressed by LADWP's asset management processes include:

- Governance of asset maintenance and operation during the delivery phase of the life cycle
- Maintenance and calibration of critical tools
- Follow-up regarding failure or unexpected operation of assets

LADWP should increasingly formalize its processes in order to consistently perform and capture institutional knowledge, which is increasingly important in the context of a rapidly changing workforce.

### 3.3.2 Preventive and Corrective Maintenance

Asset condition tracking, which informs preventive and corrective maintenance plans, is an area of focus for the Department. LADWP could further improvement its asset condition assessment by leveraging online monitoring of real time assets and replicating its condition-based approach found in substations in other areas of the organization.

LADWP does implement preventive maintenance actions that consider cost, risk, and performance and include linkage to asset management plans, timescales, and optimization consistent with the asset management objectives and strategy. However, these processes can vary between areas in the company and the Department should work towards standardizing those processes.

Corrective maintenance is prioritized but inconsistencies exist in the prioritization process. LADWP should implement a consistent risk-based prioritization and condition-based framework for corrective or emergency maintenance.

Finally, LADWP does follow up on incidents as demonstrated by its root-cause analysis (RCA) reports completed by the Department for key assets. However, LADWP may not fully leverage RCA as a structured methodology to drive results. LADWP should implement its RCA process as part of a larger continuous improvement process and train employees accordingly.

#### 3.3.3 Effective Planning, Design, Performance, Operations and Maintenance

LADWP has policies, practices, and procedures in place to integrate the planning, design, operations, and maintenance functions. However, at times the downstream divisions are not satisfied with planning and design decisions and the upstream divisions do not understand maintenance and operations issues. LADWP should continue to improve the collaboration and communication between divisions. As a best practice, this is often accomplished through the implementation of end-to-end work management processes.

#### 3.3.4 Alignment with Regulatory Requirements

The asset management policies are aligned with regulatory requirements. However, the Department should better incorporate its smart grid roadmap in order to implement policy regarding smart grid and distributed resources.

### *3.4 Asset Knowledge Enablers*

Navigant's review of LADWP's Asset Knowledge Enablers focused on the following areas:

- Asset data and knowledge
- Asset information systems
- Asset knowledge standards

With a maturity level of 2.4, the Department is adequately addressing the above areas. Navigant's recommendations, detailed below, are generally aligned with LADWP's current efforts to formalize and document processes and recommend the continuation of those activities.

#### 3.4.1 Asset Data and Knowledge

LADWP has processes in place in order to capture current asset information, and appropriate asset management information appears to be available to relevant employees and stakeholders. In addition, the Department has documented the procedures in place for critical operations. However, it has been reported that adequate document retention processes for certain legacy information such as wiring diagrams, blueprints, and instructions may not be in place.

The records necessary to document conformance with asset management practices exist in an early stage of maturity, with many processes being informal or institutional in nature. LADWP should continue to formalize and document its strategies, plans, processes and asset data.

#### 3.4.2 Asset Information Systems

The records requirements for asset management information are embedded in the Department's tracking systems and LADWP is updating its MAXIMO version for improved functionality. These actions should

help determine what the Department's asset management information system should contain, how it is maintained, and how it is kept relevant.

#### 3.4.3 Asset Knowledge Standards

LADWP has document retention requirements in place according to best practice. The Department appropriately secures its asset management information.

## *3.5 Organization and People*

Navigant's review of LADWP's organization and people (in an asset management context) focused on the following areas:

- Asset management leadership
- Competence and behavior
- Contract and supplier management
- Organizational structure and culture

With a maturity level of 2.3, LADWP is performing adequately in a number of areas but would benefit from several improvements to bring the organization closer to best practice in asset management. The Department appears to be doing well with the definition of duties and responsibilities, direction from leadership, training, and staff competency. To improve, LADWP could focus on identifying skills for changing technologies, formalizing knowledge transfer and resource allocation processes, clearly stating a contracting strategy, and encouraging a culture of continuous improvement. These findings are discussed in the following subsections.

#### 3.5.1 Asset Management Leadership

Top management duties are well defined at the Department and responsibilities are appropriately delegated. LADWP's asset plans are reviewed and approved at the highest level, which helps tie the plans together. However, ties between plans are not made clear in the current version of the PSRP. As mentioned previously, future versions of the PSRP should clearly reflect how the organization's strategies, objectives, and plans are interconnected.

LADWP's senior leadership has developed direction and expectations for the organization. However, the direction is somewhat fluid resulting from changes in top management staffing. Several top managers were observed to hold "acting" positions. LADWP should strive to implement best practices in asset management leadership, including fully enabling top management through their appointment to full positions.

#### 3.5.2 Competence and Behavior

Much of the operational knowledge of Department staff is gained through experience and training, so LADWP should continue to formalize its processes and focus on capturing the institutional knowledge of retiring employees.

LADWP staff that were interviewed are experienced and competent. Employees appear to understand their roles and responsibilities, and expectations are clearly communicated. However, most levels at the

Department are governed by seniority through the civil service system; therefore, it is not always clear that there are opportunities to introduce new skills and approaches from outside the company so that the most qualified person holds each position.. LADWP should attempt to counter this issue through training, testing, and ongoing performance feedback. And since most levels of the company are essentially a closed system, LADWP should also focus on exposing its employee to industry changes and bringing in outside influences when possible.

The PSRP and the training program address workforce competencies to a significant degree. However, the PSRP has not contemplated an optimized contracting strategy or changes in skills requirements that will be required with the ongoing changes in technology. LADWP should incorporate its clearly stated contracting strategy and its expectation of changing skills needs into the plan.

Finally, interviews revealed that the Department has an effective training process.

#### 3.5.3 Contract and Supplier Management

Contracting controls are in place and LADWP shares relevant information with contracted parties. Outsourced asset management activities are generally controlled through time and expense contracts and reviewed by LADWP staff. However, LADWP does not have a clearly stated contracting strategy. LADWP should state a defined contracting strategy with contract requirements that selectively incent best performance by contractors through quality and safety standards, performance incentives, and performance penalties.

#### 3.5.4 Organizational Structure and Culture

LADWP's senior leadership effectively considers the impact of the asset management processes on the organization and the impacts of the organization on asset management. Case-by-case evidence of continuous improvement at the Department exists, and many changes have occurred slowly over a long period of time. To improve upon this, LADWP should adopt a culture of continuous improvement and work towards accelerating asset management optimization.

Through its planning processes and PSRP, LADWP is improving its resource allocation capability. However, most resource allocations are determined through informal processes such as discussions and deliberation from middle management through the executives and the Board. LADWP should develop a consistent risk-based decision process that drives planning and then determines resource allocation.

### *3.6 Risk and Review*

Navigant's review of LADWP's risk and review for asset management focused on the following areas:

- Accounting practices
- Assets and systems change management
- Assets and systems performance and health monitoring
- Contingency planning and resilience analysis
- Criticality, risk assessment and management
- Management review, audit and assurance
- Stakeholder relations
- Strategic planning

- Sustainable development
- Weather and climate change

With a maturity level of 1.3, Risk and Review is the asset management group most in need of improvement. Navigant's critical recommendations relate closely to those made for the Asset Planning and Strategy group. Developing a more formal, best practice asset management framework such as ISO 55000 and embedding a continuous improvement framework and risk assessment framework is extremely important for managing risk as well as defining the Department's strategy. The risk framework should include risk registers and mapping of risk to objectives and mitigations across all areas of the asset management system.

LADWP will also better manage risk with tighter coordination between objectives, plans, and strategies. In the long term, the Department may minimize risk by creating a comprehensive long term technology roadmap for the electric system and by adjusting for more severe weather.

### 3.6.1 Accounting Practices

At LADWP, costs are generally tracked at the department or line item level. There are significant allocated costs and each budget contains some amount of contingency. In comparison, best practice is to minimize allocated costs and to hold contingency budgets at the corporate level rather than at the line item level.

### 3.6.2 Assets and Systems Change Management

LADWP is very much like many utilities in that the asset management function has developed organically over time. Although this generally serves LADWP well, it often does not include many of the more structured approaches of asset management to risk management and optimization. For example, the Department often documents corrective and preventive actions; however, in many cases the process is ad-hoc. In addition, there has not been a formal process for asset management function audits. As mentioned previously, LADWP should develop a more formal, best practice asset management framework such as ISO 55000 and embed a structured continuous improvement process.

There has been no opportunity during this study to observe the LADWP's behaviors for ensuring that risks to asset management activities associated with changing organizational structures, roles, or responsibilities are managed.

### 3.6.3 Assets and Systems Performance and Health Monitoring

LADWP primarily monitors asset health indirectly through system performance. Condition monitoring is used in substations and the protection system. LADWP should emulate Condition Based Maintenance programs in other areas and implement a condition monitoring program and make more use of online monitoring.

LADWP's metrics are generally output based. Best practice would include performance monitoring frameworks, balanced scorecards, etc., and management meeting minutes and reports. The Department should continue to improve its measurement of asset management though the implementation of balanced scorecards and management reviews.

There are informal controls over processes and several examples of formal controls through processes and procedures; however, quality assurance and quality control requirements have not been formally defined in many aspects. Quality Assurance and Quality Control requirements should be defined for primary processes.

### 3.6.4 Contingency Planning and Resilience Analysis

LADWP assesses response plans on a post-event basis with some evidence that other periodic reviews are conducted. LADWP should tighten these processes to ensure consistent review and proactive updates that take into account industry best practice.

### 3.6.5 Criticality, Risk Assessment and Management

It appears that there is some recognition in the Department that asset management is tied to risk. However, risk assessment appears to be incomplete and inconsistent at the company level. LADWP assesses risk across the organization through largely informal processes, and although there is some formal risk assessment as well, LADWP does not formally perform risk assessments in an asset management sense.

LADWP does inherently provide for many elements of risk in its procedures and policies. Daily operational risk is assessed according to good utility practice through typical operational processes. Risk assessment is regularly performed for requested and planned system outages, and there is evidence that LADWP performs risk assessments for some asset management functions. Additionally, some level of risk assessment is available in the PSRP.

Management fully considers routine risks in routine decision-making. Because LADWP largely identifies risks through management attention to emerging issues and resulting actions become part of the routine work plan, they appear to be ad-hoc.

Best practice would include increased forward-looking risk-based decision processes and a more formal risk assessment framework. LADWP should implement a risk management framework along with risk registers and mapping of risk to objectives and mitigations across all areas of the asset management system.

### 3.6.6 Management Review, Audit and Assurance

LADWP has a process for the regular review of processes and procedures and evidence exists that regular review occurs; however, LADWP does not have an asset management audit plan.

Asset Management practices are fairly well inked to policies and strategies though high level management review. However, there are gaps resulting from not having a formal asset management framework.

### 3.6.7 Stakeholder Relations

It appears that LADWP provides adequate communication by regularly communicating its plans and results internally in the Department and with the Board at meetings. LADWP also communicates the results of its asset process reviews and results. However, as mentioned previously, the organization's

direction appears somewhat fluid because of changes in top management staffing. Appointing top management to full positions will help clarify direction.

### 3.6.8 Strategic Planning

LADWP has held considerable internal conversations and received external assistance where appropriate in developing its asset plans.

LADWP also has good processes in place to ensure the appropriate arrangements are made for the implementation of the asset management plans, but has not fully considered the most efficient and cost effective asset management processes in many cases. Examples include optimizing maintenance cycles, optimizing procurement of assets, optimizing crew size, and implementing a robust continuous improvement process. Again, LADWP should develop a more formal, best practice asset management framework.

### 3.6.9 Sustainable Development

Historically, LADWP has reviewed its asset management objectives on a periodic basis. Best practice would indicate that LADWP should move towards tighter coordination between objectives, plans, and strategies.

LADWP has long term plans in place for its transmission system and the PSRP provides mid-term guidance for the remainder of the electric system. However, the PSRP has not been fully funded and has not been revised to account for the decreased funding. LADWP should update its PSRP to reflect the approved funding levels.

The Department also has not developed a comprehensive long term technology roadmap for the electric system. The current 10-year Smart Grid Investment Program should be developed in coordination with other long term plans for the electric system, and ongoing reliability studies for the impact of a high penetration of renewables should also be incorporated.

### 3.6.10 Weather and Climate Change

LADWP has updated some of its specifications to account for more severe weather and has used lessons learned from Hurricane Sandy to update its emergency response plan, but these changes appear to have been made on a case-by-case basis. The Department should take a holistic approach to preparing for climate change. For example, it should consider conducting a study on how changing macro conditions will impact assets.

# 4. PSRP Performance

In addition to assessing LADWP's approach to asset management though the PSRP, Navigant also reviewed documents regarding performance and expenditure for the program. This is critical because the PSRP is the Department's guide to rebuilding and modernizing the aging power grid, which is necessary not only for maintaining reliability under normal circumstances, but especially in the context of a changing power supply with more variable renewable energy resources, two-way power flows with distributed generation and electric vehicle integration, and smart grid enhancements planned in the 2014 IRP. Success depends not only on having a robust asset management planning function, but also being able to carry out program activities according to the plan.

An important finding, first identified through stakeholder interviews, is that LADWP has and continues to struggle with a pattern of underspending on the capital programs in the PSRP. This casts some uncertainty on the Department's ability to perform the planned program ramp-up described in the recently released 2015-2016 rate action and achieve its goals. Navigant has been provided with financial data to fully confirm this finding for the past three years, and a discussion of the following information should prove useful for identifying issues and monitoring performance going forward.

Navigant believes a further investigation of the actual expenditures on PSRP against authorized amounts from City Council should be conducted in the upcoming rate review. Further examination of how underspent PSRP funds were reallocated is a key issue going forward to ensure funds allocated to specific programs are spent on those programs. The 2014 IRP states, "As funding priorities constantly shift, especially from the demands of mandated regulatory programs, competition for the remaining limited pool of resources necessitates an expanded reliability program and planning process."[5] LADWP must ensure that it does not shift priorities away from the PSRP.

## *4.1 Past Performance – PRP*

The PSRP originates from the Power Reliability Plan (PRP) established in 2007 to address reliability concerns. The implementation of the PRP followed a significant increase in the number of outages on the Department's power system. Between 2003 and 2006, the annual number of outages escalated from 4,193 to 5,915, representing a 41 percent increase. The implementation of the PRP was a success in that it took the Department only two years to decrease the number of outages back to 2003 levels, with 4,296 outages in 2009. However, since 2009 the number of outages has only slightly decreased, with 3,956 outages recorded in 2013 (a 7.9 percent decrease).

According to the 2014 IRP, in FY 2013-14 1,617 poles, 1,944 transformers, and 41 miles of underground cable were replaced. In 2013, the Department's SAIFI and SAIDI scores benchmarked favorably against the California IOUs.

The Department has stated that funding constraints have prevented further progress in the reduction of the number of outages in recent years. In addition, in interviews Department staff explained that the existing one-year funding window had imposed an inconvenient cutoff on contracts required to complete PRP related projects. In 2014, LADWP expanded its PRP program into the PSRP, and indicates

[5] 2014 IRP, ES-13.

that it plans to address funding constraints through its latest rate increase proposal. However, if LADWP has not spent previously allocated budgets on the PSRP, funding constraints may not be the primary barrier and more oversight is needed to ensure increased funds go to the program and are not reallocated based on shifting priorities.

## *4.2 Implementation Status*

Navigant requested a status update on PSRP performance versus targets in its IEA Survey data request. Per Commissioner Noonan's request, a report on the same topic was scheduled to be provided to the Board on July 21, 2015 or the 1st Board meeting of August 2015. The PSRP progress report to the Board actually occurred on September 22, 2015, and contained some PSRP implementation updates discussed here. Navigant also received one sample internal PSRP report from June 1, 2015 (June 2015 Report), which reports on FY 2014-15 and includes expenditures and some information on the progress of projects.

The following tables outline LADWP's planned replacement activities in each of the four primary functions of the Power System covered by the PSRP. Although the proposed annual increases are not as large as the recommended target in the PSRP (which disregards cost according to the purpose of the PSRP report), they still reflect an aggressive ramp-up.

**Table 4-1. Generation System Proposed Annual Ramp to 2013 PSRP Replacement Target**

| Generation Asset | Total Count | FY 14-15 (Current) | FY 15-16 | FY 16-17 | FY 17-18 | FY 18-19 | FY 19-20 | PSRP Target |
|---|---|---|---|---|---|---|---|---|
| **Generator Step-Up Transformer** | 76 | 1 | 1 | 1 | 2 | 2 | 2 | 8 |
| **Generator Station Transformer** | 92 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| **Major Inspection (Thermal)** | 24 | 1 | 4 | 4 | 4 | 4 | 4 | 5 |
| **Major Inspection (Hydro)** | 22 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| **Major Inspection (Pump)** | 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **San Fernando Plant** | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |

*Source: LADWP Board Presentation*[6]

Table 4-1 above shows that the Department intends to quadruple the number of major thermal inspections and double to the number of major hydro inspections that occur from FY 2014-15 to FY 2015-16. In its September 22nd report to the Board, the Department reports that it has not met the FY 2014-15 target for the first five generation assets in the table above (no mentioned is made of the San Fernando Plant)—in other words, zero transformer replacements and major inspections occurred. Unhelpfully, the

[6]Presentation – Power System Reliability Program – Board Meeting of September 16, 2014. Board of Water and Power Commissioners.

internal June 2015 Report has a single line item for generation that would require further explanation from the Department.[7]

**Table 4-2. Transmission System Proposed Annual Ramp to 2013 PSRP Replacement Target**

| Transmission Asset | Total Count | FY 14-15 (Current) | FY 15-16 | FY 16-17 | FY 17-18 | FY 18-19 | FY 19-20 | PSRP Target |
|---|---|---|---|---|---|---|---|---|
| **138 kV UG Circuit** | 17 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| **138 kV Stop Joints** | 31 | 2 | 5 | 5 | 5 | 5 | 5 | 5 |
| **Maintenance Hold Restraints** | 238 | 10 | 20 | 30 | 40 | 40 | 40 | 48 |

*Source: LADWP Board Presentation*

Table 4-2 shows two of the three transmission system replacement activities at least doubling in the current fiscal year, and the doubling of the third activity next year. However, the September 22nd Board Report shows that two of the three items in the table above did not meet targets in FY 2014-15. Only the 138 kV Stop Joints were completed above target, with five installations. For the 138 kV Circuits, the Department is working to complete the purchase of materials. Generally, the June 2015 Report for transmission includes comments on delays and one instance of budget cutting from the budget office.

**Table 4-3. Substation System Proposed Annual Ramp to 2013 PSRP Replacement Target**

| Substation Asset | Total Count | FY 14-15 (Current) | FY 15-16 | FY 16-17 | FY 17-18 | FY 18-19 | FY 19-20 | PSRP Target |
|---|---|---|---|---|---|---|---|---|
| **High Side Transformer (RS)** | 70 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Load Side Transformer (RS)** | 88 | 1 | 1 | 1 | 1 | 1 | 1 | 3 |
| **Local Substation Transformer (DS)** | 930 | 6 | 18 | 18 | 18 | 18 | 18 | 50 |
| **Substation Transmission Breakers** | 612 | 2 | 6 | 6 | 6 | 6 | 6 | 25 |
| **34.5 kW Substation Circuit Breaker** | 1,878 | 2 | 10 | 15 | 20 | 20 | 20 | 95 |
| **4.8 kW Substation Circuit Breaker** | 2,406 | 10 | 20 | 30 | 40 | 40 | 40 | 200 |
| **Substation Battery Banks** | 640 | 10 | 64 | 64 | 64 | 64 | 64 | 200 |
| **Substation Automation** | 196 | 3 | 8 | 12 | 12 | 12 | 12 | 25 |

*Source: LADWP Board Presentation*

Table 4-3 shows similar aggressive increases as the previous tables: substation transformer and transmission breaker replacements are supposed to be tripled this fiscal year, substation automation should more than double, and substation battery bank replacements should increase by more than a

[7]The line item is 1,339.7 percent of its individual budget and comprises nearly the entire Generation expenditure, at 150.1 percent of the total Generation budget in this report.

factor of six. However, the September 22nd Board Report shows that four of the first six items listed in the table above did not meet FY 2014-15 targets, and does not mention the battery and substation automation activities. The June 2015 Report also reports various delays leading to budget and schedule slippages.

On the positive side, the six DS transformers for FY 2014-15 are either in service or under construction, and one had the bank delivered but not started construction. According to the September 22nd Board Report, four of the six were fully completed by the end of FY 2014-15. Better, the Department exceeded its targets for Load Side Transformers and 34.5 kV Circuit Breakers (completing three and 10, respectively). This shows that when certain projects are delayed by procurement or contract issues, the Department is sometimes able to move ahead of schedule on other projects.

**Table 4-4. Distribution System Proposed Annual Ramp to 2013 PSRP Replacement Target**

| Distribution Asset | Total Count | FY 14-15 (Current) | FY 15-16 | FY 16-17 | FY 17-18 | FY 18-19 | FY 19-20 | PSRP Target |
|---|---|---|---|---|---|---|---|---|
| **Poles** | 321,780 | 1,560 | 4,000 | 5,000 | 6,000 | 6,000 | 6,000 | 8,966 |
| **Crossarms** | 1,287,120 | 4,500 | 7,000 | 8,000 | 10,000 | 10,000 | 10,000 | 28,492 |
| **Lead Cables** | 1,918 mi. | 28 | 48 | 48 | 48 | 48 | 48 | 48 mi. |
| **Synthetic Cables** | 1,679 mi. | 10 | 12 | 12 | 12 | 12 | 12 | 12 mi. |
| **Transformers** | 126,000 | 450 | 600 | 700 | 800 | 800 | 800 | 3,214 |
| **Substructures** | 54,099 | 7 | 12 | 16 | 20 | 20 | 20 | 100 |

*Source: LADWP Board Presentation*

Finally, the Distribution System has proposed more than doubling pole replacements and significant increases in the other areas as well. The May 2015 budget presentation to the Board reported having replaced or upgraded 3,953 transformers since FY 2013-14. It also reported having replaced 2,108 poles during FY 2014-15, which would be a good achievement and ahead of the target.[8] However, the September 22nd Board Report shows that LADWP met targets for all items except pole replacements, with only 881 poles replaced. This number does not meet the target, is notably different from the budget report, and requires a dramatic increase for next year's target. Otherwise, LADWP has made good progress on distribution projects and appears to be in line with FY 2015-16 expectations.

In addition to challenges in dealing with the aging infrastructure itself, challenges cited in interviews for the four functional areas include procurement and staffing shortages rather than funding.

## *4.3 Program Budget & Expenditures*

In FY 2012-13, the PSRP spent of 72.7 percent of its budget. In FY 2013-14, the PSRP spent 69.8 percent of its budget, with a total dollar amount less than the "power supply replacement program" and "power system support/general" categories (tables below). In FY 2014-15, spending improved to 87.4 percent of the budget. Over the three-year period, overall actual expenditures were 77 percent of the approved budget. Notably, the Transmission program spent only 56 percent of its approved budget over the period.

[8]FY 15-16 Final Budget, May 19, 2015. Board of Water and Power Commissioners.

**Table 4-5. LADWP PSRP Capital Budget and Actuals ($ thousand)**

| Program | FY 12-13 Approved | FY 12-13 Actual | FY 13-14 Approved | FY 13-14 Actual | FY 14-15 Approved | FY 14-15 Actual | % Variance |
|---|---|---|---|---|---|---|---|
| Generation | 15,280 | 18,317 | 14,284 | 16,772 | 1,358 | 2,175 | 121% |
| Distribution | 149,874 | 110,129 | 163,774 | 122,629 | 166,208 | 180,782 | 86% |
| Substation | 74,830 | 66,143 | 73,432 | 55,612 | 87,092 | 58,125 | 76% |
| Transmission | 39,385 | 13,604 | 97,058 | 51,5644 | 94,900 | 64,9610 | 56% |
| Info Appl. Sys. | 19,514 | 9,152 | 18,629 | 9,873 | 14,658 | 12,145 | 59% |
| **Total** | **298,882** | **217,345** | **367,177** | **256,451** | **364,216** | **318,189** | **77%** |

*Source: Power Capital Budget and Actuals (August 19, 2015)*

However, in the future, the PSRP is supposed to have the highest budget of LADWP's major programs and a significantly higher dollar amount by FY 2015-16 ($516 million), as shown in the table below.

**Table 4-6. LADWP Proposed Program Capital Expenditures ($ million)**

| Program | FY 13-14 Actual | FY 14-15 Approved | FY 15-16 | FY 16-17 | FY 17-18 | FY 18-19 | FY 19-20 |
|---|---|---|---|---|---|---|---|
| **PSRP** | 256 | 364 | 516 | 603 | 582 | 553 | 541 |
| **Power Supply Replacement** | 456 | 592 | 425 | 283 | 310 | 437 | 502 |
| **Power System Support / General** | 295 | 309 | 339 | 358 | 333 | 323 | 356 |
| **Customer Opportunities** | 109 | 137 | 199 | 215 | 208 | 207 | 192 |
| **Operating Support** | 71 | 52 | 91 | 112 | 90 | 67 | 55 |
| **Customer Service** | 27 | 23 | 23 | 20 | 11 | 6 | 7 |

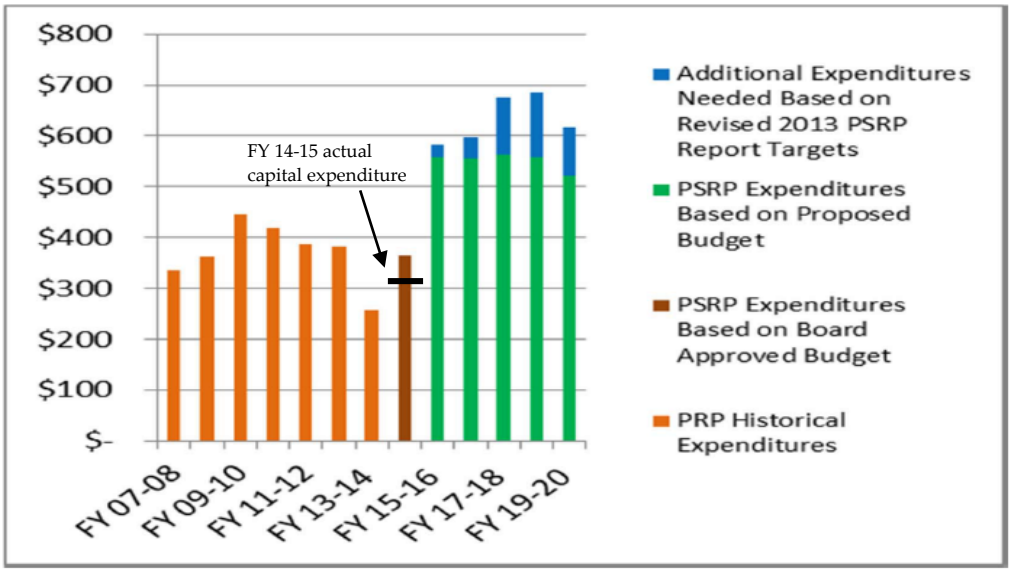
*Source: LADWP Board Presentation*[9]

LADWP should further explain the large switch that occurs during FY 2015-16 and FY 2016-17, with increased budget for the PSRP and decreased budget for power supply replacement. The total budget does not change significantly over those two years, so this will require a shift in Department priorities and runs the risk of budget being re-purposed back to popular power supply projects. This ramp-up in budget and activity warrants a careful review in the upcoming rate review.

The May 2015 budget presentation further estimated that in FY 2014-15, LADWP would spend $342.6 million of the approved $364.2 million approved budget. However, according to financial data provided by LADWP, in FY 2014-15 the approved capital budget was $376.4 million and yet the Department spent only approximately 87 percent, or $318.2 million. Compared to this underspend, the proposed capital budget as illustrated below includes an even more abrupt increase. It is also unclear where the data for FY 2012-13 was obtained, as it does not agree with the financial data in Table 4-5. This may be a remnant of the transition from the PRP to the PSRP.

[9]FY 15-16 Final Budget, May 19, 2015. Board of Water and Power Commissioners.

**Figure 4-1. Historical and Proposed PSRP Funding ($ millions)**




*Source: Navigant analysis of PSRP Report[10] and Power Capital Budget and Actuals (August 19, 2015)*

The higher spending in FY 2014-15 appears to be primarily attributable to increased spending on the distribution functional area, while the substation and transmission areas remain significantly underspent with regard to capital. In distribution, at least, this could start a positive upward trend.

Based on data provided by the Department, it also appears that the largest underspent PSRP items are related to contracting services and the purchase of materials (procurement). Specifically, only 15 percent of the planned construction services budget (a variance of $165.3 million) and 46 percent of the planned materials and supplies budget (a variance of $132.8 million) were spent over the three-year period. The program also underspent on its regular labor budget, at 81 percent (a variance of $44.2 million). These are significant amounts of money, and highlight LADWP's challenges in hiring contractors and inefficiencies in procurement processes, leading to delays.

## *4.4 Program Outlook*

Based on interviews and evidence of underspending in capital budget reports, the PSRP is faced with challenges in procurement and staffing more than in funding. The Department must create a realistic plan to meet targets in order to begin ramping up the program and regularly report achievements and milestones.

Related to this, LADWP has not updated the PSRP to reflect actual approved funding levels and has not evaluated any risks of not fully funding the PSRP or of underspending on its capital programs. And, as mentioned previously, the PSRP does not incorporate a forward-looking plan or roadmap for the implementation of new technology (including smart grid technologies outside of demonstration programs) except for the isolated case of planning for substation automation. The Department should

[10]Ibid.

update the PSRP to reflect these realities. Overall, these changes would provide more transparency into the PSRP and use of funds.

# 5. Conclusion

Navigant leveraged its Asset Management Diagnostic Tool in order to assess the Department's T&D asset management function against industry best practice and stated objectives, and conducted a preliminary review of PSRP performance and expenditures. While not achieving industry best practice, the Department's T&D asset management function appears to be in line with other U.S. utilities and provides sound governance and direction for LADWP to maintain, replace and repair its aging infrastructure, and address the key challenges it faces.

LADWP showcased a number of strengths, including a well-developed PSRP that represents a comprehensive plan for the management of the Department's power assets that is well aligned with the Department's stated objectives and to the organization structure. Other strengths include the way the organization makes operational decisions relative to its assets and very good situational awareness and management of operational risk.

However, Navigant identified a number of areas of improvement requiring immediate attention. Key areas of improvement include the need for a more formal asset management and continuous improvement framework, improvements to asset life estimates, the implementation of an outsourcing strategy, changes to the procurement process, and the development of a robust plan to address expected staff attrition. The implementation of Navigant's recommendations will require dedication and focus from the Department and possibly a change of culture. However, as mentioned previously, LADWP is facing a number of challenges and addressing these challenges while minimizing the associated costs to the ratepayers will require a transition to the implementation of best practices in asset management.

Navigant's complete list of asset management recommendations is shown in Table 5-1, below.

**Table 5-1. Asset Management Recommendations**

| | Group | Recommendations |
|---|---|---|
| Asset Strategy and Planning | Documentation of Asset Strategy and Planning | LADWP should develop an Asset Management Strategy document and implement a risk management framework along with risk registers and mapping of risk to objectives and mitigations across all areas of its Asset Management function. The Asset Management Strategy should be reviewed following a regular and structured process. |
| | | LADWP should develop a more formal, best practice Asset Management framework such as ISO 55000. |
| | Continuous Improvement | LADWP should adopt and embed a structured continuous improvement framework into its Asset Management processes. |
| | Improvements to the PSRP | Future versions of the PSRP should clearly spell out the strategy, objectives, and the direct alignment of the Plan with the Department's objectives |
| | | LADWP should expand its PSRP to include implementation strategies as well as specific annual deliverables and metrics. |
| | | All tasks required for the implementation of the Plan should be documented in the PSRP. |
| | | LADWP should include specific continuous improvement elements in the PSRP that are designed to better optimize results and cost. |

| | | |
|---|---|---|
| | | As LADWP's Asset Management system matures, LADWP should strengthen the analysis of cross-cutting issues. |
| | | LADWP should assess the impact of changing smart grid technologies on its system and include the implementation of those challenges in a smart grid road map. |
| | Prioritization | The Department should adopt a common risk-based prioritization framework across all aspects of the company. |
| | | LADWP should implement a consistent condition-based framework for corrective and emerging maintenance. |
| **Asset Management Decision Making** | Repair, Maintenance and Replacement of T&D Assets | LADWP should evolve towards accurate end-of-life standards based on asset condition and improved end-of-life estimating techniques including the development of asset health indices for each asset class. |
| | | The Department should have its maintenance performed under a hybrid Reliability Centered Maintenance (RCM) and Condition Based Maintenance (CBM) system. |
| | | LADWP should implement a procurement process for "lowest evaluated cost" which properly considers the entire life-cycle costs, including additional maintenance, life expectancy, spare parts requirements, interchangeability of parts, and other potentially significant costs. |
| | Capital Selection Process | LADWP should work towards a best practice common portfolio framework for capital project selection. |
| | Contracting Strategy | LADWP should define a stated outsourcing strategy as part of its workforce resource planning in order to consistently implement and optimize its strategy. |
| | Outages Management | LADWP should evolve towards the use of written switching orders that are created, reviewed and approved in advance. |
| **Life Cycle Delivery Activities** | Asset Management Processes | LADWP should increasingly formalize its processes in order to consistently perform and capture institutional knowledge in a time of a rapidly changing workforce. |
| | Preventive and Corrective Maintenance | The Department should leverage on-line monitoring of real time assets and replicate its condition-based approach found in Substations in other areas of the organization. |
| | | LADWP should standardize its preventive maintenance processes. |
| | | LADWP should implement a consistent risk-based prioritization and condition-based framework for corrective or emergency maintenance. |
| | | LADWP should implement a robust RCA process as part of a larger continuous improvement process and train employees accordingly. |
| | Effective Planning, Design, Operations and Maintenance | LADWP should continue to improve the collaboration and communication between the planning, engineering and operations divisions. |
| **Asset Knowledge Enablers** | Asset Data and Knowledge | LADWP should continue to formalize and document its strategies, plans, processes and asset data. |

| | | |
|---|---|---|
| **Organization and People** | Asset Management and Leadership | LADWP should strive to implement best practices in asset management leadership, including fully enabling top management through their appointment to full positions. |
| | Competence and Behavior | LADWP should continue to formalize its processes and focus on capturing the institutional knowledge of retiring employees. |
| | | LADWP should attempt to counter the fact that there are few opportunities to introduce new skills and approaches from outside the company (due to the civil service system) through training, testing, and ongoing performance feedback. And since most levels of the company are essentially a closed system, LADWP should also focus on exposing its employees to industry changes and bringing in outside influences when possible. |
| | | LADWP should state a defined contracting strategy with contract requirements that selectively incent best performance by contractors through quality and safety standards, performance incentives, and performance penalties. |
| | Organizational Structure and Culture | LADWP should adopt a culture of continuous improvement and work towards accelerating Asset Management optimization. |
| | | LADWP should develop a consistent risk-based decision process that drives planning and then determines resource allocation |
| **Risk and Review** | Accounting Practices | Best practice, towards which LADWP should aspire, is to minimize allocated costs and to hold contingency budgets at the corporate level rather than at the line item level. |
| | Asset and Systems Performance and Health Monitoring | The Department should continue to improve its measurement of Asset Management though the implementation of balanced scorecards and management reviews. |
| | Asset and Systems Performance and Health Monitoring | Quality Assurance and Quality Control requirements should be defined for primary processes. |
| | Contingency Planning and Resilience Analysis | LADWP should tighten its resiliency processes to ensure consistent review and proactive update that take into account industry best practice. |
| | Weather and Climate Change | The Department should take a holistic approach to preparing for climate change and consider conducting a study on how changing macro conditions will impact assets. |

Finally, despite the PSRP's merits as a strong planning document, Navigant heard feedback on and found evidence of underspending on the capital programs. This is a critical issue particularly because managing the PSRP is essential to the advancement towards the Recommended Strategic Case in 2014 IRP, as the Power System must be able to support a high penetration of renewables, distribution generation, storage, demand response, and smart grid technologies.

In FY 2012-13, the PSRP spent of 72.7 percent of its budget. In FY 2013-14, the PSRP spent 69.8 percent of its budget. Recent budget information provided by LADWP in August 2015 indicated that FY 2014-15 spending was $318.2 million, or approximately 87 percent of the budget and a higher dollar amount than the two previous Fiscal Years. While this is a positive development, Navigant recommends giving additional attention to PSRP performance going forward.

It also appears that the largest underspent items are related to contracting services and the purchase of materials (procurement). Specifically, 15 percent of the budget for construction services was spent over the three-year period and 46 percent of the budget for materials and supplies. The program also spent only 81 percent of its regular labor budget. These items highlight LADWP's challenges in hiring contractors and inefficiencies in procurement processes, leading to delays.

The Department should report more clearly to the Board on progress against well-defined milestones and outline a plan to ramp up program implementation effectively. This will likely require additional resource planning, including improvements to staffing and procurement processes which were reported to be obstacles. Navigant believes a further investigation of the actual expenditures on PSRP against authorized amounts from City Council should be conducted in the upcoming rate review. Further examination of how underspent PSRP funds were reallocated is a key issue going forward to ensure funds allocated to specific programs are spent on those programs.

# Volume III

# Water Infrastructure

NAVIGANT

# 2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

## Water Infrastructure Report
## Volume III

**Prepared for:**
**The City of Los Angeles**

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# Executive Summary

## *Objectives & Approach*

The City of Los Angeles ("the City"), by virtue of Section 266 of the Los Angeles City Charter, requires that the City Controller conduct an Industrial, Economic and Administrative (IEA) Survey ("the Survey") of the Los Angeles Water and Power Department ("the Department" or "LADWP"). For the 2015 edition, the City Controller has retained Navigant Consulting, Inc. ("Navigant") to conduct this study.

The primary objective of the Survey is to determine how well-prepared LADWP is to address current and future challenges, while providing safe and reliable water and power to its ratepayers at an appropriate cost. One key area of focus for the 2015 Survey is the assessment of LADWP's plan to maintain, repair and replace its aging water and power infrastructures.

This report presents Navigant's assessment of the Department's water infrastructure. Although LADWP's Water System Organization (WSO) is nationally known for excellence, water infrastructure has become an important focus area as the WSO faces a number of challenges that will require significant capital and operations and maintenance (O&M) expenditures related to the maintenance and renewal of its aging infrastructure and compliance with stringent regulatory mandates. These are urgent issues that are confronting many water utilities in the United States. The scope of the 2015 IEA primarily focuses on assessing the Department's plans with regards to:

- *Water Supply and Storage*: While LADWP's existing mix of water supplies has been a key factor in the Department's ability to provide its ratepayers with high quality, reliable, and cost competitive water, there is a need for significant changes. LADWP has been heavily relying on water purchases from the Metropolitan Water District (MWD) for many years. MWD water represents the second most expensive water source in California and its pricing is outside the direct control of the Department. The current drought further exposes the Department to MWD's high costs, as supply of lower cost water from the Los Angeles Aqueduct (LAA) has been very limited. LADWP plans to address these issues and reduce its reliance on MWD water through an increase in local water supply. In particular, the Department's plan includes increased water supply from stormwater capture, groundwater, recycled water, and conservation.
- *Water Distribution Infrastructure*: The WSO is contending with severely aging infrastructure. A significant number of its physical assets, including mainlines, trunk lines and large valves have already reached the end of their useful life. Ensuring system reliability in the current context of rapidly aging infrastructure requires a robust asset management function supported by efficient and effective processes, adequate staffing levels, and up to date technology.

Navigant's review of LADWP's water infrastructure is primarily based on insights gathered from interviews, industry experience, and supporting documentation provided by the Department. The report

is organized according to the two main topic areas above, with an additional section for the discussion of the WSO's overall water strategy.

## *Water Supply and Storage*

For most California water utilities, the Urban Water Management Plan (UWMP) is the primary water resources planning document, and includes the utility's demand and water supply forecasts. Since LADWP is in the midst of developing the 2015 iteration of its UWMP, Navigant had to rely on the 2010 version of the UWMP and additional documentation, as well as insights gathered from interviews with key personnel to review of the Department's Water Supply and Storage plans.

Given the current drought conditions facing LADWP's service area and most of California, Navigant evaluated the Department's demand forecasts against what is currently the most influential water demand driver: conservation. While further analysis would be required to fully vet the Department's demand forecasts once the 2015 UWMP is released, Navigant's review shows that LADWP's water supply projections appear to be compliant with existing conservation mandates.

Similarly, LADWP's water supply, storage and demand management strategies appear to be robust and sound. The WSO is doing a commendable job to maintain and enhance its water supplies, and achieve the City's and the Department's shared overarching goals of increasing local water supply, reducing LADWP's reliance on water purchases from MWD, and expanding its conservation efforts. In addition, given that long-term demands may decline due to a reduced per capita demand, there appears to be no need to pursue other, more costly water supply options such as seawater desalination.

However, the Mayor's goal to reduce water imports by 50 percent may prove challenging to achieve during dry years. While achieving this goal during normal and wet years is very likely, an analysis completed by Navigant shows that cutting in half MWD water purchases by 2025 during dry years (using FY 2014 as the baseline) would require a 850% increase in water supply from conservation and recycled water compared to FY2014-15 levels to meet the supply demand. Such an increase in conservation and usage of recycled water is not supported by the Department's current plans.

Finally, this report includes a discussion on the potential impact of climate change on LADWP's water supply. The WSO has completed an analysis of the potential climate change impact on the LAA System in 2011 showing that impacts may not be significant enough to adjust projected supply estimates from the LAA in the short and medium-term. However, the impact of climate change may be non-negligible beyond the 2040 planning horizon and a discussion addressing this issue is expected to be included in the 2015 UWMP.

## *Water Distribution Infrastructure*

### Asset Management Program

*Asset Management Strategy*

Over the last several years, the WSO has made significant improvements to its asset management function. The creation of an Asset Management group within Water Engineering Technical Services (WETS) was a major step, as has been the drafting of several asset management plans for critical asset

classes. Additionally, the WSO recently initiated a training program that seems to be increasing support across the organization for a more comprehensive approach to asset management. Several days of asset management training were conducted for WSO managers and the training was quite detailed and discussed a number of specific steps that need to be taken to implement a comprehensive asset management function.

The WSO's efforts to dive into the details of asset management represent great progress from the Department. However, the WSO lacks a stated asset management strategy or policy, and there is limited to no agreement among the senior staff as to the need for a formalized asset management function. Further, asset management objectives and goals are not clearly stated for all asset classes.

Over the last several years, there has been a significant international effort to develop standards for asset management programs. The result of this effort is the recent approval of International Standards Organization (ISO) 55000, 55001, and 55002. These standards provide excellent guidance on the essential elements of an asset management program. The WSO should consider developing a strategic asset management plan consistent with these standards. Many of the elements are already in place, and with the full involvement and support of the WSO's top management, this effort could be completed rapidly. Upon completion, the Department could potentially use the WSO's asset management plan as a template for the Power System and Joint Services.

When developing its asset management strategy, the WSO should address the following issues:

- While there are a number of examples that demonstrate consideration of continuous improvement from the WSO, there is no formalized process to ensure that continuous improvement is reflected in the WSO's asset management objectives and plans.
- Moving forward, one of the key asset management strategic policies that the WSO should consider is defining levels of service for each asset class. Even if the target level of service is not currently achievable, the asset management plan for a particular asset class should set a timeline to achieve that level of service and establish a program to meet the objective. Level of service definitions will drive action and will help define and allocate the resources required to meet the objective.
- There is some recognition in the WSO that asset management is tied to risk. The mainline replacement prioritization methodology constitutes a good example. However, there are other asset classes, such as pump stations and regulator stations for which limited risk evaluations have been performed. Risk assessment appears to be incomplete and inconsistent across the WSO's asset classes. Best practice would include a more formal risk assessment framework applied to all asset classes and driven by the asset management strategy.

*Asset Management Plans*

As mentioned previously, the WSO has made substantial progress in drafting asset management plans for a number of critically important asset classes. However, all of these asset management plans are in draft form, despite some dating back to 2010. These plans should be finalized to ensure that their findings are formally considered in future asset renewal strategies.

In addition, there are a number of asset classes for which asset management plans have not been developed. The WSO should consider developing plans for these assets to effectively manage water infrastructure priorities.

*Condition Assessments*

Given the aging infrastructure of the WSO, it is critical that the condition of the assets be regularly and comprehensively assessed. The WSO supplied Navigant with several asset management plans that discuss the condition of various assets; however, these reports do not constitute complete condition assessments, as they do not include critical data such as actual field condition information, or, for larger asset such as major trunk lines, findings from non-destructive inspections. Further, the WSO does not seem to have a consistent approach to condition assessment, and there is limited field data to support conclusions for a robust asset renewal strategy.

It is critical that the WSO develop comprehensive condition assessments for all its asset classes and regularly update them. The Department should use qualified contractors/consultants to support this effort as Navigant found that there are currently insufficient staff resources to complete these projects in a timely manner.

Asset condition data retention appears to be another challenge. Interviews have revealed that the WSO's staff has a solid understanding of the condition of many of the major water system assets. However, this information does not appear to have been fully documented and many of the experienced staff are currently or soon to be eligible for retirement. LADWP should continue to formalize its processes to capture the institutional knowledge of retiring employees. Collecting this information and data through additional field investigations will be more costly to the WSO than ensuring this knowledge does not leave the Department when the experienced staff depart.

*Emergency Preparedness*[1]

The WSO has emergency response and continuity of operations plans in place and has proven to be very effective and efficient in responding to emergency leaks and breaks. However, critical details appear to be missing from the plans, training is incomplete – especially in Incident Command System (ICS) – and terminology and responsibilities are not universally understood. Further, while the WSO has shared that some emergency drills have been completed, they were limited in scope and purpose. Combined, these issues may cause confusion when responding to major incidents, such as a major earthquake.

**Current State of LADWP's Water Infrastructure**

Utilities across the United States are facing increasingly aging infrastructure replacement needs as many physical assets reach the end of their useful lives. Although LADWP has yet to feel the full impact of water infrastructure failures, the UCLA trunk line break serves as one example of the damage that may occur in the future.

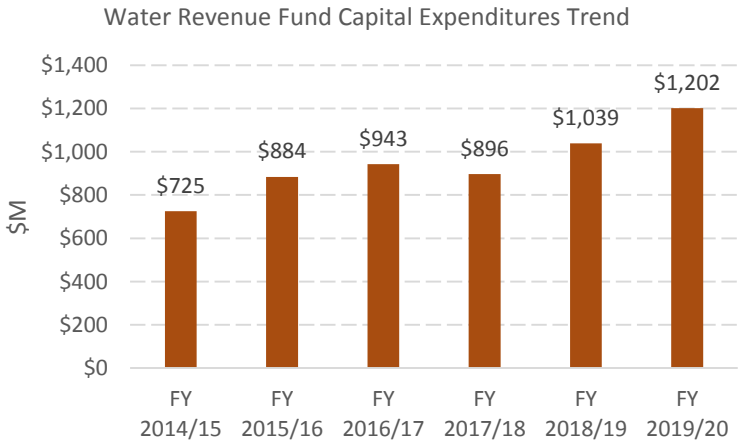
[1] This topic is addressed in detail in a separate IEA report.

To address this challenge, the Department has significantly ramped up its asset renewal[2] efforts and the recently proposed rate increase is based primarily on funding plans for a substantial acceleration of these efforts.

For instance, the WSO's current plan is to double its mainline (pipelines with diameters equal or smaller than 20 inches, excluding service lines) renewal rate from 150,000 feet/year to 300,000 feet/year. A replacement rate of 300,000 feet/year would reduce the System's replacement rate from a 235 to a 120-year cycle - which brings the rate closer to the average useful life for mainlines which ranges from 60 to 120 years. While this increase will go a long way toward reducing the projected amount of mainlines that will reach the end of their nominal useful life in the short-term, it will not be enough to address the challenges LADWP will be facing beyond 2020. At an annual renewal rate of 300,000 feet, the amount of pipe exceeding its useful life will nearly double within 15 years. If the proposed rate were to continue for decades, the amount of pipe exceeding its useful life would increase fivefold to approximately 8 million feet, or 23% of the total amount of mainline pipe. Consequently, the risk of pipe failures and the WSO's ability to meet reasonable levels of service will be greatly affected. While representing a great improvement, it is clear that a mainline replacement rate of 300,000 feet/year will not be sufficient in the medium to long-term, and that additional investments in mainline replacement programs will be required.

This recommendation also applies to large valves. The WSO's current plan is to replace 5 large valves per year, which equates to a 460 year replacement cycle. Based on the nominal useful life of large valves that ranges from 50 to 100 years (depending on the type of valve and its particular application) this rate appears to be well below what is needed to maintain a reasonable replacement schedule. This concern was also shared by LADWP staff during interviews with the Navigant team.

Replacing LADWP's aging infrastructure and ensuring system reliability will come at a cost to the ratepayers. According to the latest rate proposal, capital expenditures will increase from $725 million in FY 2014/15 to over $1.2 billion in FY 2019/20, representing a 66% increase.[3]




[2] "Asset renewal" refers to any major repair, rehabilitation or replacement.

[3] Source: Water System Rate Action Report, Chapter 2: Introduction & Background, July 2015, Figure 22.

LADWP's capital programs related to the renewal of its water infrastructure are ambitious and costly, but needed. Overall, the Department has sound plans to move forward on these programs but Navigant has concerns that it does not have the capacity to implement them – even though the WSO was able to spend 100% of its approved budget in FY 2014/15 - due to expected significant attrition, difficulties in hiring new staff and contracting out, and inefficient procurement processes. It is critical that LADWP addresses these issues in the short-term. The Department should:

- In close collaboration with the City, identify and assess solutions to accelerate the hiring and selection process.
- Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.
- Perform a comprehensive review and re-design of its procurement processes to increase efficiency and effectiveness, and to drive business process ownership and accountability.

*Advanced Metering Infrastructure*

The WSO lags behind other California utilities in its efforts to implement Advanced Metering Infrastructure (AMI), which includes remote meter reading capabilities. LADWP is in a position to combine both remote electric and water metering using a single AMI architecture; however, based on staff interviews, it appears the Power System is piloting AMI that does not currently have water metering capability. If the Power System moves ahead with this decision, this opportunity for integration and the associated implementation cost savings will be lost, unless the selected vendor develops a water metering capability. Navigant strongly recommends a combined implementation of AMI for the Water and Power Systems.

## *Water System Strategy*

Navigant observed several factors that may be limiting the WSO's ability to cost-effectively and efficiently respond to the challenges noted above. Chief among these is the lack of a single corporate strategic planning document guiding the WSO's efforts.

The WSO and the City have already developed a number of insightful strategic planning documents, including the 2008 Water Supply Action Plan, the 2009 Sustainability Plan, the One Water L.A. 2040 Plan and the 2014 pLAn. However, there is still no single, coherent Strategic Business Plan.

The existing strategic documents lay out strategies, principles, initiatives, and goals and objectives that currently drive the WSO. Taken together, these documents could provide a robust foundation for the WSO's Strategic Business Plan. However, most of the plans focus on water supply and water conservation, with limited attention paid to infrastructure. Given the current challenges related to infrastructure maintenance, renewal and enhancement, additional efforts should be devoted to developing a strategy that addresses infrastructure.

WSO leadership should initiate a process to create a Strategic Business Plan which can be started by combining and aligning many of the existing strategic documents and developing a strategy to drive infrastructure replacement efforts.

## *Conclusion*

This review of LADWP's water infrastructure has revealed that there are still a number of factors that may limit the WSO's ability to cost-effectively and efficiently respond to the challenges it faces. However, the WSO's overall approach to replacing, maintaining and repairing its aging infrastructure, and addressing the other challenges it faces appears to be robust and sound.

Navigant's major concerns are related to the expected mainline replacement rate, and the WSO's capacity to ramp up and implement its capital programs. This study shows that the proposed mainline renewal rate will not be sufficient in the medium to long-term, and that additional investments in mainline replacement programs will be required. Multiple factors led to the selection of the proposed replacement rate but one of the key objectives was to determine a renewal rate that would limit the required rate increase while still providing acceptable system reliability levels in the short-term. This strategy may not be in the best interest of the ratepayers in the medium and long-term as it may create a backlog of mainlines needing replacement that is not sustainable, which ultimately may lead to more leaks, additional repair costs, and even higher rates.

The expected significant attrition, existing difficulties in hiring new staff and contracting out, and inefficient procurement processes constitute the other top priority challenges the WSO should immediately address in order to be able to implement a significant ramp up of its capital programs.

Navigant's list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department and City.

High Priority Recommendations

- Increase mainline and large valve renewal rates.
- In close collaboration with the City, identify and assess solutions to accelerate the hiring and selection process.
- Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.
- Perform a comprehensive review and re-design of LADWP's procurement processes. Re-designed procurement processes should increase efficiency and effectiveness, and drive business process ownership and accountability.
- Continue to formalize the WSO's processes to capture the institutional knowledge of retiring employees.
- Create a single, coherent strategic business plan by combining and aligning many of the existing strategic documents already used by the WSO.
- Establish an asset management strategy and document it in a strategic asset management plan by leveraging best practice asset management framework such as ISO 55000. Specific consideration should be given to adopting structured continuous improvement and risk frameworks, defining levels of service for the WSO's assets, and including an overarching policy governing the repair, maintenance and replacement of all the WSO's asset classes.
- Develop emergency plans that are in line with best practice requirements and include the completion of emergency drills in response to major incidents, such as a major earthquake.

Medium Priority Recommendations

- Complete comprehensive condition assessment reports of all asset classes.
- Finalize asset management plans that are currently in draft form, and develop new plans for critical asset classes for which there is currently no plan.
- Integrate Power and Water System AMI.
- Address the impact of climate change on LADWP's water supply, and in particular the LAA.
- Develop processes and procedures that govern the implementation of asset management plans for all asset classes. These processes and procedures should be reviewed and updated on a regular basis.
- Continue to formalize and document the WSO's strategies, plans, processes and asset data.
- Incentivize the WSO's senior leadership to drive the implementation of a formalized asset management function, including the development of a formal asset management strategy.

Low Priority Recommendations

- Leverage Navigant's findings to improve failure analysis reports.
- Create a long term investment plan that extends beyond the 10 year capital planning horizon.

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# 1. Introduction

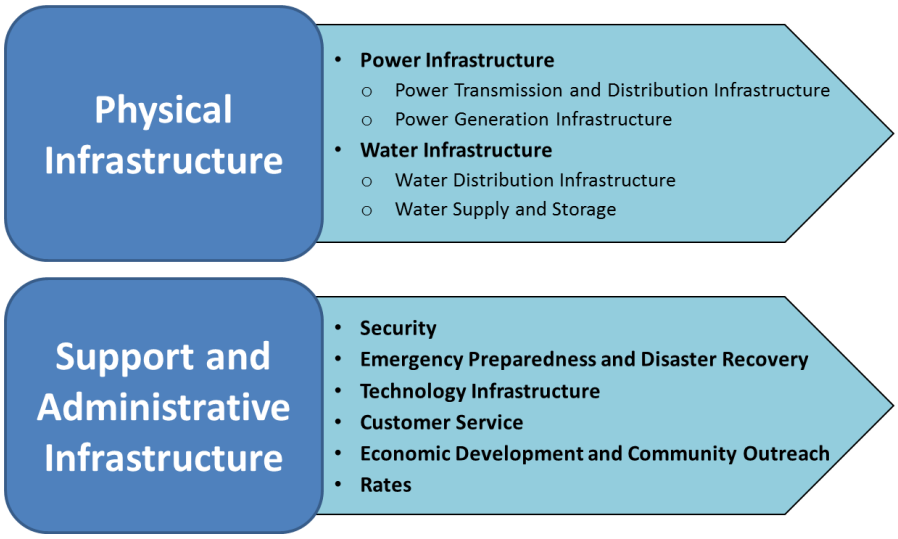
## *1.1 Study Objectives*

The City of Los Angeles, by virtue of Section 266 of the Los Angeles City Charter, requires that the City Controller conduct the IEA Survey of LADWP. For the 2015 edition, the City Controller has retained Navigant to conduct this study.

The primary objective of the IEA Survey is to assess how well-prepared the Department is to address current and future challenges, while providing safe and reliable water and power to its ratepayers at reasonable costs.

For LADWP, the most critical challenges currently revolve around power and water physical infrastructure and certain areas of administrative infrastructure. To address these, the Joint Administrators included the following focus areas in the scope of the 2015 IEA Survey:

**Figure 1-1. Focus Areas of the 2015 IEA Survey**




This report focused on the review of LADWP's Water Infrastructure.

## *1.2 Approach*

Information for this report was derived from several sources:

- Interviews with LADWP Water System staff.
- Documents collected and reviewed across the Water System including reports, presentations, budgets, model outputs, and other data provided in response to Navigant's data request.
- A literature review of California regulation, ISO standards, and peer utility publications on relevant Water System topics.

- Navigant's experience with LADWP's prior reports and practices.

Navigant conducted 15 interviews over a period of four weeks. The interviewees included the Senior Assistant General Manager of the Water System, the Executive Liaison, all five Division Managers, several direct reports to the Division Managers, and some section and group managers. See Appendix B for a full description of the interviews conducted. The documents produced by the Department are listed in Appendix C.

### *1.3 Report Organization*

This report is organized as follows:

- Water System Strategy: A summary of the mission, vision, values, strategies and other overarching policies and principles guiding the work of the WSO.
- Water Supply and Storage: An assessment of LADWP's current and planned future water demand and water supply.
- Water Distribution Infrastructure: An assessment of the WSO's efforts to operate, maintain, renew and expand its physical infrastructure.
- Conclusion: A summary of findings including recommendations based on the aforementioned assessments.

# 2. Water Supply and Storage

Urban Water Management Plans are prepared every five years by urban water suppliers in California in accordance with the Urban Water Management Planning Act. The plans must be submitted to the Department of Water Resources (DWR) and reviewed for compliance with the UWMP Act. The UWMP provides long-term resource planning to ensure that adequate water supplies are available to meet existing and future water demands over a 20-year planning horizon. In addition, each urban water supplier is required by the Water Conservation Bill (2009, SBX7-7) to report its progress on meeting the required 20% reduction in per-capita urban water consumption by the year 2020.

DWR provides a Guidebook for urban water suppliers in advance of the UWMP deadline. The 2015 Guidebook is expected to be released by the end of September 2015.[4]

For most California water utilities, the UWMP is the primary water resources planning document. Although LADWP is in the midst of updating its UWMP, there is limited information available for review without the 2015 Guidebook. Accordingly, Navigant has relied on the 2010 version of the UWMP and insight gathered from interviews with key personnel for much of its water supply and storage review. Updated information has been used when available.

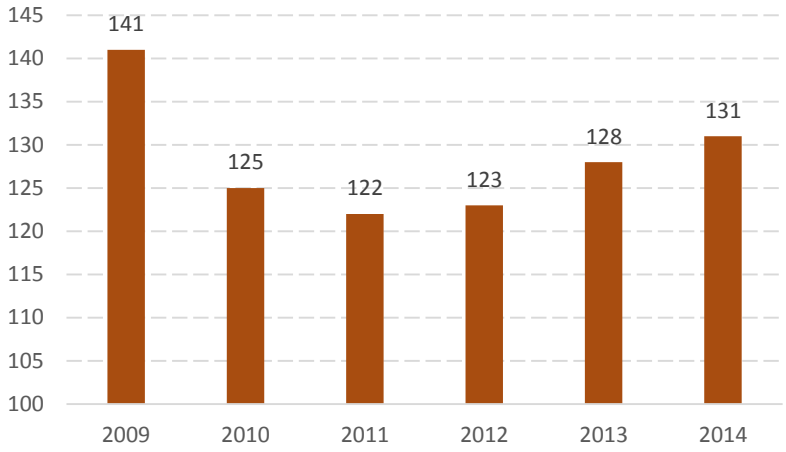
## *2.1 Water Demand Forecast*

One critical component of the UWMP is the water demand forecast. LADWP's forecasting methodology utilizes data such as historical demand by sector (single-family residential, multi-family residential, commercial, industrial, government/institutional and non-revenue), population and other demographic data from the Southern California Association of Governments (SCAG), estimates of economic activity, weather records, and even satellite infrared analysis to estimate outdoor water use.

Given the current drought conditions facing LADWP's service area and most of California, Navigant evaluated the Department's demand forecasts against what is currently the most influential water demand driver: conservation. SBX7-7, also known as 20x2020, was passed in 2009 and requires water utilities to reduce per capita water use by 20% by 2020 on a statewide basis. To achieve this, each water agency was required to establish its baseline water use and choose from one of four options for calculating compliance with the 20x2020 requirements. LADWP has chosen Option 3, which requires the 2020 target per capita demand to be 95% of the Hydrologic Region 4 Target of 149 gallons per capita per day (gpcd). This results in a 2020 target of 142 gpcd, which is higher than LADWP's per capita water demand over the last six years (see Table 2-1), highlighting the Department's early compliance with SBX7-7.

[4] A public draft of the 2015 Guidebook is expected to be released in August.

**Table 2-1: LADWP's Historical Per Capita Water Demand (gpcd)[5]**




However, the Mayor's Executive Directive No. 5 lays out a goal of reducing per capita water consumption by 20% by the end of 2017, assuming a base year of FY 2013/14. Based on a demand of 131 gpcd, this would result in a maximum water consumption target of 105 gpcd. This is a much more aggressive water demand target than mandated by SBX7-7, requiring further water conservation efforts from LADWP and its ratepayers.

Additionally, on April 1, 2015, Governor Brown directed the California State Water Resources Control Board (SWRCB) to reduce potable urban water use by 25% statewide. Conservation standards vary across urban water suppliers depending on their average residential gallons per capita per day (r-gpcd) consumption for the previous year. Significant conservation efforts over the past six years have limited the Department's conservation standard to 16%, 9% below the statewide average goal. LADWP's latest water conservation numbers are encouraging since residential water use decreased by 21% in July 2015 over July 2014, exceeding both the Mayor's and Governor's goals.

Overall, the Mayors' Executive Directive No. 5 takes precedence for water demand forecasting purposes over Governor's Brown conservation goals, given the associated higher water consumption reduction objective.

Since the 2015 UWMP was not available at the time this report was completed, Navigant used the July 2015 Water System Rate Action Report, which provides total supply projections for the FY 2014-15 – FY 2019-20 period, to assess the Department's demand forecasts.[6]

Using the projections provided in the Rate Action Report, Navigant derived projected water sales by subtracting water losses or "Non-Revenue" supply - estimated at 6.9%[7] - from the total water supply numbers, and then computed the average per capita water consumption assuming a population of 4

[5] Figure 11, Water System Rate Action Report, Chapter 2. Note that 2015 per capita water use was not available as of the writing of this report.
[6] Water System Rate Action Report, Appendix C: Water Supply Cost by Source, page Chapter 5 (Appendix C)-2, July 2015.
[7] The 6.9% non-revenue ratio was derived from Exhibit ES-H from 2010 Urban Water Management Plan.

million. Table 2-2 shows that starting in FY 2016-17 the average water consumption will be approximately 105 gpcd, which is in line with the Mayor's conservation goal.

**Table 2-2: Projected Water Sales and Average Consumption - FY 2014-15 to FY 2019-2020[8]**

| Supply (AF) | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2019-20 |
|---|---|---|---|---|---|---|
| Groundwater Pumping (AF) | 67,200 | 28,708 | 28,708 | 28,708 | 32,711 | 92,109 |
| LA Aqueduct (AF) | 91,070 | 249,689 | 256,369 | 263,049 | 269,730 | 261,077 |
| MWD (AF) | 374,478 | 238,942 | 215,014 | 191,354 | 179,356 | 135,150 |
| Conservation & Recycled Water (AF) | 10,368 | 10,505 | 10,643 | 15,311 | 18,713 | 19,063 |
| Total Supply (AF) | 543,116 | 527,844 | 510,733 | 498,421 | 500,510 | 507,398 |
| Estimated Non-Revenue (AF)* | 37,475 | 36,421 | 35,241 | 34,391 | 34,535 | 35,010 |
| **Estimated Sales (AF)** | **505,641** | **491,423** | **475,492** | **464,030** | **465,975** | **472,388** |
| **Average Per Capita Consumption (gpcd)** | **113** | **110** | **106** | **104** | **104** | **105** |
| **Change Against Mayor's Executive Directive No. 5 Goal of 105 gpcd** | **8%** | **5%** | **1%** | **-1%** | **-1%** | **1%** |

These water supply projections represent a significant decrease from the water demand forecasts included in the 2010 UWMP but are reflective of the existing conservation mandates. LADWP's latest water supply forecast for 2020 represents a 19% decrease relative to the 2010 UWMP demand forecast.

**Table 2-3: Change in Demand Forecasts Between the 2010 UWMP and the 2015 Rate Action**

| | 2015 | 2020 |
|---|---|---|
| Demand Forecast with Passive & Active Water Conservation - 2010 UWMP | 599,563 | 622,732 |
| Total Supply Forecast - 2015 Rate Action | 543,116 | 507,398 |
| Change | 9% | 19% |

While further analysis would be required to fully vet the Department's demand forecasts once the 2015 UWMP is released, Navigant's review shows that LADWP's water supply projections appear to be compliant with existing conservation mandates.

Additionally, LADWP's implied assumption that water consumption per capita will not increase over time appears appropriate. Although there is an argument that LADWP's per capita demands could increase should current water shortage rates be lifted, there is also a sentiment that they will not only

[8] Water System Rate Action Report, Appendix C: Water Supply Cost by Source, page Chapter 5 (Appendix C)-2, July 2015.

hold below the 2020 target, but may continue to decline. Further, population increases may not offset this decrease, meaning that overall demands may continue to decline, on average. These assumptions should be reflected in the 2015 UWMP, which should differ from previous UWMPs that have shown demands increasing over the 25-year planning horizon.

Finally, the Department is proposing a new water rate structure as part of their latest rate action that would further promote water conservation and validate these assumptions. Under LADWP's new water rate structure, the current two tiered rate structure would be transitioned to four tiers, and changes to water budget allotments for residential customers would be made.[9] Proposed changes to the water budget allotments include:

- Eliminating the household size allotment.
- Setting the tier 1 allotment to 8 HCF to reflect indoor use, which represents an increase for many customers.
- Retaining five lot size groups, but set allotments for lot sizes four and five equal to each other.

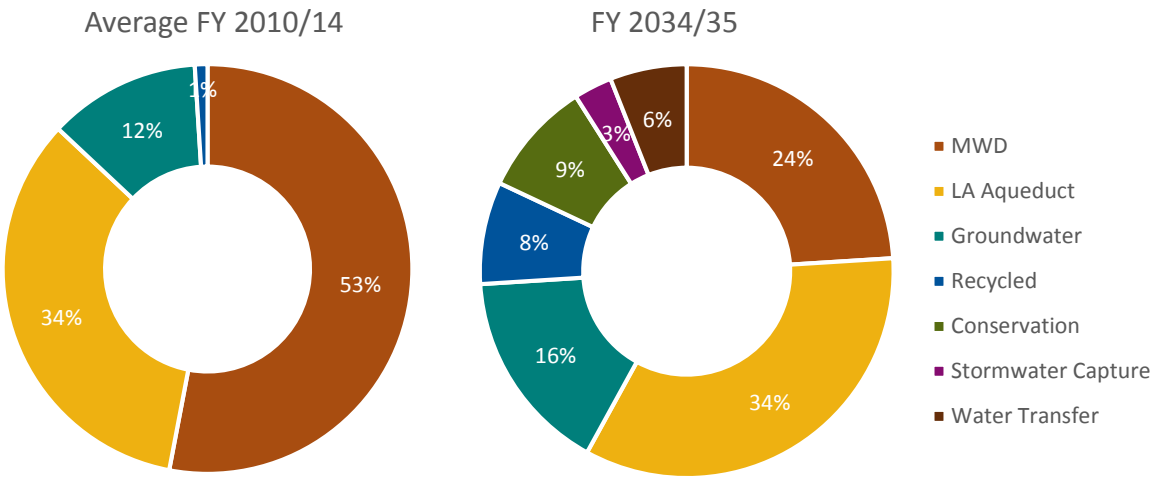
## *2.2 Water Supply*

As mentioned previously, Navigant was not provided with the 2015 UWMP and had to rely on data included in the 2010 UWMP, interviews and other documentation to assess the WSO water supply plan.

Figure 2-1 shows the past and projected mix of water supplies presented in the 2010 UWMP. It highlights a significant reduction in water purchased from MWD, offset by more conservation, and an increase in the use of recycled water, groundwater, stormwater capture and water transfers.

[9] Water System Rate Action Report, Executive Summary Section 1.5.2, July 2015.

**Figure 2-1: Average Water Supply by Source[10]**




The projected mix of water supplies that will be presented in the 2015 UWMP is anticipated to include major differences from the mix presented in the 2010 UWMP since:

- The pLAN sets a target of capturing 150,000 AF per year of stormwater by 2035[11], which would represent 26% of the Department's total annual water supply, based on Navigant's estimates.[12]
- The Mayor has set a target for imported water purchases to be reduced by 50% by 2025, using the baseline year of FY 2013/14, which translates to a maximum of approximately 220,936 AF per year[13], representing approximately 40% of the Department's total annual water supply. The selection of FY 2014 as the baseline simplifies the Department's task in achieving this goal since FY 2014 was a dry year and MWD water imports were therefore higher than usual, resulting in a higher imported water allowance.
- Overall demands are expected to decrease as a result of the Mayor's targeted decrease in per capita water use to less than 100 gpcd by 2035.
- There is an increased focus on maximizing the use of local water supplies, and this emphasis will include a greater effort to rehabilitate the San Fernando Groundwater Basin and other wellfields.

The Department is making great progress with regards to water conservation as illustrated by a 30 gpcd or 19% drop in residential water consumption between 2004 and 2014 (from 161 gpcd to 131 gpcd). Additionally, the Mayor's goal to decrease the per capita use to less than 100 gpcd by 2035 seems

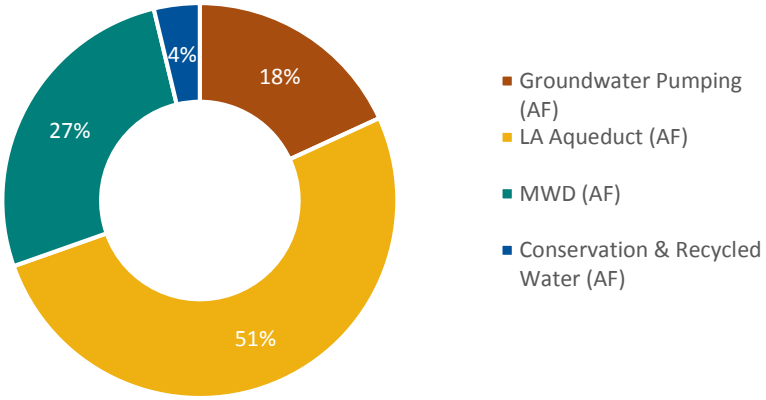
[10] Source: 2010 UWMP.
[11] Source: Sustainable City pLAn, page 20.
[12] Navigant extrapolated the water supply data presented in the Water System Rate Action Report, Appendix C: Water Supply Cost by Source, page Chapter 5 (Appendix C)-2, July 2015.
[13] Source: Sustainable City pLAn, page 20. The pLAn refers to 441,871 acre-feet of water imports from MWD during FY 2013/14.

realistic given that the Department's water supply data already shows a decrease in average residential consumption to approximately 104 gpcd by FY2017-18 (see Table 2-2).

LADWP's Stormwater Capture Master Plan, dated July 2015, highlights that the maximum amount of stormwater that could realistically be captured by 2035 ranges from approximately 135,000 AF per year to a maximum of approximately 180,000 AF per year. This range is in line with the pLAn's goal to capture 150,000 AF of stormwater per year by 2035. To achieve this goal the Department plans to capture and use stormwater on-site to offset potable water demand, and to capture and infiltrate stormwater into subsurface groundwater aquifers.[14] Achieving this level of stormwater capture would represent a great achievement for the Department in increasing its local water supply and limiting its reliance on MWD water purchases. Significant progress has already been made in this area and the Department is currently aggressively pursuing the remediation of the San Fernando Groundwater Basin. A team of consultants has recently been retained to provide planning, analysis and design services for the remediation effort.

However, while achieving the Mayor's goal to reduce imported water purchases by 50% by 2025 is very likely during normal and wet years, it may become challenging during dry years. Figure 2-2, which reflects data presented in the latest Water System Rate Action Report, shows the Department's projected water supply mix in FY 2019/20. This chart reveals that more than half of the Department's water supply would originate from the LAA, while it only represented 17% of LADWP's water supply in FY 2014/15 due to the drought.

**Figure 2-2: Projected Water Supply Mix - FY2019-20[15] [16]**




[14] Source: Stormwater Capture Master Plan, Executive Summary, July 2015.
[15] Source: Water System Rate Action Report, Appendix C: Water Supply Cost by Source, page Chapter 5 (Appendix C-2), July 2015.
[16] The share of stormwater capture is included in the "Groundwater Pumping" category.

This considerable difference highlights that LADWP's water supply mix can fluctuate significantly from a dry year to a wet year due to variations in water supply from the LAA, with shortfalls in supply from the LAA being offset by additional water purchases from MWD, and vice versa.
Assuming a dry year in 2025 and the same level of water supply received from the LAA as in FY 2014/15 (91,070 AF), the maximum level of groundwater and stormwater capture attainable by 2025 (125,000 AF[17]), and the maximum MWD imports set by the Mayor (220,936 AF), water supply from conservation and recycle water would have to increase by close to 88,000 AF or 850% compared to FY2014-15 levels to meet the supply demand. This is illustrated by Table 2-4. Attaining this level of conservation and recycled water supply seems unlikely, which suggests that the Mayor's goal will be extremely challenging to meet during dry years. However, Table 2-4 also shows that MWD water imports would be significantly lower during normal and wet years than the maximum allowance set by the Mayor.

**Table 2-4: 2025 Scenarios**

| | FY2014/15 - Actuals | 2025 - Normal Year Scenario | 2025 - Wet Year Scenario | 2025 - Dry Year Scenario | Difference FY2014/15 - Dry Year Scenario |
|---|---|---|---|---|---|
| Groundwater Pumping (AF) | 67,200 | 125,000 | 125,000 | 125,000 | 57,800 |
| LA Aqueduct (AF) | 91,070 | 259,983[18] | 300,000[19] | 91,070 | 0 |
| MWD (AF) | 374,478 | 139,960 | 99,943 | 220,936 | -153,543 |
| Conservation & Recycled Water (AF) | 10,368 | 10,368 | 10,368 | 98,305[20] | 87,937 |
| Total Supply (AF) | 543,116 | 535,311 | 535,311 | 535,311 | -7,805 |

This issue related to water supply during dry years may be magnified in the long-term (end of the century) as climate change may play a role in limiting water supply from the LAA. The potential for climate change to impact future water supplies has been of great concern to the WSO. An analysis of the potential climate change impact on the LAA System was completed in 2011.[21] The analysis utilized 16 climate change models and two different greenhouse gas emission scenarios to evaluate the impact of climate change on Eastern Sierra hydrology. The model's hydrologic outputs were entered into the Los Angeles Aqueduct Simulation Model to evaluate LAA operational impacts and to estimate the amount

[17] Source: LADWP's Stormwater Capture Master Plan, dated July 2015.
[18] Average of LADWP's LAA water supply projections for the FY 2015/16 – FY2019-20 period. Source: Water System Rate Action Report, Appendix C: Water Supply Cost by Source, page Chapter 5 (Appendix C-2), July 2015.
[19] Navigant's projection of LAA water supply during a wet year based on FY 2010/11 actuals.
[20] The estimate for Conservation & Recycled Water supply for the dry year scenario reflects shortfalls in water supply from the LAA (similar to FY2014/15 actuals), the maximum MWD water import allowance, estimated groundwater supply, and the projected total demand for 2025.
[21] Task G, Los Angeles Aqueduct System Climate Change Study Final Report. June 1, 2011.

of water that can be captured. The results were divided into three timeframes: 2010-2039, 2040-2069, and 2070-2099. The overall conclusion of this report is that "a large fraction of the monthly runoff and flow projections are within historical ranges, although about 10% are expected to be below, and 7% above historical ranges." The report further points out a long-term drying trend for the Owens Valley and Mono Basin, with flow to the City possibly being reduced to zero during years of low runoff. Cumulative runoff over the 21st century was estimated to be 2 million AF less in the Owens Valley and 400,000 AF less in the Mono Basin as compared to the historical runoff from 1950-1999.

While the results of the LAA System analysis are concerning, the major impacts of climate change will not be felt until later this century. Climate change impacts may not be significant enough to adjust projected supply estimates from the LAA in the 2015 UWMP, but some discussion regarding impacts beyond the 2040 planning horizon should be included. The study results also provide a basis upon which to implement long-term changes to how the LAA is operated, including how to take advantage of the Neenach Pumping Facility connection to the State Water Project.

With the added emphasis on stormwater capture, a more thorough analysis of the long-term impacts of climate change on stormwater runoff is also needed, along with its impacts to groundwater. The stormwater capture targets of the City may need to be adjusted in years beyond 2040 as a result of such analysis. The results of a climate change analysis may point toward the need for additional in-basin storage to capture more wet-year runoff.

A water source that is not materially impacted by climate change is recycled water. For this reason, recycled water adds value to the overall supply portfolio as a highly reliable supply and it should constitute one of the Department's focus areas going forward. The 2010 UWMP goal is to increase recycled water use to 59,000 AFY by 2035 while in FY2013-14 the system delivered close to 36,000 AF. This would represent approximately a 64% increase. To achieve this goal, LADWP plans to:

- Expand Non-Potable Reuse (NPR purple pipe network).
- Implement the Groundwater Replenishment (GWR) Project.
- Explore:
    - Satellite treatment options.
    - Injection wells.
    - Direct Potable Reuse.
    - New Treatment Technologies.
- Increase outreach on the City's recycled water program.

The combination of the actions presented above constitutes a sound plan to achieve the 59,000 AFY goal by 2035 and further increase the share of recycled water in the Department's water supply portfolio.

## *2.3 Adequacy of Water Supply Infrastructure to Meet Future Demands*

Navigant's assessment of LADWP's overall water supply shows that the WSO is doing a commendable job to maintain and enhance its water supplies, and to achieve the City's and the Department's shared overarching goals of increasing local water supply, reducing LADWP's reliance on water purchases from MWD and expanding its conservation efforts. In addition, given that long-term demands may decline due to a reduced per capita demand, there appears to be no need to pursue other, more costly water supply options such as seawater desalination.

# 3. Water Distribution Infrastructure

Navigant has implemented a two-step approach to assess the WSO's current and proposed plans to operate, maintain, and renew LADWP's water infrastructure, and to evaluate its capacity to implement these plans.

The first step focused on a high-level diagnostic of the WSO's asset management function. To complete this assessment, Navigant leveraged its Asset Management Diagnostic Tool which evaluates an organization's asset management function against six asset management groups: asset strategy and planning, asset management decision making, life cycle delivery activities, asset knowledge enablers, organization and people, and risk and review.

The second step focused on a detailed review of the WSO's plan to renew its aging infrastructure, with particular attention paid to current infrastructure investments and the adequacy of existing infrastructure renewal programs.

## *3.1 Asset Management Diagnostic*

Over the last several years, the WSO has made significant improvements to its asset management function. The creation of an Asset Management group within WETS was a major step, as has been the drafting of several asset management plans for critical assets. Recently, the WSO conducted several days of asset management training for WSO managers. This training was quite detailed and discussed a number of specific steps that need to be taken to implement a comprehensive asset management function.

The WSO's efforts to dive into the details of asset management represent great progress from the Department. However, there is still a lack of strategic focus that disrupts detailed efforts at the staff level to implement a comprehensive asset management function, and there is room for improvement in several aspects the WSO' asset management capabilities.

This section of the report presents a high-level assessment of the WSO's asset management function against industry best practice and includes recommendations for improvement. To perform this assessment, Navigant leveraged its Asset Management Diagnostic Tool. The Diagnostic Tool provides an assessment of the Department's maturity level against the tool's six asset management groups and 39 subject areas, using maturity levels ranging from 0 to 4. A maturity level of 0 signifies that the organization is not considering the subject area in question, while a maturity level of 4 signifies that organization's processes surpass standard requirements and are likely a best practice, if performed cost-effectively.

The chart below presents the WSO's average maturity level for each of the six asset management groups, based on Navigant's assessment.

**Figure 3-1: Assessment of the WSO's Maturity Level in Six Key Aspects of Asset Management**




Figure 3-1 shows that the WSO does not achieve best practice (maturity level 4) in any of the six asset management groups but performs relatively well in Asset Management Decision Making and Lifecycle Delivery Activities. However, there is room for significant improvement in Asset Strategy & Planning, Asset Knowledge Enablers, Organization and People Enablers and Risk & Review.

The following sections outline Navigant's findings related to each of the six asset management groups and identify specific recommendations for improvement. In addition, Appendix A includes the elements of an asset management system as defined by ISO 55001.

A summary of key recommendations is included in below:

**Table 3-1: Asset Management Diagnostic - Key Recommendations**

| Asset Management Category | Recommendations |
|---|---|
| Asset Strategy and Planning | ✓ Establish an asset management strategy and document it in a strategic asset management plan.<br>✓ Adopt and embed a structured continuous improvement framework in the WSO's formal asset management strategy.<br>✓ Finalize asset management plans that are currently in draft form, and develop new plans for critical asset classes for which there is currently no plan.<br>✓ Define levels of service for WSO's assets. |

| Asset Management Category | Recommendations |
|---|---|
| Asset Management Decision Making | ✓ Develop an overarching written policy and associated business processes governing the repair, maintenance and replacement of all the WSO's asset classes.<br>✓ Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management. |
| Life Cycle Delivery Activities | ✓ Develop processes and procedures that govern the implementation of asset management plans for all asset classes. These processes and procedures should be reviewed and updated on a regular basis.<br>✓ Develop emergency plans that are in line with best practice requirements and include the completion of emergency drills in response to major incidents, such as a major earthquake. |
| Asset Knowledge Enablers | ✓ Continue to formalize and document the WSO's strategies, plans, processes and asset data. |
| Organization and People | ✓ Incentivize the WSO's senior leadership to drive the implementation of a formalized asset management function, including the development of a formal asset management strategy.<br>✓ Continue to formalize the WSO's processes to capture the institutional knowledge of retiring employees. |
| Risk and Review | ✓ Develop a more formal, best practice asset management framework such as ISO 55000 and embed a structured continuous improvement process.<br>✓ Complete comprehensive condition assessment reports of all asset classes.<br>✓ Define and implement a more formal risk assessment framework that is applied to all asset classes.<br>✓ Address the impact of climate change on LADWP's water supply, and in particular the LAA. |

### 3.1.1 Asset Strategy and Planning

Navigant's review of the WSO's Asset Strategy and Planning asset management category primarily focused on the following areas:

- Documentation of Asset Strategy and Planning.
- Continuous Improvement.
- Project Prioritization.

A maturity level of 1.7 highlights a number of areas where the Department should make immediate changes. Most importantly, the WSO must define an asset management strategy that should govern continuous improvement and define service levels. This strategy should be documented in a clear and comprehensive strategic asset management plan. Additionally, the WSO should focus on finalizing its existing asset management plans. Navigant's findings are discussed in detail in the following subsections.

#### *3.1.1.1 Documentation of Asset Strategy and Planning*

While substantial progress has been made in the WSO Asset Management Program (AMP) since the last IEA Survey was conducted, it has been slow. The WSO has many Asset Management System elements in place or in the process of being developed. These include a robust GIS system and associated databases, a reporting system providing record information for constructed and repaired facilities, a computerized maintenance management system (CMMS) using the MAXIMO platform, several asset management plans, and a well-functioning capital improvement program for new facilities and asset renewal. In addition, an asset management group has been created within WETS.

However, the WSO does not have a stated asset management strategy or policy, and there is limited to no agreement among the senior staff as to the need for a formalized asset management function. Further, asset management objectives and goals are not clearly stated for all asset classes. For instance, there is a clear goal for mainline replacement of 300,000 feet/year that is supported by a robust prioritization methodology, but objectives for other asset classes such as pump stations are not as clearly stated and supported by a plan. In addition, the WSO appears to be lacking a common understanding of the meaning and implications of asset management and the relevant terminology.

As mentioned previously, the WSO has made substantial progress in drafting asset management plans for a number of critically important asset classes including:

- Large Valves.
- Los Angeles Filtration Plant.
- Pressure Regulator Stations.
- Pump Stations.
- Trunk Lines.
- Water Distribution Pipelines, also known as Mainlines.
- Water Storage Facilities.

However, all of these asset management plans are in draft form, despite some dating back to 2010. According to WSO personnel, the plans have not yet been finalized because of a lack of consistency in

the way they were written, and limited attention from the senior management on this matter. These plans should be finalized to ensure that their findings are formally considered in future asset renewal strategies.

In addition, there are a number of asset classes for which no asset management plans have been developed. These asset classes are listed in Table 3-2 and categorized by level of importance. The WSO should consider developing plans for these assets to effectively manage water infrastructure priorities.

**Table 3-2: Asset Classes with No Asset Management Plan**

| Level of Importance | Asset Class |
|---|---|
| High Importance | ✓ Los Angeles Aqueduct and all related facilities such as wells, reservoirs, dams, control and outlet valves.<br>✓ Open reservoirs (e.g. dams, inlet/outlet structures, control valves, and fencing).<br>✓ In-city well systems.<br>✓ Disinfection and water quality monitoring stations.<br>✓ Cathodic protection systems (e.g. rectifiers, anodes, and test stations). |
| Medium/Low Importance | ✓ Distribution line valves, including valve boxes.<br>✓ Hydrants, including laterals and shutoff valves.<br>✓ Water services and meters.<br>✓ Fire meters and laterals.<br>✓ Blow-off valves, valve boxes, and associated structures.<br>✓ Air release and vacuum valves.<br>✓ Backflow prevention devices.<br>✓ Recreational facilities.<br>✓ Equipment and material storage facilities. |

Moving forward, one of the key asset management strategic policies that the WSO should consider is defining levels of service for each asset class. For example, the level of service for an individual residential water service might be to have an outage greater than 4 hours occur no more than once every five years, while the level of service for an individual fire hydrant on a single-family residential street might be to have one hydrant out of service on a particular block for no greater than one week and no more frequently than once every 10 years. Even if the target level of service is not currently achievable, the asset management plan for a particular asset class should set a timeline to achieve that level of service and establish a program to meet the objective. Level of service definitions will drive action and will help in defining and allocating the resources required to meet the objective.

Other asset management strategic policies may include:

- Defining the asset classes covered in the asset management function.
- Defining the number of leaks per year that will be considered acceptable.

- Setting an asset class priority system for directing the investment of limited resources.
- Establishing division responsibility for managing each asset class.
- Setting standards for software to be used.

As the Department continues to work towards a documented strategic asset management plan, the aforementioned policies should be addressed.

#### *3.1.1.2 Continuous Improvement*

There are a number of examples that demonstrate consideration of continuous improvement from the WSO, particularly with respect to field construction, lessons learned on mainline replacements, and improvements made to the budget estimation process and project management. The WSO's recent implementation of a stage-gate approach for managing projects is a good example of continuous improvement in project management. However, there is no formalized process to ensure that continuous improvement is reflected in the WSO's asset management objectives and plans. The WSO should adopt and embed a structured continuous improvement framework in its formal asset management strategy.

#### *3.1.1.3 Project Prioritization*

While not necessarily tied directly to the asset management plans, there is a robust process for selection and prioritization of renewal projects and a well-functioning project management process, with a Project Management Office (PMO) in place. Once decisions are made on the renewal projects to be pursued, responsibility for carrying them out is clear and those responsible have the appropriate level of authority to carry them out. In addition, risk and asset performance are taken into consideration when prioritizing renewal projects.

Key Recommendations - The WSO should:

- Establish an asset management strategy and document it in a strategic asset management plan.
- Adopt and embed a structured continuous improvement framework in its formal asset management strategy.
- Finalize asset management plans that are currently in draft form, and develop new plans for critical asset classes for which there is currently no plan.
- Define levels of service for its assets.

### 3.1.2 Asset Management Decision Making

Navigant's review of LADWP's Asset Management Decision Making processes primarily focused on the following areas:

- Repair, maintenance and replacement of WSO's assets.

- Contracting strategy.

With a maturity level of 2.3, the WSO's Asset Management Decision Making is considered to be adequate; however, a number of improvements would bring the WSO closer to best practice. Specifically, the WSO should develop an overarching written policy and associated business processes governing the repair, maintenance and replacement of all its asset classes, and define a stated outsourcing strategy. These findings are discussed in additional detail below.

#### *3.1.2.1 Repair, Maintenance and Replacement of WSO's assets*

The WSO appears to have good processes in place for the management of the end of life of its assets, particularly for mainlines and trunk lines, and there is a growing focus on other asset classes. In addition, the decision making process to prioritize renewal projects is robust for mainlines and trunk lines but there is less focus on other asset classes and lifecycle costs are seldom taken into consideration in renewal projects – although some consideration is now given to lifecycle costs for new projects. Replacement efforts have been ramping up for these key assets, but may not be sufficient. These issues are addressed in detail in section 3.2.

Still, the WSO is still lacking an overarching written policy and associated business processes governing the repair, maintenance and replacement of all its asset classes.

#### *3.1.2.2 Contracting Strategy*

The WSO primarily takes an "insourcing" approach since it can take up to 18 months or more to obtain outside resources. Outsourcing can therefore result in significant delays in the execution of some of the WSO's plans, including various asset renewal plans. This issue could be resolved by incorporating the WSO's outsourcing strategy as part of its workforce resource planning, as opposed to considering outsourcing needs on a project-by-project basis. Having an outsourcing strategy set as part of a workforce plan would provide LADWP with sufficient time to appropriately plan around the abnormally long outsourcing process.

Key Recommendations – The WSO should:

- Develop an overarching written policy and associated business processes governing the repair, maintenance and replacement of all its asset classes.
- Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.

### 3.1.3 Life Cycle Delivery Activities

Navigant's review of the WSO's Life Cycle Delivery Activities primarily focused on the following areas:

- Asset management processes.

- Plans and procedures to identify and respond to emergency situations.

With a maturity level of 2.2, the Department's Life Cycle Delivery Activities are generally on track. However, Navigant identified several improvements for LADWP in this asset management group, including implementing asset management plans for all asset classes and developing emergency plans that are in line with best practice requirements.

#### *3.1.3.1 Asset Management Processes*

The assessment of the WSO's lifecycle delivery activities primarily focuses on the implementation of asset management plans. Such plans need to be comprehensive and well designed, and implemented efficiently for asset management to have any practical meaning. This involves the application of appropriate implementation processes and procedures to ensure cost, risk and asset management performance are appropriately controlled.

The WSO has a number of processes in place for the implementation of asset management plans and control of activities across the creation, acquisition and enhancements of assets. However, the existing processes do not cover all asset classes, and they are not consistently used across all the WSO divisions. Further, interviews with the WSO have revealed that the existing processes are not reviewed on a regular basis, and that in some instance, insufficient information is being collected and stored regarding the condition of assets.

#### *3.1.3.2 Plans and Procedures to Identify and Respond to Emergency Situations*

Another key aspect of the assessment of lifecycle delivery activities is to ensure that an organization has robust plans and procedures to identify and respond to emergency situations, and that such plans and procedures are periodically tested. Emergency plans should outline the actions to be taken to respond to an emergency and ensure continuity of critical asset management activities. Furthermore, emergency drills should be performed on a regular basis to ensure that the WSO is adequately prepared for an emergency.

The WSO has emergency response and continuity of operations plans in place and has proven to be very effective and efficient in responding to emergency leaks and breaks. However, critical details appear to be missing from the plans, training is incomplete – especially in Incident Command System (ICS) – and terminology and responsibilities are not universally understood. Further, while the WSO has shared that some emergency drills have been completed, they were limited in scope and purpose. Combined, these issues may cause confusion when responding to major incidents, such as a major earthquake.[22]

[22] This issue is addressed in detail in a separate IEA report.

Key Recommendations - The WSO should:

- Develop processes and procedures that govern the implementation of asset management plans for all asset classes. These processes and procedures should be reviewed and updated on a regular basis.
- Develop emergency plans that are in line with best practice requirements, and include the completion of emergency drills in response to major incidents, such as a major earthquake.

### 3.1.4 Asset Knowledge Enablers

The review of Asset Knowledge Enablers primarily focuses on ensuring the organization has:

- Processes in place governing how asset data is stored, maintained, updated and controlled.
- Asset data that is accessible to the relevant staff in the organization.
- Processes in place to document the conformance with asset management practices.

The WSO has processes in place in order to capture current asset information, and appropriate asset management information appears to be available to relevant employees and stakeholders.
The records necessary to document conformance with asset management practices exist in an early stage of maturity, with many processes being informal or institutional in nature. LADWP should continue to formalize and document its strategies, plans, processes and asset data. The current lack of formalized processes within the WSO led to a low maturity level of 1.6.

Key Recommendation - The WSO should:

- Continue to formalize and document its strategies, plans, processes and asset data.

### 3.1.5 Organization and People

Navigant's review of the WSO's organization and people (in an asset management context) focused on the following areas:

- Asset management leadership.
- Competence and behavior.

With a maturity level of 1.2, the WSO would benefit from several improvements to bring the organization closer to best practice. The WSO's senior leadership should be incentivized to drive the implementation of a formalized asset management function, including the development of a formal asset management strategy and formal processes to capture the institutional knowledge of retiring employees.

#### *3.1.5.1 Asset Management Leadership*

While the WSO's senior leadership has developed direction and expectations for the organization with regards to its asset management function, there are varying levels of commitment from the top management to a formalized asset management function, including the development of a formal asset management strategy. Interviews have revealed that some divisions and their leadership are more active in embracing asset management principles, while others question the need or value of an asset management focus. Additionally, the absence of a top management position dedicated to the asset management function has an impact on the organization's commitment to asset management.

#### *3.1.5.2 Competence and Behavior*

LADWP staff that were interviewed are experienced and competent. Employees appear to understand their roles and responsibilities, and expectations are clearly communicated. However, most levels at the Department are governed by seniority through the civil service system; therefore, it is not always clear that the most competent person holds each position. LADWP should attempt to counter this issue through training, testing, and ongoing performance feedback. And since most levels of the company are essentially a closed system, LADWP should also focus on exposing its employees to industry changes and bringing in outside influences when possible. The WSO has recently initiated a training program focused on asset management that seems to be increasing support across the organization for a more comprehensive approach to this topic.

Much of the operational knowledge of Department staff is gained through experience and training, so LADWP should continue to formalize its processes to capture the institutional knowledge of retiring employees. This recommendation is critical given the high level of workforce attrition expected in the short-term. Additionally, the WSO is developing a written plan that will identify required financial resources, equipment, training, and facilities needed to address the expected attrition and support the renewal of the WSO's infrastructure. Finalizing this plan should remain one of the Department's immediate priorities in the short-term.

Key Recommendations - The WSO should:

- Incentivize its senior leadership to drive the implementation of a formalized asset management function, including the development of a formal asset management strategy.
- Continue to formalize its processes to capture the institutional knowledge of retiring employees.

### 3.1.6 Risk and Review

Navigant's review of LADWP's risk and review for asset management focused on the following areas:

- Accounting practices.
- Assets and systems change management.
- Assets and systems performance and health monitoring.

- Contingency planning and resilience analysis.
- Criticality, risk assessment and management.
- Stakeholder relations.
- Strategic planning.
- Weather and climate change.

With a maturity level of 1.3, Risk and Review is one of the asset management groups most in need of improvement. Navigant's critical recommendations relate closely to those made for the Asset Planning and Strategy group. Developing a more formal, best practice asset management framework such as ISO 55000 and embedding a continuous improvement framework and risk assessment framework is extremely important for managing risk as well as defining the Department's strategy. In addition the WSO should complete comprehensive condition assessment reports of all asset classes, and address the impact of climate change on LADWP's water supply in the 2015 UWMP.

#### *3.1.6.1 Accounting Practices*

The WSO tracks costs to activities in a way that provides the tools necessary to optimize costs. In addition, the WSO has recently improved its budget process with more accurate estimates which has helped the organization spend 100% of its approved budget for FY 2014-15.

#### *3.1.6.2 Assets and Systems Change Management*

LADWP is very much like many utilities in that the asset management function has developed organically over time. Although this approach has generally served LADWP well, it has limited the development of more structured asset management approaches to risk management and optimization. For example, the Department often documents corrective and preventive actions; however, in many cases the process is ad-hoc. In addition, the Department does not have a formal process for asset management function audits. As mentioned previously, LADWP should develop a more formal, best practice asset management framework such as ISO 55000 that includes a structured continuous improvement process.

#### *3.1.6.3 Assets and Systems Performance and Health Monitoring*

Given the aging infrastructure of the WSO, assets should be regularly and comprehensively assessed as part of the development of relevant asset management plans. The WSO supplied several asset management plans that discuss the condition of the various assets; however, these reports are not complete condition assessments. To provide more complete condition assessments, actual field condition information should be included. For example, general soil corrosivity estimates based on a broad understanding of the types of soil in an area are helpful, but specific field measurements will provide a better understanding of the soil conditions impacting the longevity of specific pipelines and other buried facilities. For larger facilities, such as major trunk lines, non-destructive inspection techniques should be used as they can provide a wealth of information on the actual condition of a pipeline. This field information will provide a greater level of confidence in estimating remaining useful life and reducing the risk of major blowouts.

In addition, Navigant was provided two trunk line reports from 1996 and 1998 in response to its request for any and all condition assessment reports.[23] These reports were also not full condition assessments due to their limited analysis of actual field conditions. While more complete condition assessments may have been done, these reports were not made available to Navigant.[24] Based on these limited reports, Navigant found that the WSO does not have a consistent approach to condition assessment, and there is limited field data to support conclusions for a robust asset renewal strategy.

Individual staff appear to have a solid understanding of the condition of many of the major water system assets. However, this information does not appear to have been fully documented. With many of the experienced staff currently or soon to be eligible for retirement, a concerted effort to document this information before it leaves the WSO is critical. Collecting this information and data through additional field investigations will be more costly to the WSO than implementing robust knowledge transfer processes to ensure this knowledge does not leave the Department when the experienced staff depart.

#### *3.1.6.4 Contingency Planning and Resilience Analysis*

Similar to condition assessments, comprehensive failure analysis reports constitute a key component of a water utility's asset management function, especially in the area of contingency planning and resilience analysis.

A complete analysis of a failed asset should first include a determination of the step-by-step mechanism for how the asset failed. The second component is to determine why the asset failed. Lastly, the report should include ways of preventing future failures in similarly situated assets. This last aspect of a failure analysis is the most important because it can lead to investigations of comparable assets to determine if there are similar failure mechanisms that can be removed to prevent additional failures.

Navigant reviewed the failure analysis report for the 2014 pipe failure at Sunset/UCLA. This report describes the type and condition of the failed pipe section. Several primary failure mechanisms were considered, and the following conclusion was reached:

> "The various factors contributing the failure are likely a combination of age of pipe, erosion corrosion, pitting corrosion resulting in reduced wall thickness, and galvanic corrosion between old and new pipe. The geometric shape, poor quality of Wye connector weld and installation may have also contributed to the failure. […] Catastrophic overload failure of already deteriorated pipe steel material could have been triggered by high water pressure in the system."[25]

The report adequately investigates the material properties and condition of the steel pipe; however, a more complete description of all observations would be helpful. For example, there are bulleted points listing observations and pictures, but there is not sufficient description of each point to fully convey the condition of the pipe. Moreover, the report does not fully discuss why the corrosion occurred and the

[23] Trunk Line Condition Assessment Program, First Phase (1996) and Second Phase (1998).
[24] See Pump Station Asset Management Plan Report 2010, page 14, which states, "Condition assessments for the pumping stations were initially completed in July of 2006 under the Asset Management Pilot Program.
[25] Failure Analysis Report of Pipe Failure at Sunset/UCLA, 10-2-14.

failure pieces that were removed from the break location were sent to different storage locations, which limited the ability of the investigators to conduct a full analysis.

Most asset failures will not warrant the effort to complete a full failure analysis. For those critical or key assets, or for particular failures seen for the first time, a failure analysis can be highly cost-effective by alerting staff to other potential failures in the water system. When an asset failure merits further analysis, Navigant recommends that the WSO:

- Ensure that all pieces of removed pipe (or other asset) are carefully cataloged and moved to a single location that is protected from the elements. Despite the urgency to restore service, care should be taken to preserve evidence for future analysis.
- Include more detail in failure analyses, including pictures with indicator arrows.
- Adopt a consistent failure and forensic analysis format and task a group of in-house technical experts to lead and manage the investigation.
- Determine the precise failure mechanisms and causes (for instance, describe what instigated the initial corrosion, which produced pitting at X location where the coating had poor adhesion which led to a sufficiently large loss of steel that hoop stresses could not be supported and failure propagated along the longitudinal weld at Y location).
- Develop a consistent mechanism to transfer lessons learned to those doing condition assessments to look for particular conditions for the purpose of preventing similar failures.

#### *3.1.6.5 Criticality, Risk Assessment and Management*

There is some recognition in the WSO that asset management is tied to risk. The mainline replacement prioritization methodology constitutes a good example. However, there are other asset classes, such as pump stations and regulator stations for which limited risk evaluations are performed. Risk assessment appears to be incomplete and inconsistent across the WSO's asset classes. Best practice would include a more formal risk assessment framework that is applied to all asset classes.

#### *3.1.6.6 Stakeholder Relations*

It appears that the WSO provides adequate communication by regularly communicating its asset management plans and results internally, and with the Board of Commissioners. The WSO also communicates the results of its asset process reviews and results.

#### *3.1.6.7 Strategic Planning*

The WSO's recent efforts to dive into the details of asset management represent great progress from the Department. However, there is still a lack of strategic focus that impedes detailed efforts at the staff level to implement a comprehensive asset management function.

#### *3.1.6.8 Weather and Climate Change*

The WSO has completed an analysis of the potential climate change impact on the LAA System in 2011. While climate change impacts may not be significant enough to adjust projected supply estimates prior

to 2040, they should be considered beyond the 2040 planning horizon. Additionally, climate change impacts should be considered for the stormwater capture program.

Key Recommendations - The WSO should:

- Develop a more formal, best practice asset management framework such as ISO 55000 and embed a structured continuous improvement process.
- Complete comprehensive condition assessment reports of all asset classes.
- Define and implement a more formal risk assessment framework that is applied to all asset classes.
- Address the impact of climate change on LADWP's water supply and in particular the LAA.

## *3.2 Current State of Infrastructure*

### 3.2.1 Current Infrastructure Investment Plans

The WSO has extensive plans to both add new infrastructure and renew its existing infrastructure. The capital program is large and ambitious. According to the latest rate proposal, capital expenditures will increase from $725 million in FY 2014/15 to over $1.2 billion by FY 2019/20, representing a 66% increase (see Figure 3-2).[26]

In addition to the Water Infrastructure Program, major investments include local water supply projects, groundwater remediation, projects related to meeting safe drinking water quality regulations and compliance with Owens Valley regulatory requirements. Accordingly, priorities for infrastructure investment must be balanced against available staff and financial resources. Given the criticality of the WSO's aging physical assets, each infrastructure investment should be evaluated individually with respect to risks, costs, and benefits, and then incorporated into an overall, long-term plan extending well beyond the current 5-10 year capital-planning horizon.

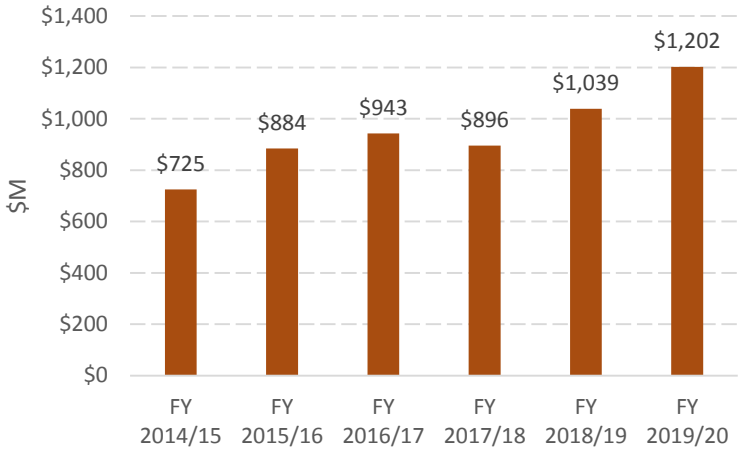
Current major capital investments planned for the next 5-10 years include:

- Construction of a number of projects to maintain compliance with current water quality regulations.
- Continuing with the Owens Valley dust mitigation.
- Rehabilitation of the San Fernando Groundwater Basin and other wellfields.
- Increasing the rate of mainline replacement to approximately 300,000 feet per year.
- Increasing the renewal rate for large valves.
- Continuing with pump station and pressure regulator station renewal.

[26] Source: Water System Rate Action Report, Chapter 2: Introduction & Background, July 2015, Figure 22.

- Continuing with the trunk line renewal program.
- Continuing with selected renewal projects on the LAA.

**Figure 3-2: Water Revenue Fund Capital Expenditures Trend[27]**




The WSO has stated during interviews with Navigant that the latest rate increase proposal would be sufficient to support the expected significant increase in capital expenditures. In addition, the WSO has demonstrated significant progress in its ability to spend its budget. Table 3-3 shows that in FY2012/13 the WSO spent only 77% of its approved budget while this ratio increased to 100% in FY2014/15. This improvement is primarily due to more accurate initial budget estimates and the implementation of a stage-gate approach for managing projects.

However, Navigant has concerns that the Department does not have the capacity to face the projected significant ramp up in capital expenditures due to expected staff attrition, difficulties in hiring and contracting out, and inefficient procurement process. It is critical that LADWP addresses these issues in the short-term. The Department should:

- In close collaboration with the City, identify and assess solutions to accelerate the hiring and selection process.
- Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.
- Perform a comprehensive review and re-design of its procurement processes. Re-designed procurement processes should increase efficiency and effectiveness, and drive business process ownership and accountability.

[27] Source: Water System Rate Action Report, Chapter 2: Introduction & Background, July 2015, Figure 22.

**Table 3-3: WSO Approved Budget vs. Actuals - FY2012/15 period[28]**

| FUNCTION | FY 12-13 Approved Budget | FY 12-13 Actuals | % Change | FY 13-14 Approved Budget | FY 13-14 Actuals | % Change | FY 14-15 Approved Budget | FY 14-15 Actuals | % Change |
|---|---|---|---|---|---|---|---|---|---|
| Safe Drinking Water Program | $215,423 | $194,409 | 90% | $234,215 | $270,956 | 116% | $172,513 | $161,712 | 94% |
| Water Infrastructure Program | $161,843 | $152,985 | 95% | $192,435 | $194,990 | 101% | $226,700 | $187,674 | 83% |
| Local Water Supply Program | $103,326 | $59,864 | 58% | $173,561 | $80,780 | 47% | $118,126 | $137,671 | 117% |
| Regulatory Compliance - Owens Valley | $104,619 | $40,139 | 38% | $123,209 | $83,595 | 68% | $167,745 | $183,846 | 110% |
| Operating Support | $30,758 | $20,502 | 67% | $36,072 | $33,227 | 92% | $29,349 | $36,699 | 125% |
| Customer Service | $19,093 | $18,951 | 99% | $9,455 | $17,088 | 181% | $7,592 | $11,555 | 152% |
| **Grand Total** | **$635,061** | **$486,849** | **77%** | **$768,946** | **$680,635** | **89%** | **$722,024** | **$719,157** | **100%** |

### 3.2.2 Adequacy of Infrastructure Renewal Plans

#### *3.2.2.1 Mainline Replacement Program*

As mentioned previously, one of the key challenges facing LADWP is the replacement of its aging infrastructure. A significant number of mainlines – pipelines with diameters equal or smaller than 20 inches, excluding service lines – have already reached the end of their useful lives and this number will continue to grow rapidly if the Department does not increase its mainline replacement rate.

LADWP has started ramping up its mainline replacement program over the past few years but the current replacement rate has proven to be insufficient. The mainline replacement goal for FY 2014-15 was 150,000 feet/year. With a replacement rate of 150,000 feet/year, the Water System replacement cycle is about 235 years, while the useful life for mainlines ranges from 60 to 120 years. Additionally, the backlog of mainlines that are at least 100 years old, which is currently at one million feet, will continue to grow significantly at the current replacement rate. This clearly highlights the urgent need for the Department to greatly increase its pipeline replacement rate to ensure system reliability in the years to come.

[28] Source: Data provided by LADWP.

The WSO's current plan is to double its renewal rate from 150,000 feet/year to 300,000 feet/year starting in FY 2015/16. A replacement rate of 300,000 feet/year would reduce the System's replacement rate to a 120-year cycle, which is greater than the average useful life of the ductile iron pipe used for replacing most mainlines. While this increase will go a long way toward reducing the projected amount of mainlines that will reach the end of their nominal useful life in the short-term, it will not be enough to address the challenges LADWP will be facing beyond 2020. As can be seen in Figure 3-3, at an annual renewal rate of 300,000 feet, the amount of pipe exceeding its useful life will more than double within 15 years. If the proposed rate were to continue for decades, the amount of pipe exceeding its useful life would increase fivefold to approximately 8 million feet, or 23% of the total amount of mainline pipe[29]. Consequently, the risk of pipe failures and the WSO's ability to meet reasonable levels of service will be greatly affected. While representing a great improvement, it is clear that a mainline replacement rate of 300,000 feet/year will not be sufficient in the medium to long-term, and that additional investments in mainline replacement programs will be required.

**Figure 3-3: Mainline Replacement Based on Current Rate Proposal[30]**

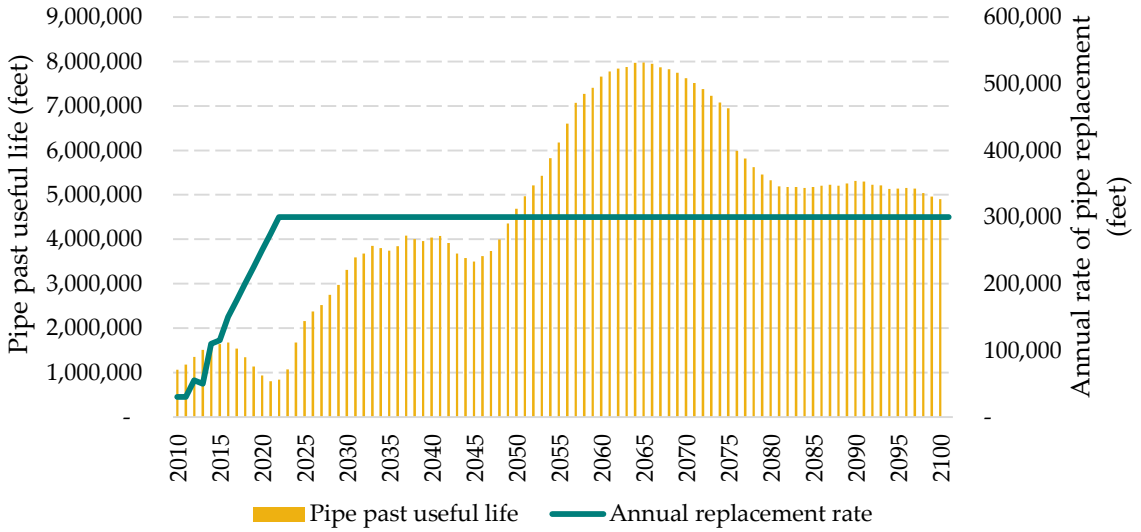
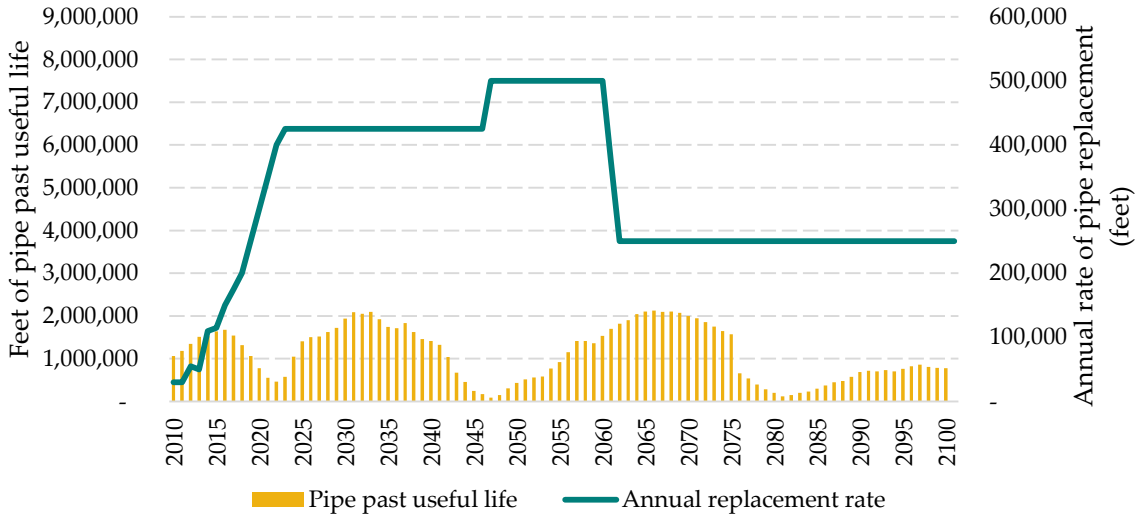



Figure 3-4 presents an alternative replacement rate scenario developed by Navigant and shows the impact of increasing the rate to 425,000 feet/year by 2023 and holding it to this level for approximately 20 years, then increasing it to 500,000 feet/year for another 15 years. In this scenario, the percentage of mainlines operating past their average useful lives would be less than six percent at its peak. While such replacement rates will help to significantly reduce the backlog of mainlines needing replacement, the associated costs may be prohibitive. Determining the appropriate mainline replacement rate, the associated additional costs, and the impact levels of service and on rates will require further analysis from the WSO.

[29] The City of Los Angeles experienced significant territorial expansion in 1950 through 1970 when multiple piping systems were added to the Water System by annexation. The replacement cycle for these piping systems is projected to have a large impact on the WSO's overall mainline replacement program by 2050.

[30] Navigant analysis of mainline data provided by LADWP.

**Figure 3-4: Accelerated Mainline Replacement[31]**




In addition to funding, securing sufficient capacity to transition to a greater mainline replacement rate will be a significant challenge for the Department. In addition to facing significant workforce attrition in the short-term, LADWP has inefficient procurement processes and cannot quickly hire new staff or contract out. Furthermore, the Water Distribution Division currently only has 22 mainline installation crews which is insufficient to support such a program. To implement a 300,000 feet/year mainline replacement rate, the Department estimates that 39 crews will be required, which is a 77% increase in crew personnel. To address this issue, the WSO is developing a written plan that will identify required financial resources, equipment, training, and facilities to support the renewal increase. Finalizing this plan should remain one of the Department's immediate priority in the short-term.

#### *3.2.2.2 Mainline Replacement Prioritization Methodology*

In order to prioritize mainline replacement project, WSO assesses the likelihood of failure and the consequence of failure for each mainline in the system.

To assess a mainline likelihood of failure, the WSO takes into account multiple parameters, including age, leak rate, area topography, soil corrosivity, material type, mainline diameter, pressure, traffic loading and elevation. A Likelihood of Failure Score (LFS) is computed for each individual mainline to determine its level of deterioration against the aforementioned parameters. Finally, each mainline is assigned a grade based on the LFS score it was given. Grades range from "A" to "F" with "A" representing a low likelihood of failure and "F" representing a high likelihood of failure. LADWP's 2011 Water Distribution Pipeline Asset Management Report indicates that 49% of the Water System's mainlines were graded "C" – moderate likelihood of failure – while 29% were graded "D" and 1% were graded "F".

[31] Navigant analysis of mainline data provided by LADWP.

The consequence of failure characterizes the level of impact a mainline failure would have on its surrounding environment, population, and customers. Key consequence of failure parameters include:

- The type of customer served. Service to critical customers such as hospitals or airports should not be interrupted.
- Pressure. Potential mainline failures that could cause significant damages to other parts of the System due to significant pressure fluctuations should be addressed in priority.
- Street Designation. Significant disruptions to traffic due to mainline failures should be prevented.

Similar to the likelihood of failure grade, each mainline is given a consequence of failure grade ranging from "A" to "F", representing very low to very high consequences of failure. LADWP's 2011 Asset Management Report shows that only 7% and 0.5% of the Department's mainlines were graded "D" and "F", respectively.

By combining the likelihood and consequence of failure grades, the WSO is able to determine a Business Risk Exposure (BRE) metric that identifies mainlines with the highest likelihood of failure and with the greatest risks to the Department and its customers. A similar "A" to "F" grading system is used for the BRE. Overall, only 6% and 0.3% of the Department's mainlines have a BRE grade of "D" and "F", respectively.

In a few instances, the Department may deviate from the methodology described above in prioritizing its mainline replacement program. For example, priority is always given to existing leaks regardless of their BRE grade. In addition, "D" and "F" mainlines that were not originally scheduled for replacement but are located near leaky pipes are replaced with the leaky pipes. This approach decreases mobilization costs and yields a higher replacement rate per crew.

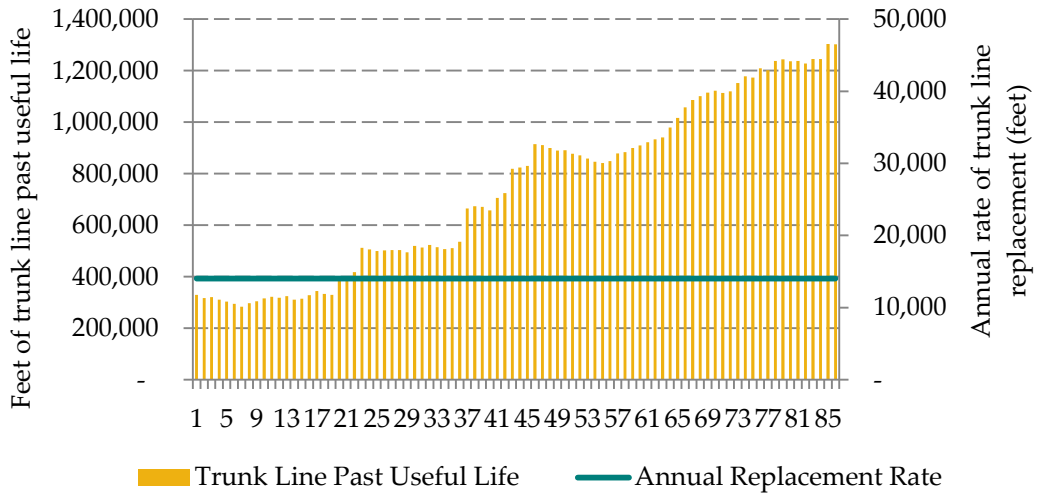
Overall, the WSO's mainline replacement prioritization methodology appears to be sound and comprehensive, and appropriately takes into consideration and addresses the potential risks to LADWP's customers and its Water System.

#### *3.2.2.3 Trunk Lines, Large Valves, Pump Stations and Storage Facilities Replacement Programs*

The current approach for trunk line renewal is partially driven by the complexity of the construction and the need to limit operational disruptions of the existing trunk lines. The average trunk line replacement rate over the last 10 years is approximately 14,000 feet/year, which is equivalent to a replacement rate cycle of almost 210 years, while a trunk line average useful life is 100 years[32]. Figure 3-5 shows that at a rate of 14,000 feet/year, 315,000 feet per year of LADWP's trunk lines would be past their useful life until 2033, representing 12% of the total portfolio. However, these numbers would start to increase significantly past 2033, reaching 848,000 feet/year in 2070, or 31% of the total portfolio.

[32] WETS – Asset Management Group – Trunk Lines, March 2015 report provided by LADWP.

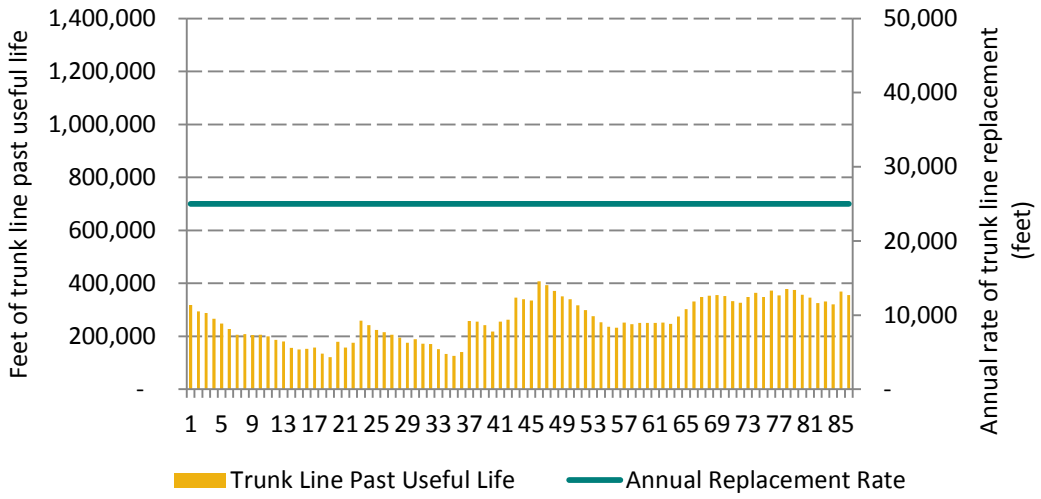
**Figure 3-5: Trunk Line Replacement Based on Historical Replacement Rate[33]**




If the WSO does not increase its trunk line replacement rate, it will face challenges similar to those it is facing with the current mainline replacement efforts. Interviews have revealed that the Department has recently significantly increased its replacement rate and it will be reaching at least 25,000 feet/year in the coming years. Figure 3-6 shows that this replacement rate would allow the Department to limit the backlog of trunk lines needing replacement to approximately 260,000 feet per year until 2100, representing 10% of the total portfolio. Based on this information, no further action to increase the rate of trunk line renewal is recommended at this time. However, a much larger effort should be placed on assessing the condition of all trunk lines approaching or beyond their expected useful lives, particularly those that are not planned for replacement within five years. This information can be critical in determining trunk line replacement priorities. Condition assessments of all facilities associated with the trunk lines, such as valves, appurtenances and vaults, should also be completed at the same time.

[33] Navigant analysis of mainline data provided by LADWP.

**Figure 3-6: Trunk Line Replacement Based on LADWP's Replacement Rate Goal**




With respect to large valves, the current plan is to replace five large valves per year, which equates to a 460 year replacement cycle. Based on nominal useful life of 50 to 100 years for large valves – depending on the type of valve and its particular application - this rate appears to be well below what is needed to maintain a reasonable replacement schedule. This concern was also shared by LADWP staff during interviews with the Navigant team. Furthermore, there are a number of valves that are defective or that are not being operated out of concern that they will not fully close or may become defective. Given that many valves are already past their nominal useful lives, Navigant recommends that the renewal rate for large valves be increased to reduce the backlog.

The ideal time to renew these large valves is when their associated trunk lines are being renewed because of the operational impacts related to shutting down the associated pipelines. Accordingly, detailed large valve renewal plans should be coordinated with the trunk line replacement program and the large valve minimum size should match the trunk line minimum size to optimize this coordination. . The WSO considers valves equal to or greater than 16 inches in diameter to be large valves. Since pipelines equal to or greater than 20 inches are considered trunk lines, the WSO should consider redefining its large valves size cutoff to match the dividing line between mainlines and trunk lines. In addition, the large valves less than 20 inches are being replaced at the same time that 16 and 18 inch mainlines are being replaced, which supports the idea of redefining the size cutoff. While we recognize the WSO is coordinating large valve and trunk line renewal, the rate of valve renewal is still low and valves may need to be renewed before their associated pipelines are renewed.

Given approximately 25% (24 stations) of the Department's pump stations were commissioned prior to 1960, these assets are not as old as some of LADWP's other assets, such as mainlines. Accordingly, pump station and pressure regulator station renewal plans appear to be adequate for many of the mechanical systems. However, further effort should be placed on the renewal of switchgear and control systems, as well as an examination of inlet and outlet headers.

Water storage facilities (tanks and reservoirs) are not a major cost component of the capital investment plan and no additional action is recommended beyond the current long-term plans, which include

regular condition assessments. Renewal plans can be made in response to the findings of these condition assessments.

### 3.2.3 Automated Meter Infrastructure

Many utilities in California have installed or are in the process of implementing AMI, which combines the ability to read meters remotely with communication systems and software to receive and analyze the meter data. Examples include:

- Burbank Water and Power has installed over 75,000 smart electric and water meters.
- Glendale Water and Power has installed over 120,000 smart meters. Glendale estimates a payback period of six years in operational savings alone.[34]
- San Francisco Public Utilities Commission has installed nearly 175,000 smart water meters.[35]

The benefits of AMI are numerous and include, among others:

- Reduced operating costs through the elimination of manual meter reading.
- Enhanced customer service through the availability of detailed usage data.
- Heightened conservation through the provision of feedback to customers on their usage.
- Improved operational understanding of the system through aggregated usage data.
- Increased sustainability by reducing the number of trucks dispatched.

While a number of California utilities have transitioned to AMI, the Department has been looking into AMI for a number of years, but it does not appear to be close to implementing a program, nor does it have a schedule to do so. Water Distribution personnel stated that new service meters are installed with the capability of remote reading; however, the WSO is still in the initial stages of investigating AMI vendors. Current plans are to replace 125,000 small meters over the next five years[36], representing nearly 20% of the total small meter inventory of sizes 2 inches and smaller.[37]

Interviews with Department personnel also revealed that the Power System is close to implementing AMI, but the prospective meter vendor does not have a comparable capability for water meters. Coordinating the AMI installation for both the Water and Power Systems by selecting a vendor that has water and power capabilities represents a significant opportunity for LADWP to minimize implementation costs. However, if the AMI elected for the Power System is not compatible with the AMI for the Water System, the opportunity for integration may certainly be lost. AMI implementation efforts should be coordinated between the Water and Power Systems, and all opportunities to minimize implementation costs should be investigated.

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[34] Glendale Water & Power's Wireless Network Provides Smart Grid Foundation, May 01, 2012, by Glen Steiger, General Manager. Article in Electric Power & Light.
[35] Municipal Utilities' Investment in Smart Grid Technologies Improves Services and Lowers Costs, October 2014. US Department of Energy.
[36] Water System Rate Action Report, Executive Summary, page 4, July 2015.
[37] Based on meter counts found in the Water Loss Audit and Component Analysis Report, September 2013.

# 4. Water System Strategy

Navigant observed several factors that may be limiting the WSO's ability to cost-effectively and efficiently respond to the challenges it faces. Chief among these is the lack of a single corporate strategic planning document guiding the WSO's efforts. However, the WSO and the City have already developed a number of insightful strategic planning documents that, if taken together could provide a robust foundation for the WSO's Strategic Plan.

The California Urban Water Management Planning Act requires that every urban water supplier prepare and adopt the UWMP every five years. LADWP released its last UWMP in 2010 and is in the process of preparing its 2015 UWMP. The UWMP forecasts future water demand and supply under average and dry years, identifies future water projects, summarizes water conservation best management practices, and provides a multi-dry year management strategy. The 2010 UWMP provides strategic guidance to the WSO, and highlights the following strategies: [38]

- Significantly enhance water conservation, stormwater capture and recycling projects to increase supply reliability.
- Implement treatment for San Fernando groundwater supplies.
- Ensure continued reliability of the water supplies from MWD through active representation of City interests on the MWD Board.
- Maintain the operational integrity of the LAA and in-City water distribution systems.
- Meet or exceed all Federal and State standards for drinking water quality.

In addition to the UMWP, LADWP and the Los Angeles Office of the Mayor have issued a number of strategic water documents that relate to water supply. These include the Water Supply Action Plan, the Sustainability Plan, the Water Integrated Resources Plan, the One Water L.A. 2040 Plan, and the Los Angeles Mayor's Sustainable City pLAn.

This section of the report identifies all the key strategic objectives included in these documents with the goal of facilitating the development of the WSO's future Strategic Plan.

## *4.1 Water Supply Action Plan & Sustainability Plan*

The Department released its Water Supply Action Plan in May 2008 to address various water reliability issues and new requirements under the Urban Water Management Planning Act. The plan contains the following five strategies:

- Increase water conservation.
- Maximize water recycling.
- Enhance stormwater capture.

[38]Urban Water Management Plan, Los Angeles Department of Water and Power, 2010.

- Accelerate clean-up of the San Fernando groundwater basin.
- Expand groundwater storage.

The following year, LADWP prepared its Sustainability Plan pursuant to Mayoral Executive Directive No. 10, issued on August 20, 2009. The Sustainability Plan restated these five strategies and summarized the efforts being done to pursue each one. Both plans are consistent with and act as predecessors to the 2010 UWMP's first two strategies involving water conservation, recycling, stormwater, and groundwater.

## *4.2 One Water L.A. 2040 Plan*

The One Water L.A. 2040 Plan is being developed in two phases, with Phase 1 focused on bringing all stakeholder City departments, regional, state, and federal agencies together to coordinate efforts toward a sustainable water future for Los Angeles beyond 2020. The effort is being jointly led by the Bureau of Sanitation, Department of Public Works, and LADWP.[39]

To date, with the input of over 300 stakeholders, the One Water L.A. initiative has developed a vision statement, objectives, and a set of guiding principles (Table 4-1). The initiative proposed the following vision statement:

> *One Water LA is a collaborative approach to develop an integrated framework for managing the City's water resources, watersheds, and water facilities in an environmentally, economically and socially beneficial manner.*
>
> *One Water LA will lead to smarter land use practices, healthier watersheds, greater reliability of our water and wastewater systems, increased efficiency and operation of our utilities, enhanced livable communities, resilience against climate change, and protection of public health.*

[39] One Water LA 2040 Plan – Guiding Principles Report, May 4, 2015

**Table 4-1. One Water LA Guiding Principles Aligned to Objectives**

| Objective | Guiding Principle |
|---|---|
| Integrate management of water resources and policies by increasing coordination and cooperation between City departments, partners and stakeholders. | ✓ Build on the success of the City's Water Integrated Resources Plan and other Mayor and City Council supported water resources plans to advance water sustainability.<br>✓ Recognize that water is integral to the actions of City departments and create a framework for integration and collaboration between departments and City Hall.<br>✓ Enhance the coordination and partnerships with regional water, transportation, education and other public agencies.<br>✓ Engage elected officials and governing boards to support coordination and cooperation to promote integrated management of water resources and policies.<br>✓ Enhance coordination with Non-Governmental Organizations, Neighborhood Councils, and other stakeholders to inform integrated planning and broaden community involvement.<br>✓ Understand the water balance that summarizes rainfall, runoff, water demands, wastewater flows, and ocean discharges to consider the potential for stormwater capture, water conservation and reuse.<br>✓ Continue coordination between City Departments during construction of the City's infrastructure. |
| Balance environmental, economic, and societal goals by implementing affordable and equitable projects and programs that provide multiple benefits to all communities. | ✓ Evaluate a "no action" alternative that considers imported water costs, regulatory requirements, water supply reliability, infrastructure reliability, climate change, and other associated risks.<br>✓ Develop a transparent process that identifies opportunities for inter departmental collaboration and cost-sharing based on benefits that are aligned with departmental missions.<br>✓ Analyze financial merits of programs using standard financial methodologies.<br>✓ Emphasize multi-benefit projects based on measures of social, environmental and economic benefits.<br>✓ Partner with academia and private interests to advance measurement of social and environmental benefits and to evaluate new technologies.<br>✓ Incorporate environmental justice into decision-making on where projects are implemented and focus on increasing benefi5ts in underserved communities.<br>✓ Consider water demands, supply availability, population, regulatory requirements, climate vulnerability, and environmental goals to establish triggers, where appropriate, to plan, implement and/or defer projects.<br>✓ Explore private, local, state and federal funding opportunities to implement multi-benefit projects. |

| Objective | Guiding Principle |
|---|---|
| Improve health of local watersheds by reducing impervious cover, restoring ecosystems, decreasing pollutants in our waterways, and mitigating local flood impacts. | ✓ Emphasize upstream solutions in order to mitigate downstream impacts, challenges and costs.<br>✓ Support strategies included in LASAN's Enhanced Watershed Management Program (EWMP) Plans and look for opportunities to integrate with LADWP's Stormwater Capture Master Plan, Bureau of Engineering's Flood Management Plan, Green Streets Program, and related updates in order to improve water quality, ecosystem restoration and flood mitigation.<br>✓ Align Mayor or City Council supported plans and projects for the Los Angeles River and other significant tributaries within the City with watershed health and other water resources goals.<br>✓ Support multi-purpose strategies for reducing impacts of localized flooding, with an emphasis on natural systems and green infrastructure over traditional gray infrastructure. |
| Improve local water supply reliability by increasing capture of stormwater conserving potable water, and expanding water reuse. | ✓ Support recommendations from LADWP's Stormwater Capture Master Plan, LASAN's EWMP Plans, and related updates to increase stormwater capture for water supply.<br>✓ Consider findings from LADWP's Water Conservation Potential Study and related updates to reduce the City's demand for potable water.<br>✓ Improve water sustainability, including water efficiency, water reuse, and stormwater capture, at City facilities and buildings.<br>✓ Explore the use of graywater systems and develop appropriate guidelines for implementation.<br>✓ Support recommendations from the City's Recycled Water Master Planning Documents and related updates to increase non-potable reuse; and indirect potable reuse; and conduct necessary technical, scientific and regulatory evaluations for assessing the potential for direct potable reuse.<br>✓ Recognize the importance of remediating and maintaining the health of the City's groundwater basins and consider recommendations of LADWP's groundwater program. |
| Implement, monitor, and maintain a reliable wastewater system that safely conveys, treats and reuses wastewater, while also reducing sewer overflows and odors. | ✓ Optimize the use of existing City assets and infrastructure and explore opportunities for distributed solutions in order to safely convey, treat and reuse wastewater.<br>✓ Optimize water reuse from the City's wastewater system, with particular emphasis on the Hyperion Wastewater Treatment Plant.<br>✓ Optimize recovery and use of nutrients from wastewater and biosolids, and recovery and use of biogases.<br>✓ Seek ways to operate wastewater treatment plants with energy independence. |

| Objective | Guiding Principle |
|---|---|
| Increase climate resilience by planning for climate change mitigation and adaptation strategies in all City actions. | ✓ Identify citywide metrics for greenhouse gas emissions and climate change adaptation and mitigation that are used to assess project viability.<br>✓ Consider water-energy-land use nexus (climate adaptation) in the City's General Plan and development zones.<br>✓ Raise the priority of water issues in relevant City plans that impact sustainability, climate adaptation/resiliency, and emergency preparedness.<br>✓ Maximize available state funding and explore financial incentives to reduce greenhouse gas emissions and increase resiliency.<br>✓ Coordinate with regional agencies on water-related climate change mitigation and adaptation strategies. |
| Increase community awareness and advocacy for sustainable water by active engagement, public outreach and education. | ✓ Explore strategies on how to increase public awareness and education for all water resources issues, with a specific focus on influencing individual behaviors around water use.<br>✓ Expand on current public education programs for water to include climate change impacts and importance of mitigation, adaptation and resiliency.<br>✓ Communicate to neighborhood councils, community groups, and other stakeholders the water related roles, responsibilities, functions, and success stories of each City department.<br>✓ Empower communities and citizens to implement distributed (parcel-scale) solutions within their control to help achieve water sustainability objectives. |

Adoption of the vision, objectives and guiding principles by the various stakeholder agencies will set the stage for Phase 2, during which extensive planning studies will be undertaken. The concept is to analyze the various water-related opportunities, particularly for stormwater and wastewater, to perform technical and cost-benefit analyses, to prioritize projects and to incorporate the results into the master plans of the stakeholder departments and agencies. The current schedule is to complete the Phase 2 work by early 2017.

### *4.3 The pLAn: Transforming Los Angeles*

The Mayor's Office released the Sustainability City pLAn which identifies both near-term and long-term outcomes related to the WSO.

- Short Term Outcomes (by 2017):
    - Secure additional funding for the San Fernando Groundwater Basin cleanup.
    - Reduce average per capita potable water use by 20 percent.
    - Establish a Water Cabinet to implement key aspects of local water policy.
    - Expand recycled water production by at least 6 million gallons per day.

- Replace 95 miles of water pipe infrastructure[40]

- Long Term Outcomes:
  - Reduce DWP purchases of imported water by 50 percent by 2025 (FY 2013-14 baseline)
  - Increase locally sourced water to 50 percent of the supply by 2035.
  - Reduce per capita water use by 22.5 percent by 2025 and 25 percent by 2035.

More importantly, the pLAn contains a set of strategies and priority initiatives for the WSO.

**Table 4-2. pLAn Strategies and Initiatives**

| Strategy | Priority Initiative |
|---|---|
| Create an integrated water strategy for Los Angeles | ✓ Create a Water Cabinet<br>✓ Develop an integrated, stakeholder-driven "One Water Plan," a comprehensive water strategy for Los Angeles. |
| Ensure a safe, secure, and reliable drinking water supply and system | ✓ Clean the San Fernando Groundwater Basin<br>✓ Ensure L.A. gets its fair share of water bond funding<br>✓ Prioritize water system funding for local water supply development and infrastructure reliability<br>✓ Improve pipe infrastructure quality<br>✓ Expand recycled water production, treatment, and distribution to incorporate Indirect or Direct Potable Reuse (IPR/DPR)<br>✓ Educate public on need/benefits of IPR and DPR |

[40]This is one of the few references to renewal of existing infrastructure as a strategic issue.

| Strategy | Priority Initiative |
|---|---|
| Reduce per capita potable water use and increase recycled water | ✓ Execute key conservation steps in Mayor's Executive Directive #5<br>✓ Expand scope and financing of DWP's turf replacement incentive program<br>✓ Implement and expand other DWP conservation incentives<br>✓ Educate and engage residents and businesses through on going awareness, social media, and action campaigns<br>✓ Benchmark customer use and recognize innovative water-reduction initiatives<br>✓ Develop more water and wastewater rate tiers to encourage conservation<br>✓ Ensure private buildings are retrofitted with high-efficiency, water-conserving fixtures<br>✓ Revise building code to encourage water use reduction, on-site water reuse, and recycling<br>✓ Produce at least six MGD of advanced reuse recycled water at Terminal Island facility<br>✓ Expand customer use of recycled water and expand purple pipe infrastructure |
| Increase storm water capture and protect marine life | ✓ Identify funding mechanism(s) to implement the Enhanced Watershed Management Plans necessary for MS4 permit compliance<br>✓ Expand use of permeable pavement in large infrastructure projects (e.g. LAX)<br>✓ Expand number of green infrastructure sites and green streets (e.g., bioswales, infiltration cut-outs, permeable pavement, and street trees)<br>✓ Expand Rain Barrel Program<br>✓ Eliminate Once Through Cooling (OTC) to improve local water quality and protect marine life |
| Lead by example through increased municipal water conservation | ✓ Increase municipal conservation through actions in Mayor's Executive Directive #5 |

All of the pLAn initiatives are worthwhile and represent an ambitious agenda. The combination of water supply enhancements, new supply initiatives, conservation programs and educational outreach will significantly increase the City's resilience by diversifying its water supply portfolio and reducing overall water demand.

### *4.4 Strategy Conclusions*

Taken together, these documents could provide a robust foundation for the WSO's Strategic Plan. However, most of the water related strategic documents focus on water supply and water conservation. With so much of the WSO annual budget focused on new capital projects and on infrastructure renewal, Navigant recommends that strategic documents put greater emphasis on water infrastructure. Our recommendation is for senior WSO leadership to initiate a process to create a Strategic Business Plan which can be started by combining and aligning many of the existing strategic documents already being used by the WSO.

# 5. Conclusions and Recommendations

This review of LADWP's water infrastructure has revealed that there are still a number of factors that may limit the WSO's ability to cost-effectively and efficiently respond to the challenges it faces, including the lack of a single corporate strategic planning document and an asset management strategy guiding the WSO's efforts.

However, the WSO's overall approach to replacing, maintaining and repairing its aging infrastructure, and addressing the other challenges it faces appears to be robust and sound. The major concerns Navigant has are related to the expected mainline replacement rate, and the WSO's capacity to ramp up and implement its capital programs.

The latest rate increase proposal includes funding for a mainline renewal rate of 300,000 feet/year, representing a 100% increase compared to the current rate. While this would represent a great improvement, this study has shown that such replacement rate will not be sufficient in the medium to long-term, and that additional investments in mainline replacement programs will be required. Multiple factors led to the selection of a 300,000 feet/year replacement rate but one of the key objective was to determine a renewal rate that would limit as much as possible the required rate increase while still providing acceptable system reliability levels in the short-term. This strategy may not be in the best interest of the ratepayers in the medium and long-term as it may create a backlog of mainlines needing replacement that is not sustainable, which ultimately may lead to more leaks, additional repair costs, and even higher rates.

The expected significant attrition, existing difficulties in hiring new staff and contracting out, and inefficient procurement processes constitute the other top priority challenges the WSO should immediately address in order to be able to implement a significant ramp up of its capital programs.

## *Recommendations*

Based on the findings developed in this report, Navigant makes the following recommendations. Some actions are already underway, but others will require additional attention and resources from the Department and City.

High Priority Recommendations

- Increase mainline and large valve renewal rates.
- In close collaboration with the City, identify and assess solutions to accelerate the hiring and selection process.
- Implement a broader and more dynamic outsourcing strategy as part of LADWP's workforce resource planning. This strategy should be incorporated into the Department's Human Resources Plan and operated as a high priority initiative with full support from City Management.
- Perform a comprehensive review and re-design of LADWP's procurement processes. Re-designed procurement processes should increase efficiency and effectiveness, and drive business process ownership and accountability.
- Continue to formalize the WSO's processes to capture the institutional knowledge of retiring employees.
- Create a single, coherent strategic business plan by combining and aligning many of the existing strategic documents already used by the WSO.
- Establish an asset management strategy and document it in a strategic asset management plan by leveraging best practice asset management framework such as ISO 55000. Specific consideration should be given to adopting structured continuous improvement and risk frameworks, defining levels of service for the WSO's assets, and including an overarching policy governing the repair, maintenance and replacement of all the WSO's asset classes.
- Develop emergency plans that are in line with best practice requirements and include the completion of emergency drills in response to major incidents, such as a major earthquake.

Medium Priority Recommendations

- Complete comprehensive condition assessment reports of all asset classes.
- Finalize asset management plans that are currently in draft form, and develop new plans for critical asset classes for which there is currently no plan.
- Integrate Power and Water System AMI.
- Address the impact of climate change on LADWP's water supply, and in particular the LAA.
- Develop processes and procedures that govern the implementation of asset management plans for all asset classes. These processes and procedures should be reviewed and updated on a regular basis.
- Continue to formalize and document the WSO's strategies, plans, processes and asset data.
- Incentivize the WSO's senior leadership to drive the implementation of a formalized asset management function, including the development of a formal asset management strategy.

Low Priority Recommendations

- Leverage Navigant's findings to improve failure analysis reports.
- Create a long term investment plan that extends beyond the 10 year capital planning horizon.

# Appendix A. Typical Asset Management System

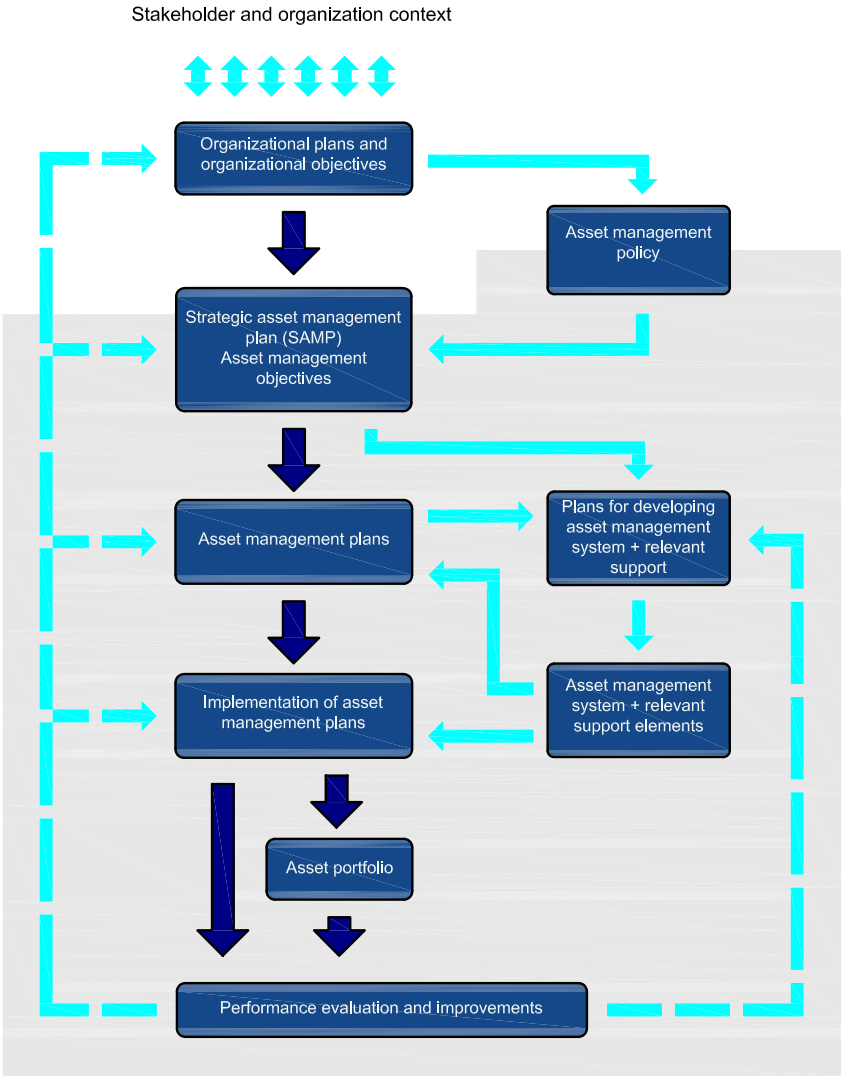
Figure 5-1 displays the elements of an asset management system as defined by ISO 55001. These elements start with and flow from overall organizational plans and objectives.

The first major element of an asset management system is a strategic asset management plan (SAMP). The SAMP establishes the organization's asset management policy, defines the scope of the asset management system, and sets out the asset management objectives. The scope establishes the boundaries of the asset management system and identifies the assets for which asset management plans will be developed. The SAMP also establishes standards for data structures and systems that will be used to support the asset management system.

Individual asset management plans (AMPs) are then developed for each asset class (e.g., large valves) using the SAMP as a guide. The AMPs feed into implementation plans, including operation and maintenance activities, construction of new assets, and retirement or renewal of existing assets. Further, the organization balances the objectives for the strategic and individual asset management plans against available resources, stakeholder interests, and other issues of concern.

In older utilities, a complete and accurate inventory of all the assets for each asset class is critical. Following, or sometimes concurrent with, the creation of the asset inventory, each of the inventoried assets should have a condition assessment. For newer assets, this may be little more than stating the asset is "new" or "as new." For older assets, especially those that are at or near the end of their useful lives, the condition assessment should be as detailed as practicable. The condition assessment information will provide a basis for determining the remaining useful life and establishing renewal schedules.

**Figure 5-1: Elements of an Asset Management System**




*Source: ISO 5000*
*Note: The grey highlighted box designates the boundary of the asset management system.*

## Appendix B. Lists of Interviews

| Name | Title/Topic | Interview Date |
|---|---|---|
| **Marty Adams** | Assistant General Manager - Water System | August 5th |
| **Greg Ammon** | Manager - Water GIS Systems | August 7th |
| **Evelyn Cortez-Davis** | Manager - Special Projects & Groundwater Planning | August 3rd |
| **Craig Davis** | Manager - Trunk line Design Group | August 5th |
| **Albert Gastelum** | Director - Water Quality | July 9h |
| **Richard Harasick** | Director - Water Operations | July 10th |
| **Delon Kwan** | Waterworks Engineer | August 3rd |
| **Charles Ngo** | Waterworks Engineer - Asset Management & Capital Improvement Group | July 31st |
| **David Pettijohn** | Director – Water Resources | July 31st |
| **Susan Rowghani** | Director – Water Engineering and Technical Services | July 9th and August 7th |
| **Julie Spacht** | Executive Liaison | July 16th |
| **William Van Wagoner** | Manager - Water Planning | July 20th |
| **Keith Sessions** | Director – Water Distribution | July 16th |
| **Stephan Tucker** | Project and Construction Management Section Manager | July 31st |

## Appendix C. List of Documents

Navigant submitted a series of document data requests to LADWP which were provided via a secure file sharing site. The primary documents are listed in detail below.

| | Documents Provided by LADWP |
|---|---|
| 1 | Central City Association, Water System Update, October 2014. |
| 2 | Estimate at Completion (EAC) Report – CIP Projects, 2014 – 2015. |
| 3 | CIP Executive Report, April 2015. |
| 4 | Water Operations Division – Metro Section, IEA Response, July 13, 2015. |
| 5 | Report of Progress on the Capital Improvement Program, April 2015. |
| 6 | Project Reporter, Water System Active Capital Improvement Projects, April 2015. |
| 7 | Distribution Mainline Asset Management Strategy, March 2015. |
| 8 | Trend Analysis Report by Responsible Organization, July 2, 2015. |
| 9 | Main Breaks, CPS Task Counts, 2014 – 2015. |
| 10 | Project Goals and Planned Accomplishments by Yard. |
| 11 | Northern Aqueduct Engineering Project Status Report, June 24, 2015. |
| 12 | CIP Prioritization List, FY 2014-15. |
| 13 | LA County Supervisory District 3 Briefing of CIP Projects, May 2015. |
| 14 | LA Filtration Plant Asset Management Report, 2010. |
| 15 | LADWP 2015 Briefing Book. |
| 16 | Large Valves Asset Management Report, 2011. |
| 17 | Leak Graph, 2003-2015. |
| 18 | Owens Valley Annual Report, 2015. |
| 19 | Project Reporter for Water System CIP Projects, April 2015. |
| 20 | Pump Station Asset Management Summary, March 2015. |
| 21 | Quarterly Budget and Schedule Update Report for CIP, May 2015. |
| 22 | Regulator Station Asset Management Plan, 2012. |
| 23 | Regulator and Relief Stations Asset Management Summary, March 2015. |
| 24 | Sunset – UCLA Trunk Line Break Board Presentation, August 6, 2014. |
| 25 | Trunk Line Asset Management Summary, March 2015. |
| 26 | Valley Alliance of Neighborhood Councils Presentation of CIP Projects, April 2015. |
| 27 | Water Distribution Mainline Replacement Analysis, August 2014. |

| | Documents Provided by LADWP |
|---|---|
| 28 | Water Distribution Pipeline Asset Management Report, 2011. |
| 29 | Water Storage Facilities Asset Management Report, 2010. |
| 30 | Water System Overview Book, July 2013. |
| 31 | Water System Ten-Year Capital Improvement Program, FY 2010-2019. |
| 32 | WETS Goals Tracking Report, FY 2014-15. |
| 33 | Water System 10 Year Capital Improvement Program, 2010-2019. |
| 34 | Drinking Water Public Health Goals Report, 2013. |
| 35 | Water System Seismic Resilience and Sustainability Program Summary Report, September 2014. |
| 36 | LADWP Recycled Water Annual Report, FY 2013-14. |
| 37 | Stormwater Capture Master Plan, Interim Report, January 2015. |
| 38 | Urban Water Management Plan, 2010. |
| 39 | LADWP Water Loss Audit & Component Analysis Final Report, FY 2010-11. |
| 40 | Purchase Order for System Water Supply to be Provided by MWD, November 2014. |
| 41 | LAA Deliveries 10 Year Running Total. |
| 42 | Professional Services Agreement for San Fernando Basin Groundwater Remediation Facilities. |
| 43 | Groundwater System Improvement Study Remedial Investigation Update Report. |
| 44 | San Fernando Groundwater Basin Remediation Owner's Agent Contract Board Presentation. |
| 45 | Mainline Attributes. |
| 46 | Mainline Model Builder. |
| 47 | One Water LA 2014 Plan. |
| 48 | Sunset – UCLA Pipe Failure Analysis Report. |
| 49 | Water GIS Pipe Location Report Process |
| 50 | Davis, Craig A., "Los Angeles water supply impacts from a M7.8 San Andreas Fault earthquake scenario", *Journal of Water Supply: Research and Technology*, 2010. |
| 51 | Pump Station Attributes. |
| 52 | Regulator and Relief Station Attributes. |
| 53 | Stormwater Capture Plan Executive Summary, July 2015. |
| 54 | Water Quality Area Map. |
| 55 | Tank Attributes. |
| 56 | LAA System Climate Change Study Final Report, June 2011. |
| 57 | Trunk Line Condition Assessment Program |

| Documents Provided by LADWP | |
|---|---|
| 58 | Trunk Line Attributes. |
| 59 | Water Infrastructure Plan, January 2015. |
| 60 | Water GIS Oracle Spatial Object Model. |
| 61 | Water GIS Domains. |
| 62 | LADWP Asset Management Training Presentations, July 2015. |
| 63 | Water Quality Division Dashboard Goals and KPIs, 2015. |
| 64 | Water Supply Assessments, LADWP Board Presentation, July 2015. |

# Volume IV

# Governance

NAVIGANT

# 2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

## Governance Report
## Volume IV

**Prepared for:**
**The City of Los Angeles**

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## Executive Summary

### *Objectives and Approach*

An important addition to the scope of the 2015 IEA Survey is the topic of governance. Although this topic was not originally included in Navigant's scope of work, stakeholder interviews made it clear that governance concerns are of great interest and deserve focused attention. Hence, the Joint Administrators authorized a chapter focused exclusively on the governance of LADWP.

A utility's governance structure is defined as the framework that articulates policy, decision-making, and leadership roles within the utility and between the utility and key stakeholders. It is also the framework for operational and financial oversight and management. For the Department, adequate, efficient governance is critical to the successful execution of the Power and Water Systems' strategic and operational plans and to the effectiveness of the Joint Systems. Critically, it defines the overall strategic and operational readiness of LADWP.

Navigant conducted an assessment of LADWP's governance structure based on information from multiple interviews, peer research, a review of prior City initiatives and studies focused on improving LADWP's governance, and our experience. To fully inform the discussion, we also reviewed alternative municipal utility governance structures to identify examples of existing structures that, if applied to LADWP, might resolve or alleviate some of the problematic effects of the current structure. Finally, we created a high-level process roadmap to facilitate further study and decision-making with short and long-term action recommendations.

The overarching goal of the governance chapter is to assist the City, and LADWP, and its customers on a path towards a governance structure with the following important characteristics:

- Clarity of leadership,
- Accountability,
- Transparency,
- Adequate oversight and controls,
- Consistency, and
- Efficiency.

Readers should note that during the course of the IEA Survey, City and Department stakeholders overwhelmingly expressed openness to different governance structures, indicating that now is the time to make a change.

### *Governance Challenges*

Every stakeholder is dissatisfied with the status quo. While dissatisfaction is an important consideration, of even more concern is the financial and execution risk the City faces as a result of current governance issues. Navigant synthesized findings and feedback into the following governance challenges:

- **Decentralized City Authority:** As mentioned previously, there are several layers of governance including various highly political bodies which bring politics into all facets of LADWP. However, no single entity has enough insight into or authority over Department operations and finances to hold it fully accountable or effectively support best practices and long-term goals.

- **Inadequate Hiring Process:** Human Resources is one area in which the Department does not benefit from centralized City authority. The current hiring process does not meet the utility's need to be more responsive and nimble. Moreover, it does not adequately address the aging workforce challenge. It is cited as a major impediment to every program initiated by the Department and has a significant impact on basic operations. It is a critical issue that, if not addressed, could prevent the Department from meeting its goals.
- **Lack of External Reporting, Transparency, and Trust:** For many years, the Department has not sufficiently communicated consistent and reliable metrics on major programs and performance against goals to key decision makers in the City and to the public at large. Only when requesting rate increases or other financial decisions requiring City Council approval does the flow of information from LADWP increase. Failure to clearly communicate key performance indicators has created distrust and confusion among citizens and City leadership, who find the Department's operations and finances to be opaque. Without increased transparency through clear reporting, it will be difficult for LADWP to earn back the public trust and carry out its agenda. Particularly, rate-setting processes that are unsupported by clear information, appropriate financial practices, and open discussion are likely to be less efficient and less useful. LADWP has increased transparency into its strategic objectives over the past few years, particularly due to the improved Power Integrated Resource Plan and public outreach efforts, but significant progress is still needed—particularly in financial and key metric performance.
- **Decentralized Internal Authority:** Navigant also identified a lack of central authority and controls within LADWP, specifically with respect to finance, security, and emergency preparedness. Overall, LADWP would benefit from centralized internal controls that establish defensible decision-making processes and higher standards of accountability. In particular, the Department lacks appropriate, centralized oversight and reporting on budgets and the movement of funds between programs and projects within the Water and Power Systems.
- **Ambiguous Role of the Office of Public Accountability:** The OPA would benefit from further refinement of its mission. Currently, the OPA is in an independent advisory role without authority over the Department's rate submissions. However, the OPA's reporting line to the LADWP Board weakens its true independence. The office faces continuous political pressure from the Department, elected officials, and City Management. Hence, it is stuck in a "no man's land" as it is neither a regulator nor a truly independent advisor. The City should—in concert with all involved parties—revise the OPA's mission to clarify its authority and independence in the Charter. This may require the City to make a choice between a purely independent office focused on ratepayer priorities and an office with a staff oversight role to advise and inform City stakeholders.

***Past Studies and Progress***

By now, LADWP's governance challenges are well-understood by City stakeholders and Department leadership. Various efforts to study and reform the governance of LADWP have been undertaken but met with limited success, which highlights the complexity of the challenge.

In 1999 at LADWP's request, Rand Corporation undertook a broad governance study of the Department motivated by electricity deregulation and restructuring developments in California. Overall, the Rand study found LADWP's governance structure to be "complex, divided, and cumbersome." The study also

offers several options for modifying the governance structure. The first option is to create a city-owned corporation, which is considered to be more flexible, efficient, and responsive than the existing structure. The second option is to create an independent city agency with a strong governing board, which is similarly considered to be more flexible and efficient. The third option would focus on streamlining approval processes and limit political involvement in business matters, but is considered to be the least effective solution of the three because it would maintain the existing structure. Since the report was issued, none of the options were adopted by the City.

In the 2009 IEA Survey, PA Consulting found that the governance and decision-making process in place is not adequate to successfully address the Department's "mission critical" decisions. The governance framework does not facilitate efficient decision-making and clouds accountability for key decisions among a variety of stakeholders. This finding is closely aligned with the Rand study; however, the 2009 IEA Survey similarly does not appear to have provided sufficient stimulus to act.

In early 2010, City Council introduced a series of governance reform motions proposing the creation of a Ratepayer Advocate/Inspector General position and several other changes to LADWP's governance, as a result of a conflict between the Council and the Department regarding proposed modifications to the Energy Cost Adjustment Factor (ECAF) component of utility rates. The ultimate result of this process was the creation of the Office of Public Accountability with the Ratepayer Advocate and new budget and City Transfer reporting requirements. Several motions also suggested the re-composition of the Board of Water and Power Commissioners, but this was the most controversial governance change and did not make it onto the ballot. Because two motions were passed, this process was a moderate success.

Finally, in 2013 the City Council President requested the 2020 Commission to study and report on fiscal stability and job growth in Los Angeles. Like previous studies, the 2020 Commission found that LADWP is subject to too much political interference and, as a consequence, high leadership turnover. The 2020 Commission recommended creating a Los Angeles Utility Rate Commission to be an independent regulator and the ultimate rate-setting authority for the utility; however, this recommendation is not currently advancing through the City Council committee hearing process.

***Review of Alternative Governance Structures***

To identify examples of governance structure options for LADWP, Navigant reviewed the governance arrangements of other U.S. municipal utilities. To synthesize our findings, we grouped the case studies into three general forms of governance: elected board governance, city council governance, and appointed board governance. We also analyzed the strengths and weaknesses of these structures in the context of LADWP's applicable governance challenges; specifically, decentralized city authority and the lack of external reporting, trust, and transparency.

<u>Elected Board Governance</u>

Sacramento Municipal Utility District (SMUD) is a good example of an elected board governance structure as a municipal utility district. SMUD is governed by a seven-member Board of Directors who are elected by customers from each of the seven geographic areas within the company's service area. The Board of Directors appoints the General Manager, approves the budget, and approves rate changes. To financially support the local government, SMUD customers in the City of Sacramento pay a utility tax of 7.5 percent and customers in the unincorporated area of Sacramento County pay a tax of 2.5 percent.

The potential strengths and weaknesses of an elected board governance structure are highlighted by SMUD's experience. According to interviews, in 2003-2004 the utility was struggling with a number of governance challenges, despite structurally being the same municipal utility district as today. However, at the time the board was becoming too tied up in the details of decision-making processes, particularly in areas where it did not have sufficient expertise. Because this was becoming a significant burden on leadership, SMUD initiated an intensive two-year process to establish clear policy, roles, and expectations for the utility district. At the end of the two years, SMUD had established a strategic direction defined by a number of policies which appear to have been very effective. Overall, stakeholders have expressed high satisfaction with the current SMUD governance model.

Based on the apparent success of SMUD, the municipal utility district model—supported by effective policies—may have the most potential to de-politicize the governance structure by distancing the utility from the primary political bodies and allowing it to function as an independent business organization, while directly serving the citizens of Los Angeles and maintaining financial support for the city.

**Table ES 1. Elected Board Structure: Resolution of Governance Challenges**

| Governance Challenges | Decentralized City Authority | Lack of External Reporting, Trust, and Transparency |
|---|---|---|
| ***Does Address*** | • Elected board acts as a clear central authority<br>• Other City politics no longer relate directly to the utility<br>• Focused attention on utility matters at all times<br>• More shared responsibility between the board and utility executives | • Direct reporting channel established between utility leadership and board<br>• Candidate qualifications impact election results, encouraging nominees with relevant expertise<br>• Decision making is likely to be based on firm business principles |
| ***Does Not Address*** | • Opportunity for politicization around election of board members<br>• Opportunity for too much board involvement in utility operations (though this could be mitigated by well-defined policies) | • Elected board members may have limited experience (though this could be mitigated by training and a dedicated advisory staff)<br>• Potential for controversial elections to lead to public distrust |

City Council Governance

Seattle City Light (SCL), Austin Energy, and Colorado Springs Utilities (CSU) are all examples of the city council governance structure, in which the utility reports directly to council or, in the case of CSU, to a board solely comprising council members. In theory, the city council model of governance provides clarity of leadership by simplifying and centralizing control; however, the case study utilities highlight several weaknesses associated with city council governance.

For example, an expert panel in 2006 noted that the city council model leaves SCL vulnerable to "political winds." For Austin Energy, the Electric Utility Commission recommended the Austin City Council transfer management and control of the utility to an independent board of trustees in order to increase transparency and accountability, improve efficiency, clarify leadership, remove political interference, and provide a mechanism by which all Austin Energy customers would be represented. Colorado Springs Utilities has faced even more scrutiny. Since becoming an enterprise of the municipal

government in 1993, four separate studies have examined a change in governance structure, each recommending CSU establish an independent board of directors. Despite recommendations, SCL and Austin Energy have maintained city council governance structures. Currently, CSU is in the midst of a Governance Structure and Governance Process Review.

LADWP's transition to full City Council authority would reduce the number of City stakeholders and centralize responsibility for LADWP; however, as found in Seattle, Austin, and Colorado Springs, the utility would likely remain highly prone to political influence and may continue to experience transparency and accountability issues.

**Table ES 2. City Council Structure: Resolution of Governance Challenges**

| Governance Challenges | Decentralized City Authority | Lack of External Reporting, Trust, and Transparency |
|---|---|---|
| ***Does Address*** | • City Council acts as a clear central authority | • Direct reporting channel established between utility leadership and City Council |
| ***Does Not Address*** | • Inherent politicization of decision making<br>• Interest in utility matters influenced by election cycles<br>• Appointed utility executives more vulnerable than City Council to blame for utility missteps | • Without a dedicated advisory staff, City Council has limited expertise and bandwidth for utility issues<br>• Utility is vulnerable to public distrust of politics<br>• Decision making based on political whim rather than firm business principles |

Appointed Board Governance

The San Francisco Public Utilities Commission (SFPUC), CPS Energy (CPSE), and Jacksonville Energy Authority (JEA) serve as examples of various appointed board governance structures. SFPUC is governed by five commissioners who are nominated by the Mayor and approved by the San Francisco Board of Supervisors. CPSE is governed by a five-member Board of Trustees, which includes the Mayor (ex-officio) and four other representatives from the four geographical quadrants of San Antonio who are selected by majority vote of the remaining members and confirmed by City Council. JEA is governed by a seven-member Board of Directors that is appointed by the Mayor and confirmed by City Council.

Appointed board governance offers many of the strengths seen with an elected board. Clear leadership by a central authority with subject matter expertise and dedicated attention simplifies operations and provides the professional oversight necessary to create an atmosphere of accountability and support long-term goals based on firm business principles. However, board appointment re-exposes the process to city-wide politics and sometimes obscures accountability. For example, in 2009 CPSE was involved in a $32 million lawsuit to exit a nuclear deal, partly as the result of CPSE executives withholding critical financial information from the Mayor and City Council regarding a $4 billion increase in expected construction costs. Additionally, JEA is currently facing serious governance and legal issues with the Sunshine Law: the Board was discovered to be preparing scripted talking points in advance of meetings.

The problems encountered by CPSE and JEA argue that, if the same structure were adopted, LADWP may be at higher risk of a communication breakdown between various layers of authority. One option for LADWP could be to simplify the structure by involving City elected officials and executives directly

in the board. A board comprised of five City stakeholders would clarify and centralize roles and responsibilities while allowing multiple City offices to have direct input.

**Table ES 3. Appointed Board Structure: Resolution of Governance Challenges**

| Governance Challenges | Decentralized City Authority | Lack of External Reporting, Trust, and Transparency |
|---|---|---|
| ***Does Address*** | • Appointed board acts as a clear central authority<br>• Focused attention on utility matters at all times<br>• More shared responsibility between board and utility executives | • Direct reporting channel established between utility leadership and board<br>• With board member expertise requirements, members will have necessary skillset and knowledge to run the utility<br>• Decision making likely to be based on firm business principles |
| ***Does Not Address*** | • City-wide politics may influence board appointments (mitigated by fixed terms and limited reappointments) | • Reporting channel between the board and the City not clearly established<br>• Without requirements for board member expertise, members may lack necessary skillset and knowledge to run the utility<br>• Because the board is not directly accountable to the public, it is potentially less transparent |

*Roadmap for Change*

Creating a new governance structure to address LADWP's current governance challenges is no small undertaking. If the City of Los Angeles chooses to pursue fundamental governance changes as discussed in this chapter, it will be embarking on a complex, multi-year journey. Navigant recommends that the City initiate a process by which it can ultimately propose specific governance reforms on the 2017 ballot.

In the near term, increased transparency through reporting is one of the simpler solutions to several of LADWP's governance issues. Improved reporting on key metrics would help address the lack of transparency, accountability, and oversight. However, this is unlikely to achieve a permanent improvement, nor does it address every governance challenge. The governance issues described should provide sufficient motivation for revisions to the City Charter by ballot measure, as part of a long-term change process. However, significant additional work must be completed before those revisions are determined. Navigant's recommendations below outline a framework for the City to approach fundamental long-term changes.

Near-Term Recommendation

Navigant recommends that LADWP tie financial and performance metrics to rates by ordinance. This would mean defining and reporting a set of key metrics to decision makers on a specific schedule, in order to inform annual rate adjustments via the adjustment factors. Specifically, for each major Department program and initiative, the ordinance would require agreed-upon metrics (including budget targets and actuals, milestones, etc.) to be reported to the Office of Public Accountability, Board of Water and Power Commissioners, and City Council (Energy and Environment Committee).

Long-Term Recommendation

The City of Los Angeles should take the following steps for its governance reform process:

- City Council introduces a motion forming a committee to examine governance reforms for the LADWP, with the explicit task of reporting on its findings and recommending a measure for the 2017 ballot.
- City Council forms a hybrid committee including representatives from the Mayor's office, City Council Energy & Environment Committee, CAO, CLA, Controller, City Attorney, Office of Public Accountability, Board of Water and Power Commissioners, the general manager of LADWP, and IBEW Local 18. Navigant recommends that the CAO, CLA, and an outside third-party facilitator be assigned the role of facilitators (additional detail on facilitation in full report).
- The committee defines the governance issues it seeks to address via ballot measure.
- The committee conducts an in-depth study of solutions to the specified governance issues, including multiple opportunities for public input.
- The committee reaches consensus on a solution and submits a final report with a proposed ballot resolution to City Council, in time for the 2017 ballot according to a schedule set by the CAO, CLA and City Attorney.
- City Council requests the City Attorney, with the assistance of the CAO and CLA as necessary, to prepare a ballot title and finalize the resolution for placement on the 2017 ballot.

The final result of this process should be a measure that the committee in good faith believes will address LADWP's current governance issues.

## 1. Introduction

This report addresses the governance structure of LADWP. Here, the governance structure is defined as the framework that articulates policy, decision-making, and leadership roles within the Department and between the Department and key stakeholders. It is also the framework for operational and financial oversight and management. Adequate, efficient governance is critical to the successful execution of the Power and Water Systems' strategic and operational plans and to the effectiveness of the Joint Systems. Critically, it defines the overall strategic and operational readiness of the utility. Although this topic was not originally included in Navigant's scope of work for the 2015 IEA Survey, stakeholder interviews made it clear that governance concerns are of great interest and deserve focused attention. Hence, the Joint Administrators authorized this report to describe challenges with the Department's current governance structure, provide a set of alternatives via case studies, and prepare the way for the City of Los Angeles to explore and implement appropriate solutions.

Previously, the topic of governance was raised in the 2009 IEA Survey. PA Consulting identified governance as one of two major issues that could impede the ability of LADWP to effectively and efficiently conduct day-to-day operations as well as meet long-term objectives. PA Consulting found that the framework for governance at LADWP "does not facilitate efficient decision-making and clouds accountability for key decisions."[1] Specifically, PA Consulting considered the complexity of relationships between the Department and various stakeholders—including the Board of Commissioners, City Council, City Executives, Mayor's Office, and others—to be a fundamental issue that undermines clarity of policy leadership. These findings are still true today, as the governance structure is extremely difficult to alter and has not changed. In the current IEA Survey, Navigant also identified issues around financial management practices and reporting at the Department that lack appropriate governance and accountability, which will be further discussed in this report.

After identifying the governance challenges facing the Department, Navigant conducted an assessment of LADWP's governance structure based on information from multiple interviews, peer research, a review of prior City initiatives and studies focused on improving LADWP's governance, and our experience. To fully inform the discussion, we also reviewed alternative municipal utility governance structures to identify examples of existing structures that, if applied to LADWP, might resolve or alleviate some of the problematic effects of the current structure. As part of this review, we evaluated possible positive and negative outcomes for each structure in the unique environment of Los Angeles.

We recognize that the governance alternatives discussed in this report are significantly different from the status quo and would require major changes to the City of Los Angeles Charter. To help the City decide on and pursue a course of action, at the end of this report Navigant provides a high-level process roadmap to facilitate further study and decision-making with short and long-term action recommendations. Readers should note that during the course of the IEA Survey, City and Department stakeholders overwhelmingly expressed openness to different governance structures, indicating that now is the time to make a change. This momentum should not be lost.

[1] Industrial, Economic, and Administrative Survey of the Los Angeles Department of Water and Power. PA Consulting Group, February 1, 2009 (Page iii).

The overarching goal of this report is to assist the City, and LADWP, and its customers on a path towards a governance structure with the following important characteristics:

- Clarity of leadership,
- Accountability,
- Transparency,
- Adequate oversight and controls,
- Consistency, and
- Efficiency.

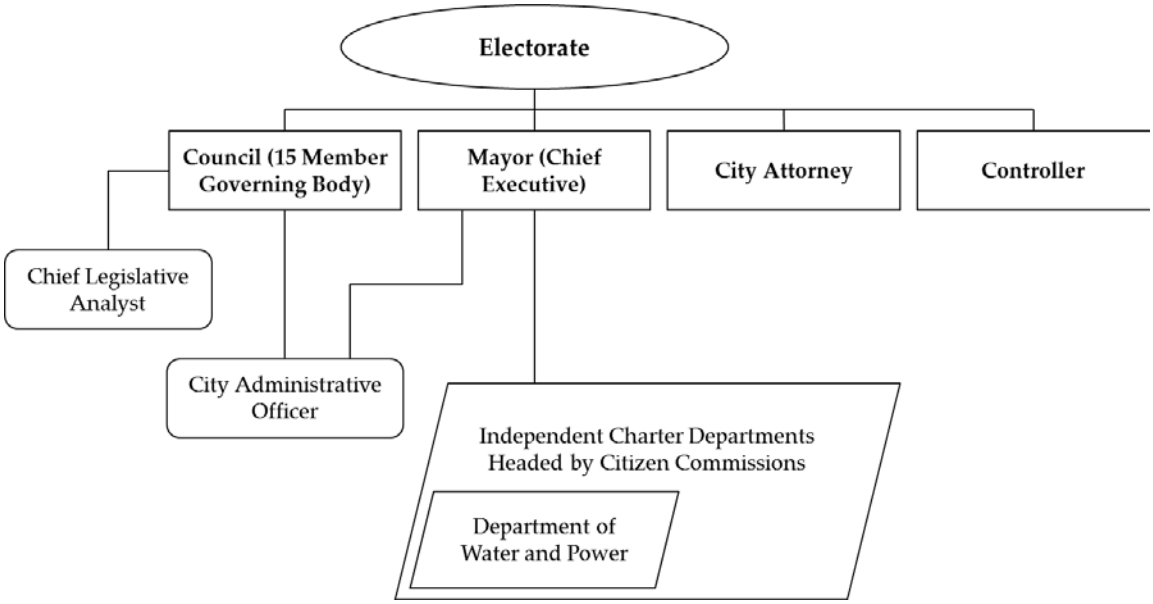
In Los Angeles, this means minimizing politicization of key issues, fully educating and informing decision-makers, and facilitating business operations and best practices. Moving in this direction will likely also help to regain the public trust, which has suffered lately due to recent infrastructure failures, billing system issues, and increased media scrutiny. The report is organized into the following sections:

1. Current Governance Structure
2. Governance Challenges
3. Past Studies and Progress
4. Review of Alternative Governance Structures
5. Roadmap for Change

## 2. Current Governance Structure

The Los Angeles City Charter created LADWP as one of three proprietary departments of the City (City Charter Sections 600-610[2]) in addition to Los Angeles World Airports and the Port of Los Angeles. Specifically, LADWP is a revenue-producing, independent proprietary department of the City of Los Angeles with a citizen commission (Figure 2-1). Although it is semi-autonomous, LADWP is governed by the City as well as its citizen commission and transfers a portion of its annual estimated electric revenues to the Los Angeles General Fund via the City Transfer.

**Figure 2-1. Organization of the City of Los Angeles Related to LADWP**




*Source: Navigant simplification of the City of Los Angeles organizational chart.*[3]

Founded in 1902, LADWP is the largest municipal utility in the U.S., employing 8,800 staff and delivering water and power to 3.9 million residents and businesses of the City (674,000 water customers and 1.4 million electric customers). The Power and Water Systems supply more than 25 million megawatt-hours of electricity and 191 billion gallons of water each year to the City's residential and business customers.[4] Governance of such a large municipal utility is naturally complex; however, LADWP's current structure is unnecessarily so, with negative repercussions.

Governance of LADWP is shared among the Board of Water and Power Commissioners, the Mayor's office, the City Council, and the City Attorney. The Controller, City Administrative Officer (CAO), and Chief Legislative Analyst (CLA) are also important stakeholders. Finally, a relatively new department, the Office of Public Accountability (OPA), was established in 2011 to be an independent analyst of LADWP's rates. Among these positions, no single entity has enough insight into or authority over

[2] The Official City of Los Angeles Charter text is available at: law.resource.org/pub/us/code/city/ca/LosAngeles/snapshots/revision-27/LAAC.html.
[3] Available from the Controller's Office at: cao.lacity.org/misc/LAorgchart.pdf.
[4] 2015 Briefing Book, Los Angeles Department of Water and Power.

Department operations and finances to hold it fully accountable or effectively support utility best practices and long-term goals. These leadership roles are described in more detail in the following subsections.

## *2.1 LADWP Leadership*

LADWP functions independently from the City of Los Angeles for most day-to-day operations. Business operations are under the direction of the General Manager, who is appointed by the Mayor and confirmed by City Council. One consequence of the appointment of general managers by the Mayor is that the position has seen high turnover over the last decade as mayoral administrations change (specifically, eight general managers in the last 15 years from 2000 to the present). This creates a relatively high degree of instability in Department leadership and hinders progress towards establishing consistent long-term action plans. Reporting expectations and other important protocols also vary with each new General Manager. Under the General Manager, the Water and Power Systems are led by Senior Assistant General Managers who currently have a significant amount of operational independence.

The General Manager reports to a five-member, volunteer citizens Board of Water and Power Commissioners (the Board) established by the Los Angeles City Charter Sections 670-6844. The Board is responsible for setting policy and controlling finances, although final rate decisions go to City Council. Board-approved finances include: revenues, operational budgets, fuel, purchased power, purchased water, bonds, and notes (LADWP's operations are financed solely by the sale of water and electric services and capital funds are raised through the sale of bonds).

The Board of Water and Power Commissioners does not function as a regulator like the California Public Utilities Commission,[5] nor as a truly governing utility board like the Sacramento Municipal Utility District (SMUD).[6] The Board is under the authority of several City elected entities. Members are appointed by the Mayor and confirmed by City Council for a term of up to five years. City Council also has contract approval authority and the power to review and overturn any financial decisions made by the Board. As political appointees without requirements for subject matter expertise in water and power, the Board relies heavily on LADWP itself for analysis and direction. At the same time, it receives policy direction from the Mayor's office and—in recent years—opinions on rates from the Office of Public Accountability.

## *2.2 City Leadership*

The Mayor and City Council have the important responsibilities to appoint the General Manager and the Board and approve rates, respectively. The City Attorney provides legal counsel to LADWP and the

[5] The CPUC regulates privately owned electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies. It is designed to protect customers of utility services and infrastructure and preserve reasonable rates while supporting the California economy. There are five Governor-appointed Commissioners (confirmed by the Senate) with a large professional staff as well as an independent arm to represent consumers in commission proceedings, the Office of Ratepayer Advocates. The CPUC has full plenary authority over the state's three investor-owned electric utilities, and sets rates for these as well as the largest 10 investor-owned water utilities through General Rate Cases. (www.cpuc.ca.gov/NR/rdonlyres/7EA9B970-6827-4C89-9D2C-38DD8DE50428/0/CPUCRegulatoryResponsibilities0414.pdf).

[6] SMUD is featured in Section 5 Review of Alternative Governance Structures.

City's Personnel Department handles civil service workforce hiring. In turn, the Mayor's office and City Council rely on legal and financial advisory services from the appointed offices of the Chief Legislative Analyst and City Administrative Officer, both of whom therefore influence Department oversight and rate-setting. The City Controller is also responsible for oversight of the City's departments through audits such as the IEA Survey effort. City duties are further outlined below.

- ***Mayor's Office:*** In the Los Angeles charter (Sections 230-234), the elected Mayor has management authority over the city government and is the chief executive officer of the city. One of the Mayor's duties is appointing heads of departments and members of commissions. This applies to LADWP's General Manager as well as the Board of Water and Power Commissioners. Importantly, the Mayor's office influences much of LADWP's policy (as it does with other City departments). Under Executive Directives 3 and 4 from Mayor Villaraigosa in 2005,[7] the Department submits to the Mayor's office all significant policy and financial matters and all matters requiring City Council consideration.
- ***City Council:*** The Los Angeles City Council has 15 members elected by individual districts for four-year terms (Charter Sections 240-254). Rates needed to support the Water and Power businesses are approved by ordinance by the City Council. The City Council also confirms general managers and boards appointed by the Mayor, has contract approval authority under Section 674 of the Charter, and the right to review and overturn any decisions made by the Board of Water and Power Commissioners under Section 245 of the Charter,[8] among other responsibilities. LADWP is one focus area of the Council's Energy and the Environment Committee.
- ***City Attorney:*** The City Attorney is the city government's lawyer and a criminal prosecutor for misdemeanor violations in the city, and approves ordinances in terms of form and legality (Charter Sections 270-275). The City Attorney's Municipal Counsel Branch acts as the lawyer for departments including LADWP, elected officials, and city commissions.[9]
- ***Controller:*** The elected controller is the City's chief accountant and works closely with the treasurer and CAO, together forming Los Angeles' financial oversight system (Charter Sections 260-266). The Controller also conducts performance audits of the departments and is leading the IEA Survey.
- ***City Administrative Officer (CAO):*** The CAO is appointed by the Mayor with approval by City Council (Charter Sections 290-293). The CAO's office serves as a central research staff for both the Mayor and City Council, producing many reports on every aspect of city business and helping to prepare the annual budget. The CAO is the chief financial adviser supervising the implementation of the budget and the lead labor negotiator, and also functions as the City's chief risk management officer.[10]

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[7] Executive Directive 3: lacity.cityofla.acsitefactory.com/sites/g/files/wph281/f/mayorvillaraigosa331283117_10202005.pdf; Executive Directive 4: lacity.cityofla.acsitefactory.com/sites/g/files/wph281/f/mayorvillaraigosa331283118_10202005.pdf.

[8] Within the next five meeting days of the Council convened in regular session, after an action by a board of commissioners, City Council has the power to veto the board action (by two-thirds vote). Also referred to as "Prop 5."

[9] Raphael J. Sonenshein. "Los Angeles: Structure of a City Government." League of Women Voters of Los Angeles, 2006 (www.lwvlosangeles.org/files/Structure_of_a_City.pdf).

[10] Ibid.

- ***Chief Legislative Analyst (CLA):*** The CLA is appointed by the council as a support function, providing technical support for committees, summarizing city measures, and developing the city's legislative program (Administrative Code Section 20.100-111).

For the 2015 IEA Survey, Navigant interviewed stakeholders from each of the entities listed above with the exception of the City Attorney. Like the previous IEA Survey, Navigant considers the many stakeholders and multiple layers of bureaucracy that have been folded into LADWP's governance structure to cause confusion around roles and responsibilities. Furthermore, relationships in a politically-charged environment are often fraught, especially when multiple distinct, highly political entities have significant authority over the utility. On the other hand, actual oversight is fairly limited. Various offices have different levels of financial oversight, and only one office (the Controller) has performance oversight—which is stretched thinly across all City departments.

## *2.3 Office of Public Accountability*

The Office of Public Accountability (OPA) is a relatively new City department established by Charter Amendment I adopted on March 8, 2011 (Section 683).[11] The office was founded in order to "provide public independent analysis of department actions as they relate to water and electricity rates"; specifically, the OPA analyzes proposed increases in water and power rates. The Ratepayer Advocate is the executive director of the office appointed by a citizen selection committee. The current—and first—Ratepayer Advocate was selected in early 2012 for a five-year term. By ordinance, City Council established provisions for the OPA, including reporting requirements and consumer protection and complaint procedures.

Because the OPA is a new office that has the potential to provide much needed, independent analysis and potentially oversight, Navigant also investigated the role of the Ratepayer Advocate and how it fits into the governance of LADWP.

## *2.4 Employee Unions*

In addition to the various government stakeholders across the City, the role of several unions must be considered when evaluating the current and future governance structure of the Department. With approximately 95 percent of its workforce covered by union agreements, the Department and City depends on strong ongoing relationships with union leadership. Six unions currently represent the employees of LADWP:

1) The International Brotherhood of Electrical Workers (IBEW) Local 18
2) The Service Employees Union, Local 721
3) The LADWP Dispatchers Association
4) The DWP Management Employees Association (MEA)
5) The Association of Confidential Employees
6) The Los Angeles/Orange counties Building and Construction Trades Council

These unions generally work under five (5) year agreements, the specific nature of which are determined through collective bargaining. These agreements have a major long-term impact on Department

[11] City Charter Amendment for the OPA available at: opa.lacity.org/html/charterAmendment.htm.

operations inasmuch as they define the work rules, wages, benefits, cost of living increases, and work classifications of Department personnel.

The current relationship between the employee unions and the City has had mixed results, with no party feeling that trust and effectiveness are at the level desired by all stakeholders. This is not a union problem, where one side should change its behavior and not the other; rather, it is an opportunity for the City and the unions together to move towards a more productive relationship. To fully address governance issues and increase the agility and flexibility of LADWP as an organization a partner-based model in which goal setting and decision-making are collaborative processes should be pursued. This must be accomplished within the appropriate context with the full involvement of union leadership.

One step towards greater collaboration would be to include a seat for union leadership on the governance working group, described in Section 6 of this report (Roadmap for Change). The perspective of the union into the current governance challenges is a valuable source of information, and we believe it is essential to include in a successful reform effort.

## 3. Governance Challenges

Navigant's assessment, based on analysis and interviews with the IEA Survey's Joint Administrators, LADWP executive management, key City leaders, and union leadership revealed a number of concerns with LADWP's current governance structure. In short, every stakeholder is dissatisfied with the status quo. And while dissatisfaction is an important consideration, of even more concern is the financial and execution risk the City faces as a result of these issues. Navigant synthesized findings and feedback into the following governance challenges, which are covered in further detail in this section.

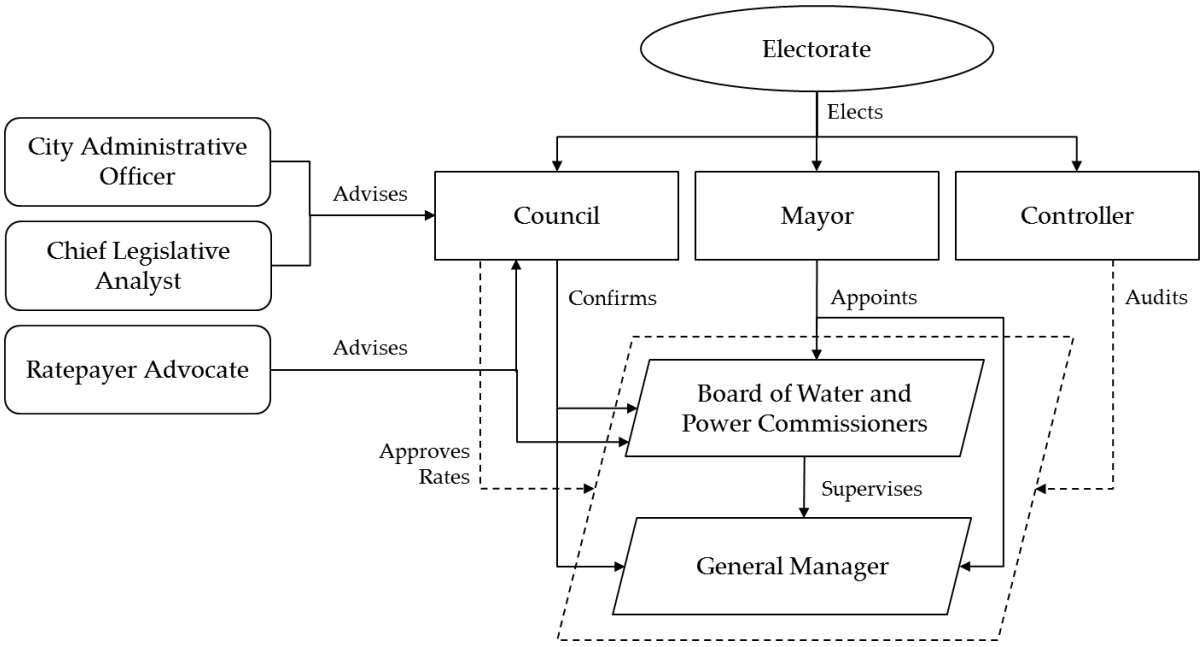
- **Decentralized City Authority:** As mentioned previously, there are several layers of governance including various highly political bodies which bring politics into all facets of LADWP. However, no single entity has enough insight into or authority over Department operations and finances to hold it fully accountable or effectively support best practices and long-term goals.
- **Inadequate Hiring Process:** Human Resources is one area in which the Department does not benefit from centralized City authority. The current hiring process does not meet the utility's need to be more responsive and nimble. Moreover, it does not adequately address the aging workforce challenge. It is cited as a major impediment to every program initiated by the Department and has a significant impact on basic operations. It is a critical issue that, if not addressed, could prevent the Department from meeting its goals.
- **Lack of External Reporting, Transparency, and Trust:** For many years, the Department has not sufficiently communicated consistent and reliable metrics on major programs and performance against goals to key decision makers in the City and to the public at large. Only when requesting rate increases or other financial decisions requiring City Council approval does the flow of information from LADWP increase. Failure to clearly communicate key performance indicators has created distrust and confusion among citizens and City leadership, who find the Department's operations and finances to be opaque. Without increased transparency through clear reporting, it will be difficult for LADWP to earn back the public trust and carry out its agenda. Particularly, rate-setting processes that are unsupported by clear information, appropriate financial practices, and open discussion are likely to be less efficient and less useful. LADWP has increased transparency into its strategic objectives over the past few years, particularly due to the improved Power Integrated Resource Plan and public outreach efforts, but significant progress is still needed—particularly in financial and key metric performance.
- **Decentralized Internal Authority:** Navigant also identified a lack of central authority and controls within LADWP, specifically with respect to finance, security, and emergency preparedness. Overall, LADWP would benefit from centralized internal controls that establish defensible decision-making processes and higher standards of accountability. In particular, the Department lacks appropriate, centralized oversight and reporting on budgets and the movement of funds between programs and projects within the Water and Power Systems.
- **Ambiguous Role of the Office of Public Accountability:** The OPA would benefit from further refinement of its mission. Currently, the OPA is in an independent advisory role without authority over the Department's rate submissions. However, the OPA's reporting line to the LADWP Board weakens its true independence. The office faces continuous political pressure from the Department, elected officials, and City Management. Hence, it is stuck in a "no man's

land" as it is neither a regulator nor a truly independent advisor. The City has not made a choice between a purely independent office focused on ratepayer priorities and an office with a staff oversight role to advise and inform City stakeholders.

### *3.1 Decentralized City Authority*

Although City stakeholders hold final decision-making authority for many critical matters at LADWP, the City is not actively managing the utility. The various City entities are not currently required to be in charge of monitoring performance or finances at LADWP. Because of the definitions in the City Charter, no one group has a formal oversight role tied to decision-making (to an extent that would be truly effective). And due to Charter-defined constraints and the numerous difficulties of monitoring a large and complex utility, no one is able to voluntarily undertake this role, either. However, to properly carry out its responsibilities in the current governance structure, the City must increase its knowledge and oversight of the Department. Figure 3-1 (below) illustrates some of the many different roles and interactions.

**Figure 3-1. Decentralized Governance of LADWP**




*Source: Navigant*

Oversight is more clearly assigned to the Board of Water and Power Commissioners. However, Board members receive information on budget matters and the use of funds from LADWP directly, often without professional third-party analysis. Additionally, the Board has not focused on instituting reform at LADWP. This may be due to the part-time volunteer nature of the citizen Board, which restricts deep dives into topics of interest or concern, or because of the authority of City government entities.

LADWP faces inherent politicization due to governance by multiple elected entities. For example, the general manager position is politicized by direct appointment and approval—and removal—by the Mayor's Office and has seen high turnover. And at times, political influences may inadvertently cloud practical discussions of utility issues. For example, the emphasis on low rates may appeal on the surface

to citizen-ratepayers but actually diverts attention from the important construction and maintenance activities the Department must undertake to support the power and water infrastructure of Los Angeles. Because of these political influences, LADWP is put in the difficult position of showcasing low rates and asking for limited funding, while setting ambitious goals. This has and will continue to lead to underperformance on goals, although the City does not currently track this in a comprehensive manner.

Overall, there is no single outside entity or coordinated group to set policy, provide specific goals and metrics, monitor performance, and hold LADWP accountable. It is this vacuum that creates and sustains an environment that allows suboptimal performance and fosters undesirable situations.

### *3.2 Inadequate Hiring Process*

Although LADWP is a City department, it runs autonomously for day-to-day operations. However, it can only hire civil service employees through the central City Personnel Department, which serves all Los Angeles government civil service hiring. This has proven to be a laboriously slow and costly process that is unable to keep pace with LADWP's needs. For example, even if the Power or Water System has enough funding to make significant progress on a capital program in a given year, lately it has not had the staff to manage the work. This is a growing problem, because with an aging workforce the number of vacancies at the Department will continue to increase. Additionally, the Department has not been able to quickly address emergency staffing needs such as those required by Customer Service.

This issue is relatively well-understood by City stakeholders, and there is interest in allowing LADWP to have its own expedited Humans Resources organization. LADWP and the rest of the proprietary departments are unique, and could reasonably run independent personnel units. Navigant recommends that LADWP have a Human Resources function within the organization that is not dependent on city resources. Additionally, LADWP should have more civil service exempt positions with expertise in utility operations. As a dynamic business entity, the Department should be far more nimble in this respect.

According to interviews, the City expects to roll out a solution to address the aging workforce issue, which affects all City departments. The Personnel Department intends to have eliminated the hiring backlog and to have completed its succession planning within two to 2.5 years. This is a promising development; however, the issue would likely be better addressed within each department independently, with its better understanding of changing employee skills and requirements. Also, given the amount of ratepayer money LADWP is proposing to spend over the next 3 years, it would be imprudent to wait on a potential City-wide solution.

Creating a Human Resource function within LADWP would most likely require a Charter change, because under the current City Charter Section 514, the Mayor and City Council cannot transfer powers related to duties and functions of the Proprietary Departments. However, whether by ordinance or Charter change, this is an important issue that—if resolved—will have significant benefits.

### *3.3 Lack of External Reporting, Transparency, and Trust*

LADWP faces particular challenges due to distrust among Los Angeles citizens and City leadership. The lack of centralized authority with formal oversight of the Department compounds this issue because operations and finances are often opaque to anyone outside of the utility. City leadership does not have enough insight into certain Department processes and decisions to feel comfortable, and the public has

been presented with various recent missteps and system failures via the media, often without context or an understanding of the infrastructure and other issues facing the utility.

The Department is not currently operating in a way that supports transparency, although it has made and is in the process of making some improvements. However, LADWP is not required to externally account for its performance against budgets. Once rates are approved (rates that are historically requested based on what is estimated to be palatable to City Council and its staff), LADWP's finances are largely internal. Because the Department generally shows only selected, macro-level progress made each year without properly including budgetary impacts and changes, City authorities essentially have to take its word on what funding is needed for the next fiscal year and what LADWP might accomplish with new rates. Navigant also found that LADWP's current financial budget and reporting practices are not consistent with best practice to prudently manage the significant sums of money spent by the Department (discussed further in the next subsection).

The City is sometimes aware of the fact when LADWP is unable to spend its budget on programs considered to be priorities, even when the money is theoretically available. However, outside stakeholders are often not fully informed on the reasons why or the solutions taken within the Department in response. This opacity leads to the perception that LADWP cannot manage its money, and consequently, reluctance to give it more. This directly affects rate cases. In fact, stakeholders currently seem to be less concerned with actual rate increase numbers—within reason—than they are with hearing the case for why the Department really needs an increase and what will be done with it. Certain stakeholders need more robust justification for the size of the increase, but others simply need more assurance that LADWP can manage significant program ramp-ups using the requested rates.

Building trust is especially important because of its impact on the Department's ability to meet and improve upon its long-term goals—not only in terms of rates, but also enabling LADWP to be a stronger leader in the power and water utility service industries. LADWP would likely be able to take a better leadership role in efforts such as water conservation and recycled water, renewable energy, and electric grid modernization when it has clear support and its decisions and requests are fully understood by the public and key stakeholders.

The Department's current efforts in terms of increased transparency include "DWP Stat" which will report on a number of key performance indicators. The Controller's Utility Panel is another step forward for reporting to the City, containing public key financial data about LADWP in a central location online. The OPA is another step. In the long term, transparency and communication within the Department and especially to City stakeholders could further improve though a clearly defined, central oversight function with robust reporting and controls for key performance metrics.

### *3.4 Decentralized Internal Authority*

Previously, Navigant asserted that no single entity in the City of Los Angeles has enough insight into Department operations and finances to hold it accountable or effectively support best utility practices, and that the lack of transparency into LADWP is due in part to having no centralized City authority with oversight of the Department. This subsection address a similar issue within the Department itself, which affects several important areas identified during the IEA Survey. In the issues discussed below, LADWP would benefit from centralized internal controls establishing defensible decision-making processes and higher standards of accountability.

### 3.4.1 Financial Accounting

Throughout the 2015 IEA Survey, Navigant identified underspending on several capital programs at LADWP. Given the lack of financial documentation and continuous, accessible reporting, it was initially unclear what happened to the remaining funds that had been budgeted for these programs, and also how the Department generally conducts its accounting activities and reporting when capital underspending occurs. To illuminate this aspect of LADWP's operations, Navigant conducted interviews with employees in the Financial Services Organization (FSO) and the Power and Water Organizations.

#### *3.4.1.1 Funds*

During each rate cycle, the Department makes the business case for rate increases based on specific programs. However, Navigant found that LADWP does not necessarily use rates for the programs included in the original business case, and that there is not a proper review process for moving money from program to program. This is a poor business practice.

There are various reasons for moving funds between programs under normal and abnormal circumstances. On one hand, it is accepted that large construction projects typically undergo budget changes as the work progresses. Navigant also understands that in certain cases, the original budget was created with an expected rate increase in mind which did not occur. If the rate action does not occur until halfway through the year, and provides less funding than expected, then the FSO must work to reallocate and re-budget programs. But on the other hand, procurement and contracting delays, overruns on projects, and undercollection (recently, the CIS-related undercollection) are undesirable situations that lead to the reallocation of funds. Although some of these reasons are understandable and in some cases unavoidable, the funding reallocation should always be reported and clearly explained internally to the FSO, to the Board, and to Council with regard to rate-setting. Currently, it is not.

Given LADWP's Debt Service Coverage ratio requirements, not spending cash is actually desirable for LADWP at times. When base rates are collected, the Department may elect to use those funds to support the Debt Service Coverage ratio. Supporting the Debt Service Coverage ratio is a strategic imperative at the Department because so much of its spending is debt-financed. Hence, when LADWP collects base rates for a specific program but is unable to spend the funds that year, it is motivated to sit on the cash portion. This too should be adequately explained to stakeholders when it occurs. On a positive note, when LADWP underspends on a program that would have been debt-financed, the FSO simply reduces borrowing (does not issue debt), which is a good practice. Additionally, LADWP has made a good effort to catch up on historically underspent programs.

The Department's current practices result in opaque budgeting, rate requests that are not held accountable to program accomplishments, and underspending that leads to delays in capital programs. Importantly, the Department should establish controls and reporting activities related to the internal allocation of funding, as discussed in the next subsections.

#### *3.4.1.2 Controls*

There is no defined process at the Department for re-purposing funding on a program-by-program basis. Navigant found that the Water and Power Organizations appear to make these decisions on an ad-hoc basis, with some consultation with the FSO and the Chief Financial Officer (CFO).

LADWP's budget controls have varied over the years, in some cases based on the preferences of the general manager at the time. In past years, there was an aggressive budget review period conducted by the FSO. The FSO would flag budget matters to go to the general manager and conduct a back-and-forth question and answer exchange with the Water and Power Organizations. At present, the two organizations have significant autonomy. The CFO helps compile budgets but has less control than in the past, and does not formally review budget matters with the general manager. Water and Power often work collaboratively with the FSO to determine budgets; however, this is not controlled by formal procedures. Effectively, the FSO is a good resource for the Water and Power Organizations and stays informed on budget-related matters in order to maintain the overall annual budget and issue debt, but is not necessarily involved in the decision-making process for re-allocating budgets as projects advance (or stall) throughout the year.

Navigant recommends establishing (or re-establishing) a formal, centralized budgeting process through the FSO. While the Water and Power Organizations act largely as independent businesses, all budget and spending matters should be supervised by the CFO on a Department-wide basis to add a layer of control, facilitate communication with utility leadership, and better support rate cases.

#### *3.4.1.3 Tracking and Reporting*

More reporting occurs for overspending on capital projects than for underspending. The FSO tracks program budgets on a 10-year basis down to each job level to show where funds are allocated and make sure there are available funds in the contracts. If there are not sufficient funds, the Power or Water Organization must identify offsets within its budget. But if the budget is underspent, the organization can use that money elsewhere without communicating with the FSO (according to interviews, they do only spend it in the same "bucket" or category of program but this is not monitored externally).

Within the Water Organization, there appears to be a reasonable level of internal tracking using project management software and rigorous internal budget meetings attended by the FSO. The Power System does not use a similar tool, but has two monthly meetings to track budget and performance for PSRP and capital program priorities. Although there are various progress reports, this appears to be a less robust approach.

The Department revises initial budget estimates as projects progress, which happens in every capital-intensive firm and is not considered to be an issue. However, communicating these changes and the reasons for them to management and the City appears to be a greater problem. Navigant encountered different levels of understanding and awareness of LADWP's finances among stakeholders. The City and LADWP should have a healthy, ongoing conversation around project funding and adequate explanations for the phases of a project's lifecycle and its costs.

At present, there appears to be no formal process to report key program financial milestones to leadership, including the general manager, except when contracts go to the Board. The Department is beginning to address this issue through discussions of performance-based budgeting and through the Corporate Performance group's activities. Navigant recommends the FSO own program budgets, budget changes, and reasons for the changes. Reports should be compiled in a central location, where issues and questions can be flagged and raised to higher levels of authority.

### 3.4.2 Security

As part of the IEA Survey, Navigant conducted a security assessment of the Department which is detailed in the separate Security Report. Several findings that relate to a lack of sufficient internal, centralized controls and authority are also summarized here.

As with program spending decisions discussed in the previous subsection, the Water and Power Organizations are also autonomous in terms of cybersecurity. In particular, the cybersecurity of the Water System is completely isolated from the rest of the Department. Navigant also found that there is limited communication and reporting among Water, Power, and Joint Services on cybersecurity. The security teams in Joint Systems have little visibility into the Water and Power security systems. And as might be expected with separate systems and poor communication, there is no consistency to the cybersecurity policies across the organizations. Like budget re-allocation activities within the organizations, Navigant found that many processes surrounding cybersecurity are also ad-hoc.

Additionally, LADWP does not have comprehensive planning activities for Physical Security, as the Security Planning group, which plans and manages physical security projects, has been moved around the Department in recent years. As a result, Physical Security does not have the authority or processes in place to ensure that facility managers in the Power and Water Organizations prioritize physical security.

Navigant recommends the Department develop an overarching security policy that identifies the processes necessary to communicate security vulnerabilities, mitigation efforts, and risk assessment on a corporate level. A corporate security plan is essential to providing the Department with sound policies, programs, and project management. The plan should be approved by the General Manager and enforced within each organization. Having central authority and planning will ensure that corporate resources are used in a productive way and will allow for visibility into the Water and Power Organizations. For increased transparency, Navigant recommends that LADWP also establish processes to regularly monitor and report physical and cybersecurity efforts.

LADWP should also consider creating senior executive-level positions for security and risk. Specifically, Navigant recommends that LADWP create a new senior executive position that would report directly to the General Manager and own the corporate security policy with overall physical and cybersecurity responsibility.

### 3.4.3 Emergency Preparedness

During the IEA Survey Navigant also conducted an assessment of the Department's emergency preparedness, which is detailed in the separate Emergency Preparedness Report. The finding that is relevant here is that emergency preparedness activities have been fully decentralized at the Department. The Department's enterprise emergency preparedness function serves in a very high-level coordination role, but is not charged with leading an enterprise-wide business continuity effort, which would identify and assess the risks that would disrupt service delivery and prioritize and routinely test the LADWP response to a material disruption event. Navigant recommends creating a standardized, corporate-level emergency preparedness and business continuity program, which will provide a clear method of managing any significant disruption to service delivery and restore the Department's ability to supply its critical products and services to an agreed level. As with security, we recommend that accountability for Emergency Preparedness reside in a centralized enterprise risk management function with a dedicated senior executive.

### *3.5 Ambiguous Role of the Office of Public Accountability*

Navigant found that the OPA would benefit from refinement of its mission. Currently, the OPA is in an independent advisory role without authority over the Department's rate submissions. However, the OPA's reporting line to the LADWP Board weakens its true independence. Hence, the Office is stuck in a "no man's land" as it is neither a regulator nor a truly independent advisor and is still searching for relevancy in the current governance structure. In many cases, the OPA does not have a clear place in protocols and processes. Under these circumstances, the office has begun to issue opinions but has not found a secure niche. Increasing its oversight role—particularly in program performance, metric review, and rate matters—would benefit all stakeholders. As the current rate ordinances are being revised while this report is being completed, there is a clear and present opportunity to address this issue.

The Ratepayer Advocate should also be cognizant that the office must communicate with ratepayers in a clear and easily understandable manner. Given the highly technical information handled by the office, it must report digestible financial information and key takeaways rather than focus on too many financial details up front. One solution would be to create the role of a Public Information Officer, who could serve as a spokesman and facilitate the preparation of clear and concise communication media.

One of the challenges for the OPA has been to illuminate critical issues at LADWP in a constructive way that increases discussion while recommending performance and process improvements. For example, in the past several years the OPA has become familiar with the lack of financial transparency at LADWP but has not been able to offer process-related solutions. This is partly complicated by its direct reporting line to the Board as well as limited staff resources, and limitations of the office related to operational oversight.

While it is appropriate for the Ratepayer Advocate to report to the Board, City stakeholders, and City Council, it must be clearly separate from decision makers and not become conflated with political interests. Importantly, the RPA is not a decision maker and should not necessarily try to please City decision makers or take direction from them. As with most aspects of LADWP's current governance structure, within the existing structure the OPA faces continuous political pressure from the Department, elected officials, and City Management. The City should—in concert with all involved parties—work on revisions to the OPA's mission to clarify its authority and independence in the Charter. This may require the City to make a choice between having a purely independent office focused on ratepayer priorities and an office with a staff oversight role to advise and inform City stakeholders.

# 4. Past Studies and Progress

Most of LADWP's governance challenges are not new. By now, they are well-understood by City stakeholders and Department leadership. Various efforts to study and reform the governance of LADWP have been undertaken but met with limited success, as described below. This highlights the depth and complexity of the challenge.

## *4.1 2001 Rand Study*

In 1999 at LADWP's request, Rand Corporation undertook a broad governance study of the Department.[12] The study was motivated by electricity deregulation and restructuring developments in California. It describes the complexity of the shared governance structure of the Department, including the governing roles of the Mayor, City Council and staff, and the City Attorney, as well as the key roles of the Controller, CAO, and CLA. At the time, there were also recent City Charter amendments (adopted in June 1999).

The Rand study analyses alternative municipal utility structures in the U.S. and offers three primary options for modifying the governance structure. Because of the multiple parallels with our report—and many of the same governance challenges—the following sections briefly outline the Rand Corporation's findings. In later sections of this report, Navigant conducts a similar analysis but with updated utility information, without specific structural recommendations, and with an explicit roadmap for the City to use in pursuing governance reform.

### 4.1.1 Decision-Making and Operational Problems under the Current Structure

Overall, the Rand study found LADWP's governance structure to be "complex, divided, and cumbersome." Although the system was originally put in place to provide checks and balances on the Department, even at the time of the Rand study, the business needs of a changing industry were already outstripping the ability of disparate City authorities to effectively manage the utility.

The complex and divided reporting structure was found to limit the general manager and executive staff in their ability to make and implement operational decisions in a timely way. Additionally, hiring was found to be complicated by the fact that nearly all the Department's employees fall under the city's civil service system. Very few positions are exempt from civil service rules, and still require mayoral and council approval. Delays in hiring were viewed as especially problematic when trying to hire technically skilled workers. To the detriment of LADWP, workers who are in demand from other employers often do not wait to qualify under the city's civil service rules. The study's authors found that utilities under similar union agreements but not civil service rules could hire people with similar skills within a few weeks—much more quickly than the Department.

Other issues related to legal counsel, procurement, and negotiating customer contracts are also discussed, but the study ultimately refers back to complex governance as causing or exacerbating the other problems. In particular, because of the multiple layers of governance, the Department felt like it could not be entrepreneurial nor operate efficiently.

[12] Report available for download at: www.rand.org/pubs/monograph_reports/MR1189.html.

Today, the Department is still required to elevate many decisions to the various layers of the Board and City for approval and is still inhibited by slow hiring processes (as described in Sections 3.1 and 3.2). At the same time, it is operating in a way that restricts transparency into its programs and internal financial decisions (as outlined in Section 3.3) and lacks sufficient internal controls (as outlined in Section 3.4). Effectively, the well-intentioned "checks and balances" of the governance structure neither facilitate the operation of the utility nor result in increased oversight, trust, or transparency. This issue is particularly critical as problems that could be contained before they spiral into major performance or cost issues are without transparent reporting and controls. All too frequently, issues or incidents in the current structure develop into very public and expensive situations that harm all stakeholders.

#### 4.1.2 Other Governance Models for Municipal Utilities

The Rand study looked at five different municipal utility governance structures with a total of eight case studies, several of which Navigant also examines in this report. The five structures from the Rand study are summarized in the following list along with a brief snapshot of the study's analysis.

- **Municipal utility reporting to city council:** Simplifies governance with a direct reporting line, and seems to work well in small cities with utilities of modest size. Rand concludes that this model would not be as appropriate for LADWP because it is larger and more complex.
- **Independent city agency:** Has an independent governing board with full governing authority, appointed by city officials. The model is designed to distance utility operations from city politics, and the study opines that it works quite well.
- **City-owned Corporation:** LADWP's assets and operations would be transferred to a new California non-profit corporation governed by a board of directors with the city as sole shareholder (by charter amendment). The Mayor and City Council would appoint board members.
- **Municipal Utility District:** The elected board has broad authority over the district and the utility has much more autonomy than a city department. The study notes that converting LADWP into a municipal utility district would require closely coordinated support and legislation at the city, county, and state levels.
- **Joint Powers Agency (JPA):** The board of directors whose members represent participating agencies would be formed under a Joint Powers Agreement. The study finds that a JPA could be more flexible and have more independence from local politics, but may be problematic for a utility offering retail as well as wholesale services based on California JPA rules.

Navigant also presents municipal utility case studies in Section 5, but uses different categorizations and updated information to draw our own conclusions.

#### 4.1.3 Governance Options for LADWP

To address problems under the LADWP structure, Rand Corporation recommends procedural changes in the near term to improve decision-making and oversight. It also recommends that the City seriously consider more streamlined governance structures in order to be a competitive utility in the market. The study recommends three alternatives to the status quo:

1. Create a city-owned corporation to provide utility services.

2. Create a more independent city agency governed by a strong board or commission.
3. Modify the existing structure to improve DWP governance.

A municipal utility district and JPA are ruled out—in the Rand study—because of legislative hurdles at both the city and state level. The first option (city-owned corporation) is considered to be more flexible, efficient, and responsive than the existing structure. To address concerns, the charter amendment could be written to maintain the City Transfer and prevent eventual privatization. The second option (independent city agency with strong governing board) is similarly considered to be more flexible and efficient than the existing structure, and governance would be relatively similar to the city-owned corporation. The third option would focus on streamlining approval processes and limit political involvement in business matters, but is considered to be the least effective solution of the three because of maintaining the existing structure. Since the report was issued none of the preferred options were adopted by the City.

### *4.2 2009 IEA Survey*

In the 2009 IEA Survey, PA Consulting found that the governance and decision-making process in place is not adequate to successfully address the Department's "mission critical" decisions. The governance framework does not facilitate efficient decision-making and clouds accountability for key decisions among a variety of stakeholders. This is closely aligned with the Rand study. Clearly defining roles, responsibilities, and the limits of authority was—and is—a critical recommendation of the Survey.

As an example of ill-defined leadership roles, PA Consulting identified a cycle of "activist" and then less involved Boards depending on the membership, finding that the proper relationship of the Board to the Department was not clear. Additionally, PA found that an absence of independent analysis around policy decisions could lead to the politicization of LADWP by City political offices. Overall, PA found that the complex relationship between the Department and various stakeholders was a fundamental issue that undermined clarity of policy leadership and decision-making authority and accountability.

Like the Rand study, the 2009 IEA Survey does not appear to have provided sufficient stimulus or a concrete way forward for the City. What progress has been made since 2009 is largely attributable to other causes. For example, the improved relationship between the Board and the Department's executive team was due to personnel changes, and the creation of the Office of Public Accountability and the Ratepayer Advocate was a response to a ratemaking conflict between the Department and City Council. The latter development is detailed in the next section.

### *4.3 2010 Governance Reform Motions*

In early 2010, City Council introduced a series of governance reform motions proposing the creation of an Ombudsperson/Ratepayer Advocate/Inspector General position and several other changes to LADWP's governance, as a result of a conflict between the Council and the Department regarding proposed modifications to the Energy Cost Adjustment Factor (ECAF) component of utility rates.[13]

[13] Information on the ECAF debate from the City Controller is publicly available at: controller.lacity.org/stellent/groups/electedofficials/@ctr_contributor/documents/contributor_web_content/lacityp_010463.pdf.

Because two of the motions were, in some form, passed by ballot in the following election, this process was a moderate success.

The CLA and CAO reported on the Council's reform motions to the Energy and Environment Committee on April 13, 2010,[14] and in August, Council adopted a motion requesting the City Attorney, CLA, and CAO to provide a proposal and to begin the process for placing the proposal on the March 2011 ballot. The Energy and Environment and Rules and Elections Committees jointly held a series of evening meetings throughout Los Angeles to solicit public input on governance changes, which helped inform the report.[15] The original motions related to the governance topics in this report proposed the following changes:

*Independent Oversight*

- Create a fully independent ombudsperson[16] to provide independent analysis of rate increases. (CF-08-1967)
- Establish a Ratepayer Advocate Position that reports to the Board of Water and Power Commissioners, City Council, and Mayor. (CF 08-1967-S1)
- Request the CAO, CLA, and City Attorney to report on the feasibility of creating an Inspector General position to independently review and report on the operations and management of LADWP. (CF 09-2544)
- Call on the City Attorney, CLA, and CAO to report back on recommendations on a process for public input regarding establishing a ratepayer advocate and prepare a ballot measure for the March 2011 ballot. (CF 08-1967-S2)

*LADWP Leadership*

- Change appointment of the Board to two Mayoral appointments, two Council appointments, and one Congress of Neighborhoods appointment; require Board appointees to have specific backgrounds; and establish an Inspector General position in LADWP. (10-0586)
- Change appointment of the Board from five Mayoral appointments to one Mayoral appointment, one Council appointment, one Controller appointment, one City Attorney appointment, and one Congress of Neighborhoods appointment. (10-1335)
- Give City Council the authority to remove the General Manager with a two-thirds vote. (10-0583)

*Reporting*

- Require the LADWP annual budget to be adopted by the Mayor and City Council. (10-0587)
- Establish the definition of "surplus" in the annual LADWP Power Revenue Fund transfer to be based on the balance that existed on June 30th of the prior year. (10-1289)

[14] Report from April 2010 available at: clkrep.lacity.org/onlinedocs/2008/08-1967-s1_rpt_cla_4-13-10.pdf.
[15] Report from October 2010 available at: clkrep.lacity.org/onlinedocs/2008/08-1967_rpt_cla_10-26-10.pdf.
[16] An ombudsperson is a public advocate appointed to represent the interests of individuals by receiving, investigating, reporting on, and helping to settle complaints.

The report found that the public was very supportive of an oversight position and for the re-composition of the Board with alternate appointments. It offered a number of items for placement in the March 2011 ballot, including three options for reforming the LADWP Board composition, a recommendation for the creation of an Inspector General/Ratepayer Advocate, a recommendation regarding Council removal of the LADWP General Manager, and a recommendation regarding the submittal of the budget to Council and the definition of "surplus" in the context of the Power Revenue Fund transfer (City Transfer).

The ultimate result of this process was the creation of the Office of Public Accountability with the Ratepayer Advocate, as described in Section 2.3, and approval of the budget and City Transfer reporting. While the creation of the Ratepayer Advocate was a step in the right direction with the potential to improve oversight and transparency, it has not resolved the underlying issues related to clarity of leadership, accountability, and appropriate controls. As discussed in Section 3.5, the Ratepayer Advocate position itself would benefit from greater clarity regarding its role as either a staff adviser or a full independent customer advocate. Notably, the oversight powers envisioned for the Inspector General position are not embodied in the Ratepayer Advocate (i.e., the power to audit and review programs and operations, investigate complaints, and recommend actions for LADWP).

The proposed re-composition of the Board was the most controversial governance change, and none of the three options ultimately made it onto the ballot—despite initial Council approval—due to a variety of political influences.

### *4.4 The Los Angeles 2020 Commission*

The most recent example of a governance-related initiative is the Los Angeles 2020 Commission. In 2013, the City Council President requested an independent, private commission to study and report on fiscal stability and job growth in Los Angeles.[17] This effort was endorsed by Mayor Villaraigosa and involved leaders from across the community. It found that Los Angeles had a crisis in leadership and direction; however, its findings were apparently met with little enthusiasm or action.[18,19]

The first report published in December 2013 found that Los Angeles was underinvesting in the "competitive modernization" of the port, airport, and LADWP.[20] The second report published in April 2014 included a specific recommendation for the governance of LADWP:[21] create a truly independent oversight and rate-setting body. Like previous studies, the 2020 Commission found that the Department is subject to too much political interference and, as a consequence, high leadership turnover. It concludes that "this leads to instability and constant shifts in direction and policies and ultimately impacts DWP's ability to make good long-term decisions." This echoes PA Consulting in the 2009 IEA Survey, in particular.

[17] Information on the Los Angeles 2020 Commission available at: www.la2020reports.org.
[18] "L.A.'s mellow response to 2020 Commission's crisis warning," Los Angeles Times, June 15, 2014 (www.latimes.com/opinion/op-ed/la-oe-newton-column-2020-report-beutner-wesson-20140616-column.html).
[19] "Why is LA's City Council Ignoring the Recommendations of the LA 2020 Commission?" CityWatch, January 9, 2015 (clkrep.lacity.org/onlinedocs/2014/14-1184_misc_1-8-15.pdf).
[20] "A Time for Truth," Los Angeles 2020 Commission, December 2013 (www.la2020reports.org/reports/A-Time-For-Truth.pdf).
[21] "A Time for Action" Los Angeles 2020 Commission, April 2014 (www.la2020reports.org/reports/A-Time-For-Action.pdf).

The 2020 Commission recommends creating a Los Angeles Utility Rate Commission to be an independent regulator and the ultimate rate-setting authority for the utility. The commission would have a five-member Board appointed by the Mayor and approved by City Council. In addition to setting rates, the Board would also appoint the general manager, determine policy, and provide overall operational oversight. A full-time, professional staff would advise the Board.

Ultimately, the 2020 Commission believed that an independent appointed Board with professional advisory staff would function efficiently and consistently as a professional rate-setting body, remove most of the destabilizing politics from LADWP, and reduce the distraction in City government related to LADWP.

The 2020 Commission presented to City Council after the release of the second report in April 2014, but as mentioned, reportedly met with a cool reaction. Eventually, a number of the 2020 Commission's recommendations were referred to the Rules, Elections, and Intergovernmental Relations Committee, which in turn referred them to several other committees. Council approved this referral on January 20, 2015.[22] From here, the recommendations will go through the lengthy committee hearing process. The recommendation for the Los Angeles Utility Rate Commission has not yet been included in the committee process.

[22] Report available at: clkrep.lacity.org/onlinedocs/2014/14-1184_ca_01-20-15.pdf.

# 5. Review of Alternative Governance Structures

To identify examples of governance structure options for LADWP, Navigant reviewed the governance arrangements of other U.S. municipal utilities. Los Angeles stakeholders were particularly interested in seeing a selection of different public utility governance models, supporting the notion that there is real interest in a City Charter change.

There are various types of municipal utilities, including utility districts like SMUD, public utilities commissions like SFPUC, and city-owned departments like LADWP but with different roles and responsibilities. As evidenced by the case studies described in this section, utilities take a relatively wide variety of approaches to the formation of the governing body, the utility's financial relationship to the municipality, and other areas of governance. To synthesize our findings, we group the case studies into three general forms of governance: elected board governance, elected city official governance, and appointed board governance. We also analyze the strengths and weaknesses of these structures in the context of the applicable governance challenges identified in Section 3. Specifically, each of the three models of governance is evaluated on the basis of the two issues most easily addressed by structural changes: decentralized city authority and the lack of external reporting, trust, and transparency.

This section also provides a summary of other Ratepayer Advocate roles in municipal utilities and in the California Public Utility Commission (Section 5.4) for comparison to the Los Angeles OPA.

## *5.1 Elected Board Governance*

### 5.1.1 Sacramento Municipal Utility District

Sacramento Municipal Utility District (SMUD) is an electric-only utility with a service territory including most of Sacramento County and a portion of Placer and Yolo Counties, with a population of 1.4 million. A utility district is a public agency created by the local community (i.e. a portion of a city, county, or multi-county), typically because residents want new or improved utility services.[23] The citizens of Sacramento voted in favor of the community-owned electric service in 1926, but due to legal hurdles SMUD was not officially operational until 1946. The citizens wanted to control the power resources of their city,[24] were dissatisfied with Pacific Gas & Electric rates and service, and generally distrusted corporate monopolies.[25]

Under the California Municipal Utility District Act, any public agency with unincorporated territory or two or more public agencies with or without unincorporated territory may organize and incorporate as a municipal utility district.[26] The Act gives SMUD the power to fix rates and charges for commodities or services it furnishes, and to incur indebtedness and issue bonds or other obligations. SMUD is exempt from payment of federal and state income taxes and, under most circumstances, real and personal

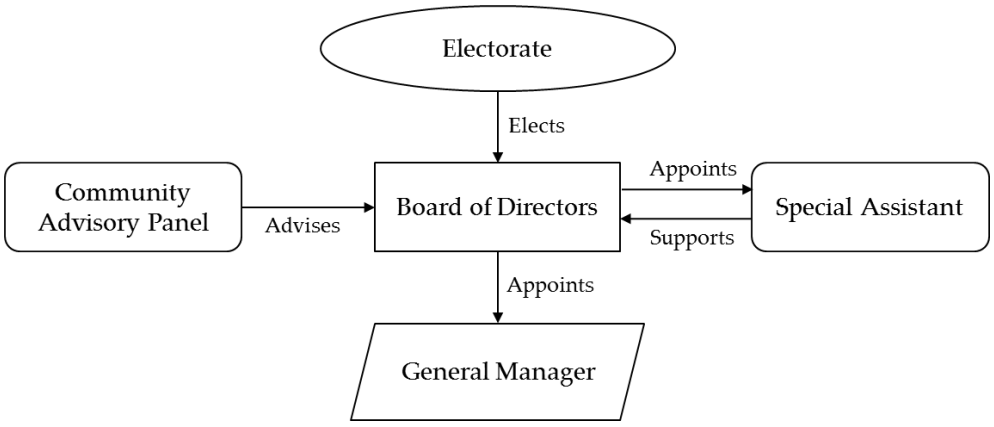
[23] "Governance in a Changing Market," RAND Corporation, 2001, pp. 30-31.
[24] SMUD website (www.smud.org/en/about-smud/company-information/history/).
[25] IBEW 1245 website (ibew1245.com/education/history-of-our-union/sacramento-municipal-utility-district).
[26] A "public agency" is defined as a city, county, water district, county sanitation district, or sanitary district. See California Public Utilities Code Section 11501-09 and 11561-62.

property taxes.[27] In addition, SMUD must submit annual financial reports to the State Controller and must follow state laws pertaining to public meetings, bonded debt, record keeping, and elections.[28]

SMUD is governed by a seven-member Board of Directors. Board members are elected for four-year terms by customers from each of the seven geographic areas within the company's service area. Board membership is on a part-time basis compensated at a daily rate for up to ten days of service per month.[29] The Board of Directors appoints the General Manager/CEO (under an employment contract), approves the budget, and approves rate changes. The Board is supported by a Special Assistant, which helps the Board fulfill its responsibilities and is hired and terminated by the Board.[30] A Community Advisory Panel also interacts with the utility, as a group of small business organization representatives that raises local small business awareness about contracting opportunities with SMUD and helps the utility expand its pool of potential contractors. New memberships are reviewed at panel meetings and approved by majority vote.[31] A simplified governance diagram is shown in Figure 5-1, below.

Up to 5 percent of the SMUD workforce can be non-civil service employees, and civil service rules and labor negotiations are approved by the General Manager/CEO.[32] To financially support the local government, SMUD customers in the City of Sacramento pay a utility tax of 7.5 percent and customers in the unincorporated area of Sacramento County pay a tax of 2.5 percent.[33]

**Figure 5-1. SMUD Governance Structure**




*Source: Navigant*

### 5.1.2 Strengths and Weaknesses

The potential strengths and weaknesses of an elected board governance structure are highlighted by SMUD's experience. According to interviews, in 2003-2004 the utility was struggling with a number of

[27] SMUD Annual Report, 2013, p. 39.
[28] California State Controller's Office, Special Districts Report (www.sco.ca.gov/ard_locarep_districts.html).
[29] GP-12 Board Compensation and Benefits (www.smud.org/assets/documents/pdf/GP-12.pdf).
[30] BL-4 Board-Special Assistant Relationship (www.smud.org/assets/documents/pdf/BL-4.pdf).
[31] SMUD Community Advisory Panel Charter (www.smud.org/assets/documents/pdf/CAP%20Charter.pdf).
[32] IBEW Local Union 1245 Memorandum of Understanding, 2013-2017 (http://www.ibew1245.com/Agreements/SMUD_MOU_2013-2017.pdf).
[33] California State Controller's Office website (www.sco.ca.gov/Files-ARD-Local/LocRep/adhoc_city_9899utilityuserstax.pdf).

governance challenges, despite structurally being the same municipal utility district as today. However, at the time the board was becoming too tied up in the details of decision-making processes, particularly in areas where it did not have sufficient expertise. Because this was becoming a significant burden on leadership, SMUD initiated an intensive two-year process to establish clear policy, roles, and expectations for the utility district.

At the end of the two years, SMUD had established a strategic direction, defining what the organization wanted to accomplish.[34] The set of policies incorporated into the overall strategic direction are grouped into three categories, as follows:

1. Strategic Direction: Defines organizational values.
    a. Core values: Competitive rates, reliability, safety, environmental leadership, ethics, etc.
    b. Key values: Research and development, economic development, system enhancement, and outreach and communication.
2. Board-Staff Linkage: Defines responsibilities and expectations.
    a. Defines the relationship between the Board and staff, including the CEO, general counsel, and auditor.
    b. Establishes performance evaluation policy.
    c. Establishes delegation policies.
3. Governance Process: Defines election, committee, and training procedures and principles, the Board's governance focus and Code of Conduct, and more.

These policies appear to have been very effective in focusing SMUD on its role as a utility now and into the future. Policies are revisited annually, which provides SMUD with the flexibility to handle the current power utility industry transition.

Although the public election process does not necessarily produce board members with utility or business expertise, SMUD has a robust training program for its Board. Strategic Development Policy GP-10 sets the standards for initial orientation and continuing education. Orientation involves in-depth conversations with utility executive including the CEO. Continuing education includes industry conference attendance and presentations by industry experts organized by a committee focused on strategic development. Although board terms are set for four years, members traditionally serve multiple terms. This affords members the opportunity to become experts in the field, as well as providing leadership continuity.

The Board relies on information provided by SMUD staff for decision-making, but policies establish a permanent internal auditor role[35] and mandate an annual audit from an external auditor.[36] As elected officials, Board members are also accountable to their wards. Due to the nature of elections, the elected board governance structure does not completely remove politics for SMUD. However, the well-defined strategic direction and supporting policies have reduced politics by establishing a highly articulated

[34] Overview of SMUD's strategic direction available at: www.smud.org/en/about-smud/company-information/board-of-directors/strategic-direction.htm.
[35] Board-Internal Auditor Relationship, BL-3 (www.smud.org/assets/documents/pdf/BL-3.pdf).
[36] External Auditor Relationship, GP-14 (www.smud.org/assets/documents/pdf/GP-14.pdf).

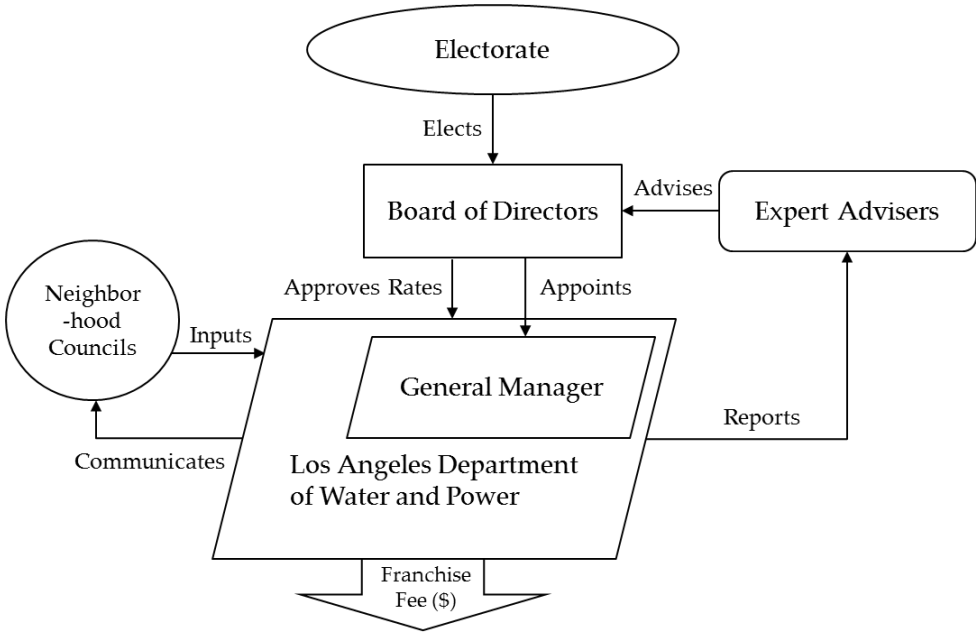
operating structure. An additional element of stability is the CEO's contract, which helps protect the position from political pressures.

SMUD interfaces with local governments via partnerships (e.g. the Mayor of Sacramento's 10,000 Home Initiative) and through the local government group in SMUD and key account representatives working with jurisdictions on energy efficiency and environmental goals. This could be a weakness of the model according to city officials who lack the authority to dictate policy for the utility, but there are numerous partnership opportunities to align goals. Overall, stakeholders have expressed high satisfaction with the current SMUD governance model, both in interviews with Navigant and in survey results from an outside study.[37]

### 5.1.3 Opportunities for LADWP

Based on the apparent success of SMUD, the municipal utility district model may have significant potential to de-politicize the governance structure by distancing the utility from the primary political bodies and allowing it to function as an independent business organization, while directly serving the citizens of Los Angeles and maintaining financial support for the city. This transition could result in a LADWP governance model to the one shown in Figure 5-2, below.

**Figure 5-2. LADWP Municipal Utility District Governance Sample**




*Source: Navigant*

In this model, the Board of Directors should also have a panel of subject matter experts appointed to monitor and analyze the Department to support decision-making, similar to SMUD's internal auditor role but reporting solely to the Board. The Los Angeles Neighborhood Councils could still function as citizen advisories; however, the OPA as a city department would need to be revised to apply to an

[37] "Improving Public Utility Governance: A Case Study," Leading Resources Inc., 2015 (www.oppd.com/media/165301/2015-2-improving-public-utility-governance.pdf).

independent utility district. One possibility is for OPA to act as liaison between City government and the utility district. The utility district could pay a franchise fee or tax to Los Angeles, which could effectively maintain the City Transfer.

As demonstrated by SMUD, strong elected board leadership requires well-defined policies. These would potentially enable the internal and external controls and reporting necessary to transform LADWP into a transparent, communication driven, and accountable organization. However, the election of board members still leaves governance open to some politicization. In this environment, the general manager/CEO's employment contract is important to minimizing political influence because it provides the CEO a secure, defined role.

Elected board governance for LADWP is only possible through a City Charter change and would result in the City of Los Angeles losing direct control of the utility. As an independent agency, the general manager/CEO would have responsibility for negotiating the labor agreement.

**Table 5-1. Elected Board Structure: Resolution of Governance Challenges**

| Governance Challenges | Decentralized City Authority | Lack of External Reporting, Trust, and Transparency |
|---|---|---|
| ***Does Address*** | • Elected board acts as a clear central authority<br>• Other City politics no longer relate directly to the utility<br>• Focused attention on utility matters at all times<br>• More shared responsibility between the board and utility executives | • Direct reporting channel established between utility leadership and board<br>• Candidate qualifications impact election results, encouraging nominees with relevant expertise<br>• Decision making is likely to be based on firm business principles |
| ***Does Not Address*** | • Opportunity for politicization around election of board members<br>• Opportunity for too much board involvement in utility operations (though this could be mitigated by well-defined policies) | • Elected board members may have limited experience (though this could be mitigated by training and a dedicated advisory staff)<br>• Potential for controversial elections to lead to public distrust |

## *5.2 Elected City Official Governance*

### 5.2.1 Seattle City Light

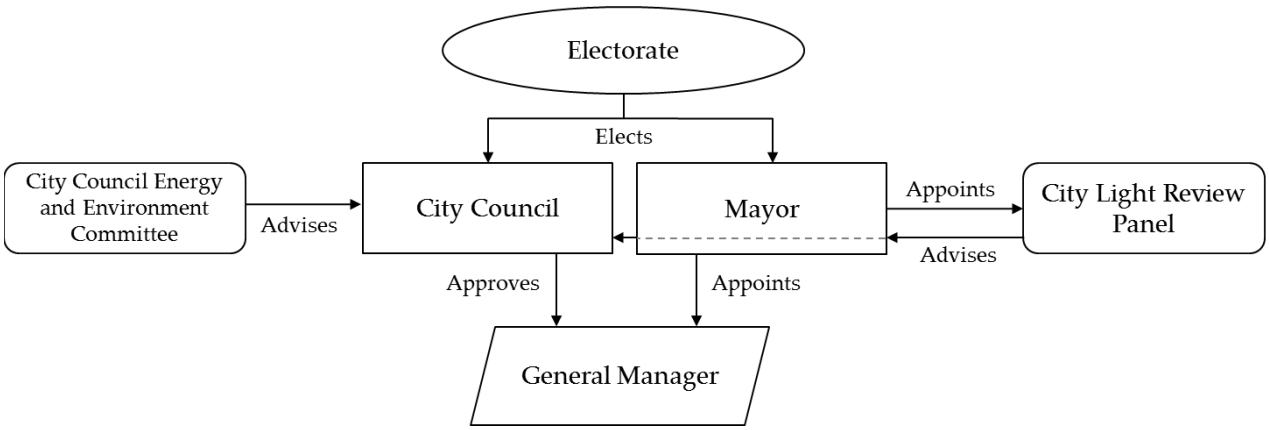
Seattle City Light (SCL), or the City Light Department, is an electric utility serving 415,000 customers in the City of Seattle and eight adjacent jurisdictions, created by the citizens of Seattle in 1902.[38] It is governed by Seattle City Council and the Mayor of the City of Seattle as a City Department established by the Seattle Municipal Code, Title 3 and the City Charter. The mayor appoints the general manager subject to the approval of the council, and makes a recommendation to the council regarding rates based

[38] 2014 Annual Report (www.seattle.gov/light/pubs/annualrpt/2014/default.html).

on information from SCL. City Council is the final ratemaking authority.[39,40] Additionally, the Council's Energy and Environment Committee reviews the processes and policies of SCL, including rates and resource matters, and provides recommendations to Council. Six percent of rate revenue goes to the City's General Fund.

The City of Seattle and City Light Department enter into the labor agreement through the Joint Labor/Management Committee process, with representatives from the General Manager and CEO of Seattle City Light, City of Seattle Director of Labor Relations, Seattle City Light Human Resources Officer, and the Union Business Manager.[41]

**Figure 5-3. Seattle City Light Governance Structure**




*Source: Navigant*

### 5.2.2 Austin Energy

Austin Energy is a department of the City of Austin and the largest city in the United States whose municipal utility is governed directly by its city council.[42] Austin City Council appoints the general manager and approves the utility's policy, rates, budget, and bond issuances.[43]

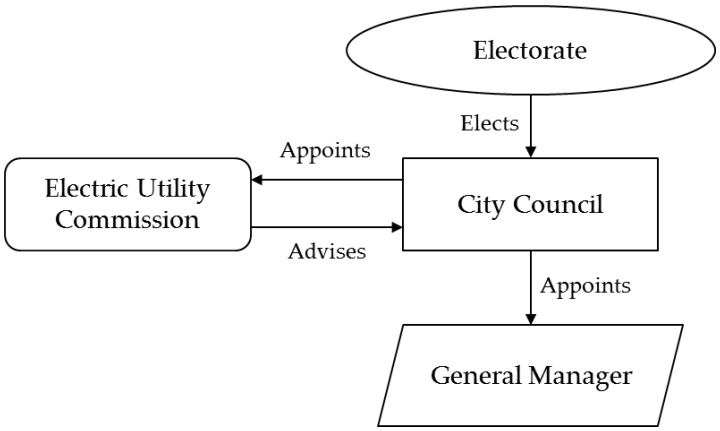
The city also has an Electric Utility Commission (EUC), a seven-member citizen's advisory committee appointed by City Council. Committee members may include registered engineers with experience in power production, attorneys, and utility customers who live outside the city's corporate limits. The EUC reviews and analyzes the utility's policies and procedures including rate structures, fuel costs, budget, and strategic planning.[44] Recommendations are given to City Council, the City Manager, the utility, city

[39] Seattle governance structure, Office of the City Clerk (www.seattle.gov/cityclerk/legislative-process-guide/governance-structure).
[40] Seattle City Light Strategic Plan Interim Outreach Meeting Summary, June 8, 2011 (www.seattle.gov/light/strategic-plan/docs/Forum%20Summary%20-%20McKinstry%20-%20June%208.doc).
[41] IBEW Local 77 agreement, 2013-2017 (www.seattle.gov/personnel/resources/pubs/Local%2077%20CBA%202013-16.pdf).
[42] Austin Electric Utility Commission Report and Recommendations Regarding Future Governance of Austin Energy - October 29, 2012 (austinenergy.com/wps/wcm/connect/fd6c0304-afca-495a-a6f5-0c96d84f1611/EUCgovernanceRecommendationsOct2012.pdf?MOD=AJPERES).
[43] Response to Resolution 20130321-041 Comparison of Municipal Utility Performance, Austin Energy.
[44] City of Austin website (www.austintexas.gov/euc).

departments and city boards. Austin City Council adopted a policy in 2012 requiring that rates be reviewed every five years.

Austin Energy makes a General Fund Transfer of its net revenue to the city, which is an annual payment that does not exceed 12 percent of its three-year average revenue (i.e. the actual total revenues of the past two years plus the current year projection of total revenue).[45]

**Figure 5-4. Austin Energy Governance Structure**




*Source: Navigant*

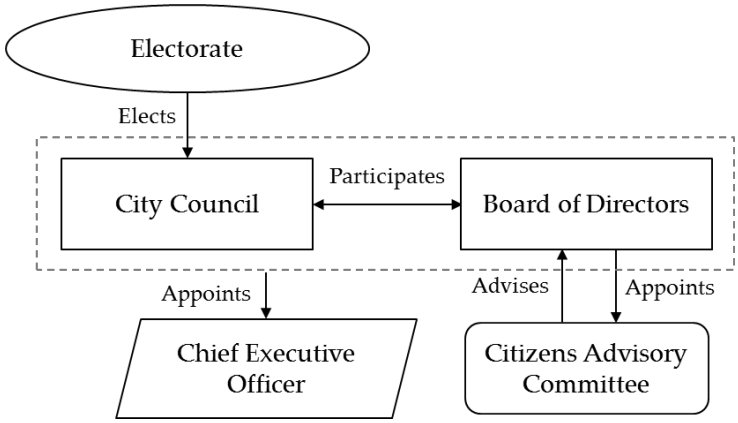
### 5.2.3 Colorado Springs Utilities

Colorado Springs Utilities (CSU) is an enterprise of the City of Colorado Springs, providing power, natural-gas, water, and wastewater services. CSU is governed by the City Council directly and through its Board of Directors, which wholly comprises City Council members. City Council approves the budget and acts in a legislative capacity to establish ordinances regarding utility services and to issue bonds. City Council also fills a regulatory role similar to the California Public Utilities Commission to establish tariffs, rates, and extension policies. As the Board of Directors, councilmembers establish policy direction for the utility and monitor performance.

City Council appoints and establishes executive limitations for CSU's Chief Executive Officer, who is accountable for all management and operational responsibilities. The Board of Directors appoints a seven-member citizens Utilities Policy Advisory Committee (UPAC) that develops policy recommendations from an informed perspective for consideration by the Board. The mayor is currently required to sign all CSU contracts; however, this is the result of an oversight during a charter change process in 2010, in which the city transitioned from a council-manager to a council-mayor form of government.[46]

[45] City of Austin, Texas Financial Policies, Volume II, pp. 516-517.
[46] Governance Alternatives White Paper, Colorado Springs Utilities, January 2011 (www.csu.org/CSUDocuments/governancealternatives2011.pdf).

**Figure 5-5. Colorado Springs Utilities Governance Structure**




*Source: Navigant*

### 5.2.4 Strengths and Weaknesses

In theory, the elected city official model of governance provides some clarity of leadership if there is one central authority removing confusion around roles and responsibilities and establishing a direct reporting channel; however, this is not the case when there are multiple elected officials involved. Directly involved elected city officials also allows for a greater degree of politicization.

External reviews conducted for the preceding utilities help highlight the several weaknesses associated with elected city official governance. A 2011 UMS Group report highlighted inefficiencies in Seattle City Light governance, suggesting that enhanced organizational performance through benchmarking, efficiencies, and performance-based reporting efforts aimed at making the utility leaner could, with other improvements, save SCL $35 million a year. The report echoed the findings of a 2006 expert panel, which recommended that the city appoint an independent board. In particular, the expert panel noted that SCL is vulnerable to "political winds."[47]

In 2012, the Austin City Council asked the Electric Utility Commission (EUC) to evaluate alternative governance models provided by the City Manager.[48] Like the UMS report for SCL, the EUC's evaluation resulted in a recommendation for the Austin City Council to transfer management and control of Austin Energy to an independent board of trustees in order to increase transparency and accountability, improve efficiency, clarify leadership, remove political interference, and provide a mechanism by which all Austin Energy customers would be represented.

Colorado Springs Utilities has faced even more scrutiny. Since becoming an enterprise of the municipal government in 1993, four separate studies have examined a change in governance structure, each recommending CSU establish an independent board of directors. The latest study identified the following drivers and benefits of transitioning governance to an independent board:

[47] "Seattle City Light told to get leaner as rates rise," *The Seattle Times*, December 3, 2011 (www.seattletimes.com/seattle-news/seattle-city-light-told-to-get-leaner-as-rates-rise).
[48] "Governance Study of Public Power Utilities for the City of Austin," Bob Kahn, LLC, August 27, 2012 (austinenergy.com/wps/wcm/connect/f3bb639b-6433-4dfb-a687-b0c0376ed3b1/governanceStudy.pdf?MOD=AJPERES).

- Business drivers: the complexity of running a multi-service utility is accelerating (due to resource supply uncertainty, volatile costs of fuel and purchased power, expensive environmental compliance, high financial scrutiny, increasing risks and liabilities, a shrinking work force, and rising customer expectations), demanding governance by a devoted team with utility expertise.
- Political drivers: the breadth of constituency concerns managed by City Council and the relatively short-term duration necessarily results in members with a narrow window to become experienced in utility issues and a limited bandwidth for utility matters.
- Benefits: a separate board would relieve City Council from an extensive time commitment, providing more opportunity for Council to engage in its core role on behalf of the City. The appointed board would be a clear delineation from the municipal government, enabling the long-term interests of the utility to be placed above short-term or political goals. Additionally, rating agencies support strong independent boards with industry expertise as the preferred governance structure.[49]

Despite the recommendations of these reports, SCL and Austin Energy have not changed their governance structures. The SCL committee with oversight of the utility rejected an independent board structure, pointing to lax corporate boards that contributed to the recession. However, the report did spur the creation of SCL's first multi-year plan in its 100-plus-year history, based on four key objectives: improving customer experience and rate predictability; increasing workforce performance and safety; enhancing organizational performance; and continuing conservation and environmental stewardship.[50]

In 2013, Austin City Council postponed indefinitely the ordinance that would have formed an independent board. Instead, it approved an ordinance to form a council subcommittee to provide oversight and policy recommendations.[51] CSU is in the midst of a Governance Structure and Governance Process Review led by the Board. The public review will determine a proposed governance structure and/or governance process and is targeting the implementation of a development plan in April 2016.[52]

The fact that each of these utilities has had an outside entity suggest a transition to governance by an independent board but been unable to make that transition attests to the extreme difficulty of restructuring the governance model of a large utility. To help guide LADWP through this challenge, Navigant included a process roadmap in Section 6.

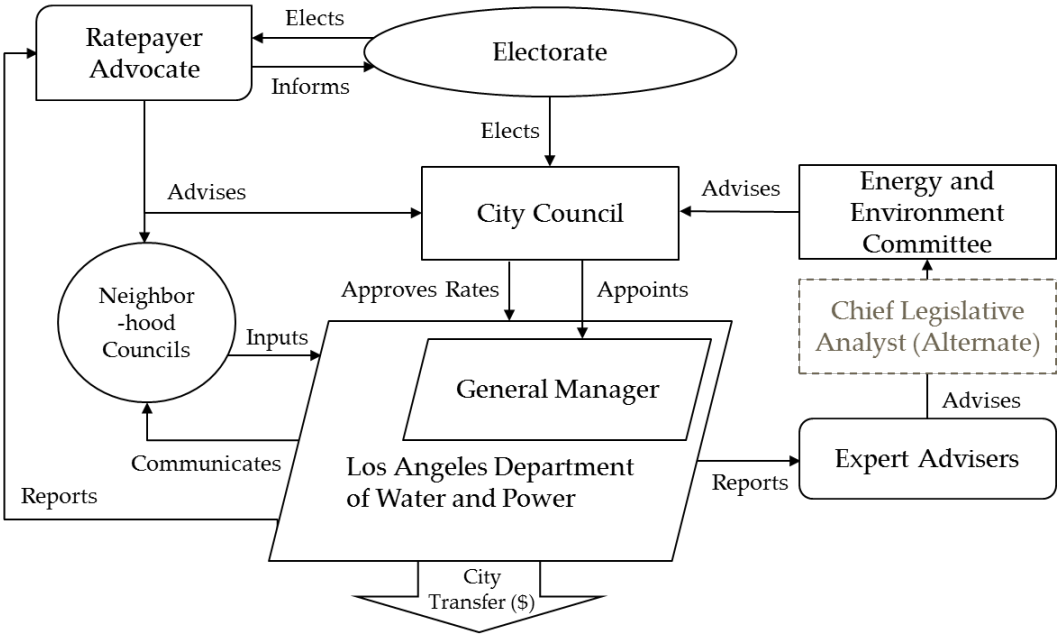
### 5.2.5 Opportunities for LADWP

LADWP's is already governed largely by elected city officials. If it were to transition to full City Council authority like Austin Energy, it would reduce the number of City stakeholders and centralize

[49] Governance Alternatives White Paper, Colorado Springs Utilities, January 2011 (www.csu.org/CSUDocuments/governancealternatives2011.pdf).
[50] "Seattle City Light rate plan provides predictability, accountability," *The Seattle Times*, June 21, 2012 (www.seattletimes.com/opinion/seattle-city-light-rate-plan-provides-predictability-accountability).
[51] "Austin Energy governance ordinance postponed indefinitely," *Community Impact Newspaper*, May 24, 2013 (communityimpact.com/2013/05/24/austin-energy-governance-ordinance-postponed-indefinitely/).
[52] Governance Process and Governance Structure Review, Colorado Springs Utilities (www.csutilitiesgovernance.com/home).

responsibility for LADWP. Making this transition while maintaining a fairly similar structure to the current one could result in a governance model similar to Figure 5-6, below.

**Figure 5-6. LADWP City Council Governance Sample**




*Source: Navigant*

The Council's Energy and Environment Committee would still review the processes and policies of LADWP, including rates and resource matters, and provide recommendations to the Council. Alternatively, the CLA could fill the role of adviser to City Council on LADWP matters. With this model, a panel of subject matter experts should also be appointed to monitor and analyze the Department and support the Energy and Environment Committee or CLA. As in the current governance structure, the Ratepayer Advocate could also function as an independent analyst and the Neighborhood Councils could continue to function as citizens advisory committee-type bodies. LADWP could also continue to provide the City Transfer in its current form.

However, as found in Seattle, Austin, and Colorado Springs, the utility would likely remain highly prone to political influence and may continue to experience transparency and accountability issues.

**Table 5-2. City Council Structure: Resolution of Governance Challenges**

| Governance Challenges | Decentralized City Authority | Lack of External Reporting, Trust, and Transparency |
|---|---|---|
| ***Does Address*** | • City Council acts as a clear central authority | • Direct reporting channel established between utility leadership and City Council |
| ***Does Not Address*** | • Inherent politicization of decision making<br>• Interest in utility matters influenced by election cycles | • Without a dedicated advisory staff, City Council has limited expertise and bandwidth for utility issues<br>• Utility is vulnerable to public distrust of politics |

| | | |
|---|---|---|
| | • Appointed utility executives more vulnerable than City Council to blame for utility missteps | • Decision making based on political whim rather than firm business principles |

## *5.3 Appointed Board Governance*

### 5.3.1 San Francisco Public Utilities Commission

The San Francisco Public Utilities Commission (SFPUC) is a department of the City and County of San Francisco, providing water, power, and wastewater services to the city and surrounding area. Power customers are primarily San Francisco municipal departments (San Francisco International Airport, San Francisco Police Department, San Francisco Fire Department, etc.), certain residents and businesses, and the Modesto and Turlock Irrigation Districts. Surplus energy is sold on the open market. In addition to providing retail drinking water and wastewater services to San Francisco, SFPUC also supplies wholesale water to three Bay Area counties.[53]

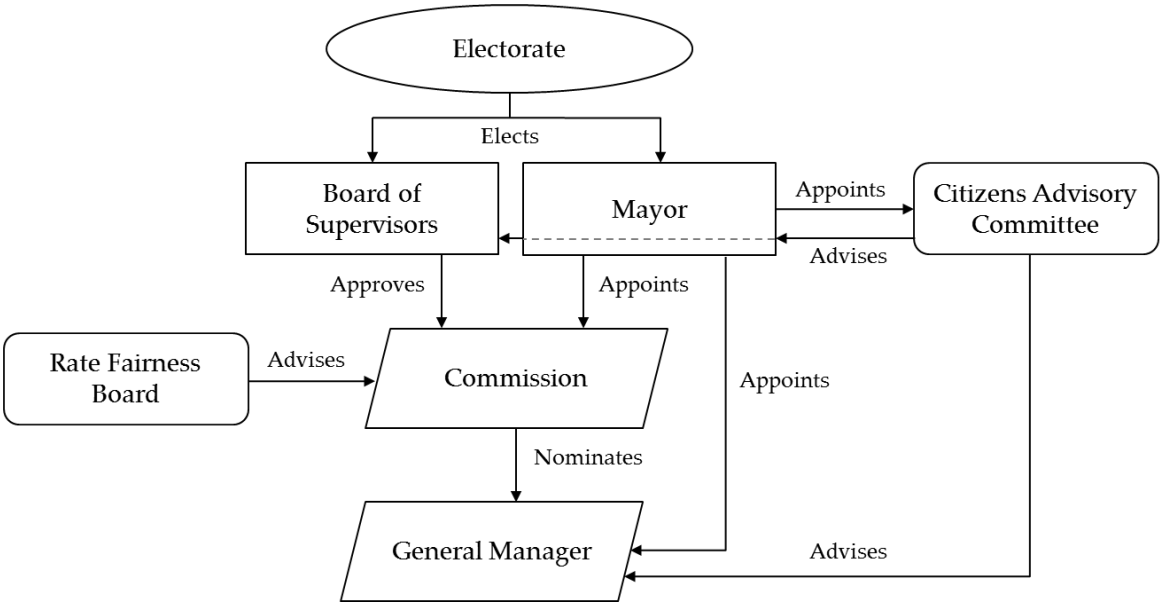
SFPUC is governed by five commissioners who are nominated by the Mayor and approved by the San Francisco Board of Supervisors, which is a legislative branch of the City and County of San Francisco. Each of the 11 members of the Board of Supervisors is elected on a non-partisan basis by the district in which he or she lives.[54] The SFPUC commissioners serve on a part-time basis[55] for terms of four years, determine utility rates, approve contracts, and define organizational policy. Previously, a 2008 City Charter amendment made several significant changes to SFPUC governance. It terminated the appointment of five commissioners (all of whom had been appointed by the mayor alone), set new qualifications, and required that the Board of Supervisors approve the mayor's appointments by majority vote (previously, the Board could reject an appointee with a two-thirds vote but did not have approval authority). Qualifications include expertise in environmental policy, consumer advocacy, project finance and power, and public utility management.[56]

The SFPUC also has a 17-member Citizens Advisory Committee that provides feedback to the Commission and the Board of Supervisors on the utility's long-term strategic, financial, and capital improvement programs. Each member of the Board of Supervisors appoints a resident of his or her district to the committee and the President of the Board appoints two additional members. The mayor appoints the remaining four members. The mayor also appoints the general manager nominated by the SFPUC. The general manager and SFPUC then enter into an employment contract with a fixed term (not limited to one term).[57]

[53] SFPUC website (www.sfwater.org).
[54] San Francisco Board of Supervisors website (www.sfbos.org).
[55] Assumption that City employees serving on charter-mandated boards and commissions will spend 0.25 of their time in service, and SFPUC commissioners are compensated at $100 per month (www.sfcontroller.org/Modules/ShowDocument.aspx?documentid=2392).
[56] SFPUC Comprehensive Annual Financial Report, 2009, p. 2.
[57] https://infrastructure.sfwater.org/fds/fds.aspx?lib=SFPUC&doc=762564&data=293587140.

The city's Director of Human Resources enters into labor agreements on behalf of the City and County of San Francisco, its Boards and Commissioners, and on behalf of City Departments.[58] Surplus revenue that the SFPUC determines is not required for utility purposes may be transferred to the city's general fund.[59]

**Figure 5-7. SFPUC Governance Structure**




*Source: Navigant*

### 5.3.2 CPS Energy

CPS Energy (CPSE) is a natural gas and electric utility owned by the City of San Antonio. It is the largest municipally-owned utility in the U.S. that provides both natural gas and electric service, with more than 1 million total customers in and around San Antonio. The City of San Antonio acquired the former San Antonio Public Service Company in 1942.

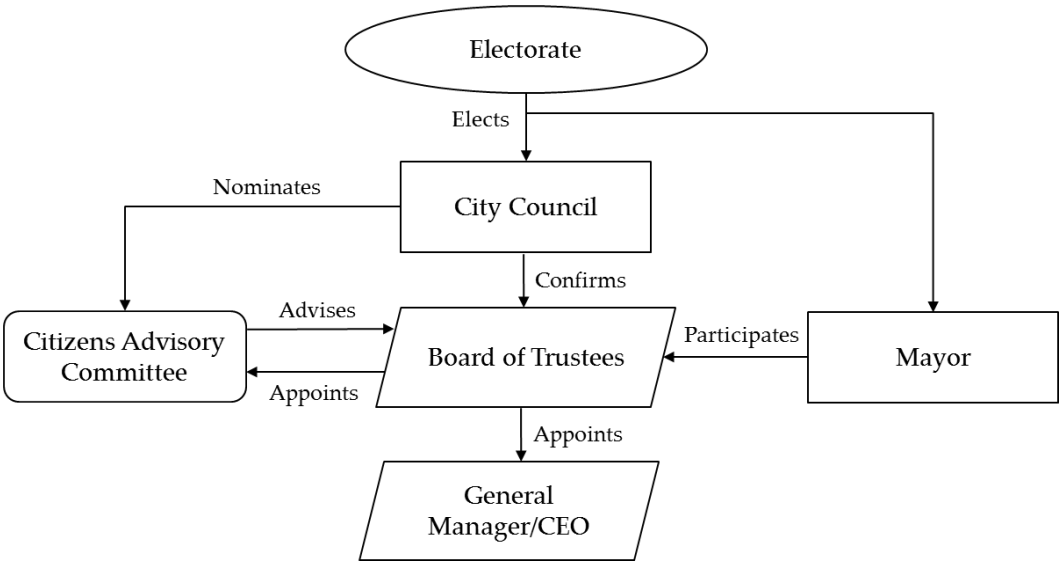
CPSE is governed by a five-member Board of Trustees, which includes the mayor (ex-officio) and four other representatives from the four geographical quadrants of San Antonio. Board members serve part-time for a term of five years and are eligible for an additional term.[60] Board of Trustees vacancies are filled by majority vote of the remaining members and confirmed by City Council. The mayor is responsible for keeping the City Council informed about the Board's actions and decision. The Board of Trustees appoints the utility CEO, approves the budget, and provides rate recommendations to City Council for approval. CPSE appoints all officers and employees, self-funds its pension and health care

[58] IBEW Local 6 Collective Bargaining Agreement, 2014-2017 (www.sfdhr.org/modules/showdocument.aspx?documentid=20603).
[59] SFPUC Comprehensive Annual Financial Report, FY 2012-13, p. 43.
[60] CPS Energy website (www.cpsenergy.com/en/about-us/who-we-are/trustees.html).

plans, and is completely independent of city services such as HR, financial, fleet, etc.[61] Trustees receive a small annual compensation.[62]

14 percent of the utility's gross revenue is transferred to the City's general fund each year.[63]

**Figure 5-8. CPS Energy Governance Structure**




*Source: Navigant*

### 5.3.3 Jacksonville Energy Authority

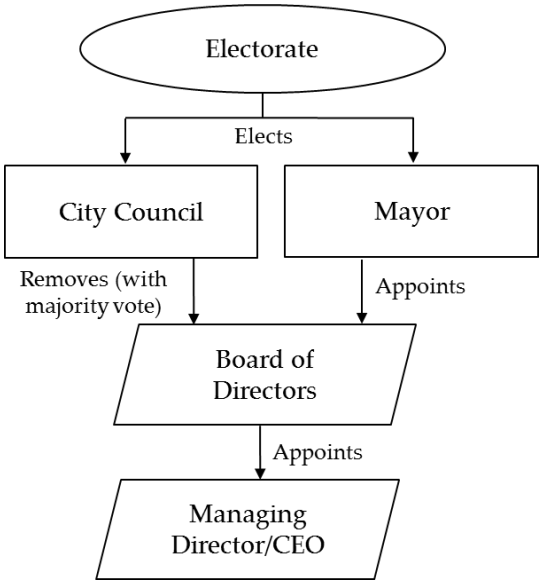
Jacksonville Energy Authority (JEA) is an independent city agency in Jacksonville, Florida, created by the consolidation of city and county governments, providing power, water, and wastewater services. The utility is governed by a seven-member Board of Directors that is appointed by the mayor and confirmed by the city council. Board members serve four-year terms for no more than two consecutive terms and are uncompensated.[64] JEA pays a franchise fee of 3 percent of electric system and water and sewer system revenues.[65]

The Board of Directors appoints the utility CEO and has the power to approve rate changes for the utility; however, City Council approves its budget.[66] Accordingly, the JEA governing board is distanced from City Council and board member removal requires two-thirds of the City Council vote.[67] The City of

[61] "Governance Study of Public Power Utilities for the City of Austin," Bob Kahn, LLC, August 2012 (austinenergy.com/wps/wcm/connect/f3bb639b-6433-4dfb-a687-b0c0376ed3b1/governanceStudy.pdf?MOD=AJPERES).
[62] $2,000 per year. The chairperson received $2,500 per year and the mayor receives no compensation (https://webapps2.sanantonio.gov/boardcomm/PrintAgenda.aspx?id=CPS%20Energy%20Board).
[63] http://newsroom.cpsenergy.com/blog/corporate-responsibility/community-involvement/publicly-owned-cps-energy/.
[64] Charter of the City of Jacksonville, Section 21.03 (www.municode.com/library/fl/jacksonville/codes/code_of_ordinances?nodeId=CHRELA_PTACHLACHJAFL_ART21JE).
[65] Charter Section 21.07.
[66] JEA website (www.jea.com/About/Company_Info/Budget_Process/).
[67] "Governance in a Changing Market," RAND Corporation, 2001, p. 24.

San Antonio Employee and Labor Relations Division manages and administers the City's labor relations, making recommendations to the mayor, city council, and department heads.[68]

**Figure 5-9. JEA Governance Structure**




*Source: Navigant*

### 5.3.4 Strengths and Weaknesses

Appointed board governance offers many of the strengths seen with an elected board. Clear leadership by a central authority with subject matter expertise and dedicated attention simplifies operations and provides the professional oversight necessary to create an atmosphere of accountability and support long-term goals based on firm business principles. Additionally, with set terms and appointment limits, an appointed board may have the greatest potential to be distanced from city-wide politics. With the proper controls, appointed board members could be protected from political whims and function as a fully professional entity.

On the other hand, while the model creates a direct reporting channel between the utility and the board, the structure may not sufficiently establish transparency and oversight between the utility, the board, and elected city officials. In 2009, CPSE found itself in the midst of a $32 million lawsuit to exit the South Texas Project nuclear deal with NRG Energy. This, in part, was the result of CPSE executives withholding critical financial information from the Mayor and City Council regarding a $4 billion increase in expected construction costs of the nuclear reactors, which would have required a larger rate increase than originally proposed. The utility's CEO, another executive, and several board members were forced to step down as a result, and the utility continues to repair public trust issues.[69]

JEA provides another example of the importance of transparency and trust within an appointed board governance structure. The utility is currently facing serious governance and legal issues with the

[68] Charter Section 33.401.

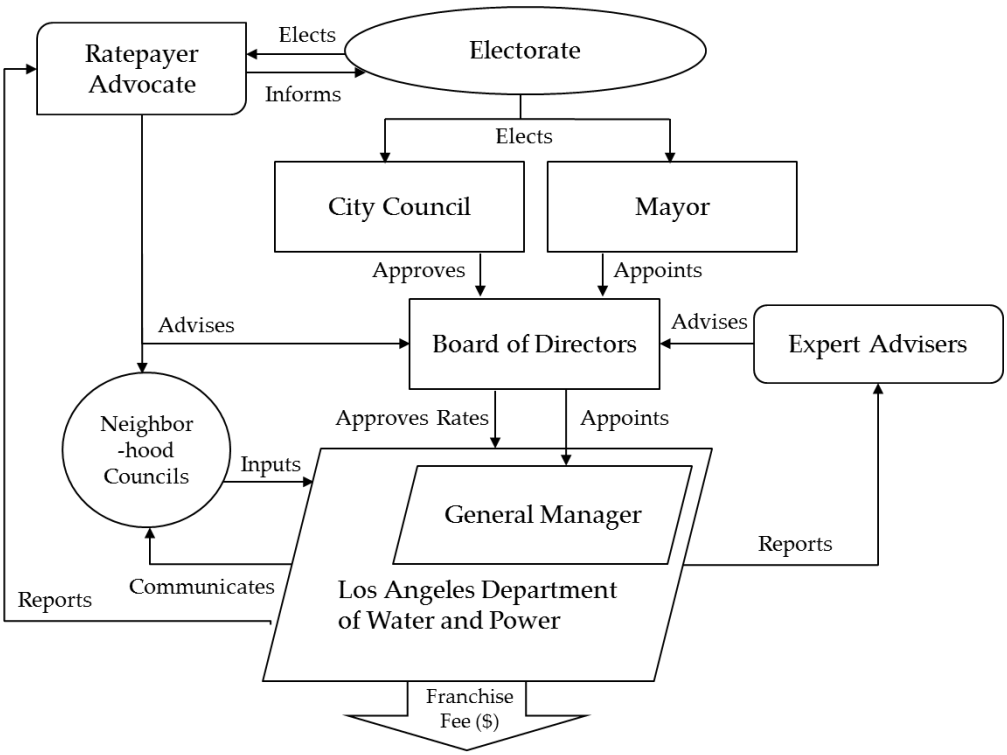
[69] "CPS deal died of multiple causes," San Antonio Express-News (intrabecc.cocef.org/programs/intranetnotasperiodico/uploadedFiles/cpsdealdiedofmultiplecauses.pdf).

Sunshine Law: the Board was discovered to be preparing scripted talking points in advance of meetings. Unfortunately, this comes at a time when the utility has been working to earn the public's trust and confidence regarding the utility's long-standing practice of employee annual bonuses. The Chief Administrative Officer commented that a "complete revamp of structure and leadership may be in order" at JEA. Thus far, the mayor has asked two board members to resign.[70]

### 5.3.5 Opportunities for LADWP

LADWP currently has one type of appointed board governance structure; however, a new version may be required to solve the governance issues related to transparency, accountability, and oversight. One possibility for an appointed board structure would be the recommendation by the 2020 Commission to establish an independent, appointed Los Angeles Utility Rate Commission (Section 4.4). This would involve a five-member Board appointed by Mayor and approved by City Council serving staggered four-year terms, with direct authority to determine LADWP's policy, appoint the general manager, set rates, and provide overall operational oversight. A version of this structure is illustrated below.

**Figure 5-10. LADWP Appointed Board Governance Sample**



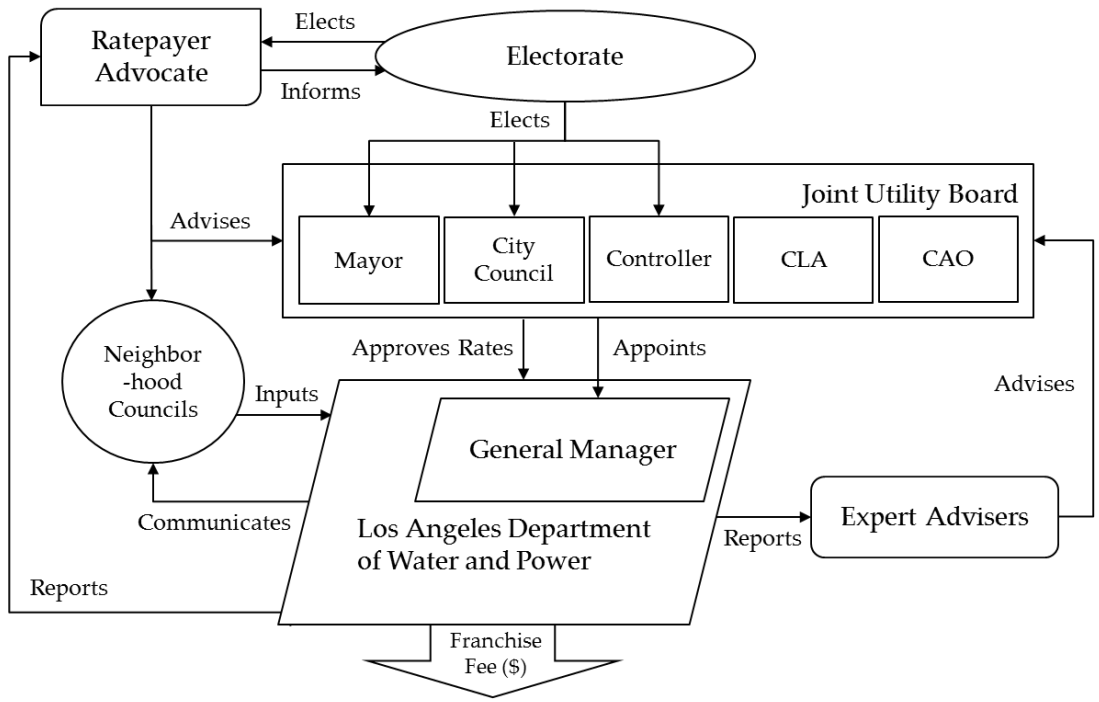

*Source: Navigant*

However, the problems encountered by CPSE and JEA argue that the utility may be at higher risk of a communication breakdown between the various layers of authority. Another option for LADWP (shown

[70] "After Times-Union report, Curry asks 'what the hell' is going on at JEA, raises legal and governance concerns," The Florida Times-Union, September 21, 2015 (jacksonville.com/news/metro/2015-09-21/story/after-times-union-report-curry-asks-what-hell-going-jea-raises-legal-and).

in Figure 5-11 below) is to simplify the structure by involving City elected officials and executives directly in the board. A board comprising five City stakeholders, as shown, would clarify and centralize roles and responsibilities while allowing multiple City offices to have direct input. However, this structure would also remain vulnerable to politicization, and disagreements between the various offices would potentially slow down decision-making processes. Additionally, as term limits are tied to City offices, the board would be prone to issues arising from relatively high turnover in leadership positions.

**Figure 5-11. LADWP Joint Utility Board Governance Sample**




*Source: Navigant*

Under either model, LADWP may pay a franchise fee rather than the City Transfer. The Ratepayer Advocate and Neighborhood Councils could likely function as before. Transitioning to an appointed board would require a Charter change.

**Table 5-3. Appointed Board Structure: Resolution of Governance Challenges**

| Governance Challenges | Decentralized City Authority | Lack of External Reporting, Trust, and Transparency |
|---|---|---|
| ***Does Address*** | • Appointed board acts as a clear central authority<br>• Focused attention on utility matters at all times<br>• More shared responsibility between board and utility executives | • Direct reporting channel established between utility leadership and board<br>• With board member expertise requirements, members will have necessary skillset and knowledge to run the utility<br>• Decision making likely to be based on firm business principles |
| ***Does Not Address*** | • City-wide politics may influence board appointments (mitigated by | • Reporting channel between the board and the City not clearly established |

| | | |
|---|---|---|
| | fixed terms and limited reappointments) | • Without requirements for board member expertise, members may lack necessary skillset and knowledge to run the utility<br>• Because the board is not directly accountable to the public, it is potentially less transparent |

## *5.4 Ratepayer Advocate Structures*

LADWP's OPA currently finds itself in a role in which it is neither a regulator nor a truly independent advisor. Further refinement of the OPA's mission to establish itself as either a purely independent office focused on ratepayer priorities or an office with a staff oversight role would result in greater benefits for the Department and ratepayers. Navigant reviewed the Ratepayer Advocate roles of several of the municipal utilities above to spark a conversation on how the office can operate more efficiently and effectively.

In several utilities, the role of the Ratepayer Advocate is filled by city officials or an appointee of city officials. This creates a situation similar to the OPA's in which the entity is subject to political influence.

### 5.4.1 Seattle City Light Review Panel

Seattle City Light has a nine-member City Light Review Panel that helps develop the company's strategic plan and plays an important role in engaging SCL's ratepayers in the development and review of the utility's biennial update to the six-year Strategic Business Plan.[71] The panel includes five members nominated by the Mayor and four members nominated by City Council. Panel membership must include a set of required positions: an economist, a financial analyst, a representative from a non-profit or non-governmental organization whose mission is to advocate for the efficient use of energy, representatives from SCL's residential, industrial, commercial, and low-income customers, a representative from among SCL's suburban franchise area, and an at-large candidate.[72]

The required mix of technical experts and customer representatives serves to produce a panel that can independently handle technical rate information as well as report easily digestible financial information to ratepayers. Additionally, strict personnel requirements may curtail political influence during the nomination process and for day-to-day operations.

### 5.4.2 Austin Energy Electric Utility Commission

Austin Energy presents another structure for the Ratepayer Advocate. Austin Energy does not have a full-time ratepayer advocate, but as part of the five year rate review process the EUC can request an outside consultant to review the policies and procedures of the utility and can hire an independent consumer advocate to represent the interests of residential and small commercial customers throughout the rate-making process.[73] The independent consumer advocate is not only experienced and competent in ratemaking matters, but truly independent from Austin Energy and the EUC. This model eliminates costs associated with a full-time Ratepayer Advocate while providing a similar service; however, it does

[71] City of Seattle Ordinance No. 123256.
[72] City of Seattle website (www.seattle.gov/citylightreviewpanel/).
[73] City of Austin Code of Ordinances § 2-1-143 – Electric Utility Commission.

not provide the regular oversight of a fulltime advocate. In 2014, Austin Energy also developed a Low Income Consumer Advocacy Group to revise rules for deferred payment plans and utility service disconnections.[74]

### 5.4.3 SMUD Policies

SMUD's governance structure with its set of strategic directives serves to eliminate some of the need for a Ratepayer Advocate by establishing the maintenance of competitive rates as a core value of the utility district. Policy SD-2 clearly defines the Board's rate objectives to be the following:

- The Board establishes a rate target of 18 percent below Pacific Gas & Electric Company's (PG&E) published rates on a system average basis. In addition, the Board establishes a rate target of at least 10 percent below PG&E's published rates for each customer class.
- SMUD's rate of change for both rates and bills shall be competitive with other local utilities on a system average basis.
- In addition, SMUD's rates shall be designed to balance and achieve the following goals:
    - Reflect the cost of energy when it is used,
    - Reduce use on peak,
    - Encourage energy efficiency and conservation,
    - Minimize "sticker" shock in the transition from one rate design to another,
    - Offer flexibility and options,
    - Be simple and easy to understand,
    - Meet the needs of people with fixed low incomes and severe medical conditions, and
    - Equitably allocate costs across and within customer classes.[75]

One argument for the effectiveness of this strategy is that SMUD's rates that are among the lowest in California, and on average are more than 27% lower than those of neighboring PG&E.[76]

### 5.4.4 San Francisco Public Utilities Commission Rate Fairness Board

The SFPUC has a Rate Fairness Board (RFB) which was established by Proposition E in 2002 and comprises city residential and business customers and officials from the offices of the City Controller and City Administrator. The current roster has appointees from the Director of the Office of Public Finance, Board of Supervisors, Mayor, Controller, and City Administrator.[77] Responsibilities include conducting an annual review of the five-year rate forecast, holding public hearings on rate proposals, providing a report and recommendations to the SFPUC on the rate proposal, and submitting to the SFPUC rate policy recommendations for consideration by the Commission. Proposition E also expressly mandates that one seat of the SFPUC must be held by an experienced utility ratepayer or consumer advocate.

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[74] Austin Energy Low Income Customer Advocates information available at: www.austintexas.gov/content/austin-energy-low-income-customer-advocates.
[75] SMUD Board Policy SD-2 available at: https://www.smud.org/assets/documents/pdf/SD-2.pdf.
[76] SMUD rate comparison (https://www.smud.org/en/residential/customer-service/rate-information/rate-comparison.htm).
[77] Rate Fairness Board, SFPUC website (www.sfwater.org/index.aspx?page=120).

In 2008, Proposition I was introduced which called for the creation of the office of an independent Ratepayer Advocate for the SFPUC,[78] a role that would improve the professional and technical analysis of proposals by the RFB and theoretically would also improve the objectivity of the analysis by shielding it from political pressures. Proposition I was voted down, likely due to the perceived overlap between the position and the RFB. However, in 2012 the SFPUC adopted the Ratepayer Assurance Policy and Scorecard, which is reviewed annually as part of the budget process and independently verified and published by the Office of the Controller to ensure measurable, verifiable, and wise use of ratepayer resources. The framework is based on three key elements ratepayers expect from their utility: reliable asset management, cost-effective sustainability and mission management, and excellent service/personnel management.[79] The scorecard functions as a vehicle through which issues with the SFPUC are illuminated to increase the dialogue around performance and process improvements.

### 5.4.5 CPS Energy Citizens Advisory Committee

CPS Energy has a 15-member Citizens Advisory Committee (CAC) to enhance community relations and provide advice on all utility-related projects and programs. Ten committee members are nominated by City Council, representing each city district, and five members are at-large candidates nominated by the committee. [80] The Board of Trustees appoints nominated members to the committee. The CAC meets monthly with the primary goal of providing judicious advice from a customer perspective on utility-related projects and programs, including weighing in on a new CEO. A background in energy is not necessarily for appointment to the committee.[81] To date, there have

### 5.4.6 California Public Utility Commission Office of Ratepayer Advocates

Navigant also reviewed the California Public Utility Commission's (CPUC) Office of Ratepayer Advocates (ORA) to inform our discussion on the OPA. The ORA is an independent arm of the CPUC with the mission to obtain the lowest possible rates for service consistent with reliable and safe service levels.[82,83] The ORA has a staff of 142 engineers, economists, scientists, and auditors with expertise in regulatory issues related to the electricity, natural gas, water, and telecommunications industries in California. ORA's analysis continuously evolves to incorporate state policy directives and customer needs into the rapidly changing landscape of utility services, include state goals on topics such as increasing safety, reversing climate damage, and stimulating economic development.

In 2013, the ORA lobbied decision makers nearly 200 times, reportedly saving California ratepayers more than $1.5 billion – a significant amount compared to the Office's $24.375 million budget.[84] The ORA's independence from the CPUC removes political pressure, allowing the Office to focus solely on ratepayer needs. Additionally, the Office's success is highly attributable to the staff's expertise and

[78] Charter amendment for Proposition I available at: www.smartvoter.org/2008/11/04/ca/sf/prop/I.
[79] Ratepayer Assurance Scorecard Manual, SFPUC (sfcontroller.org/Modules/ShowDocument.aspx?documentid=4989).
[80] Citizens Advisory Committee, CPS Energy website (www.cpsenergy.com/en/about-us/who-we-are/citizens-advisory-committee.html).
[81] "CPS Energy's CAC, Citizens Advisory Committee, needs to fill vacancies," CPS Energy, August 21, 2013 (newsroom.cpsenergy.com/blog/corporate-responsibility/community-involvement/cps-energy-cac-advisory-committee).
[82] Public Utilities Code Section 309.5 (www.leginfo.ca.gov/cgi-bin/displaycode?section=puc&group=00001-01000&file=301-327).
[83] More information available at: www.ora.ca.gov.
[84] Office of Ratepayer Advocates, 2013 Annual Report (www.ora.ca.gov/AR2013.aspx).

ability to adapt to the evolving utility landscape. While the scale of the ORA is much larger than the Los Angeles OPA, it is important to note the ratepayer benefits that result from an advocate's independence, clear objectives, and ample resources.

One immediate recommendation from this observation is that—assuming further clarity of the OPA's role is provided—the office would benefit from additional supporting professional staff positions.

# 6. Roadmap for Change

Creating a new governance structure to address LADWP's current governance challenges is no small undertaking. If the City of Los Angeles chooses to pursue fundamental governance changes as discussed in this report, it will be embarking on a complex, multi-year journey. Navigant recommends that the City initiate a process by which it can ultimately propose specific governance reforms on the 2017 ballot.

The governance issues described in Section 3 should provide sufficient motivation for revisions to the City Charter by ballot measure. However, significant additional work must be completed before those revisions are determined. Without careful management and comprehensive stakeholder engagement throughout a well-defined process, the City is at risk of falling into a politically charged, contentious situation. In this section, Navigant outlines the steps and underlying principles for this change process. Because of the large scope of the challenge, the first subsection presents a set of short-term recommendations that address some of the governance issues by making improvements to the current governance structure. The following subsection lays out a framework to make more fundamental changes.

## *6.1 Short-Term Recommendations*

In the near term, increased transparency through reporting is one of the simpler solutions to several of LADWP's governance issues. Improved reporting on key metrics would help address the lack of transparency, accountability, and oversight. A variety of metrics are already reported regularly to the Board and online, but as mentioned previously, LADWP is not required to account for its performance against budgets or rates. This means that there is no clear connection between rate increases and specific accomplishments, internal Power and Water System budgets are relatively fluid, and the rate-setting authority (City Council) may not have complete information for decision-making purposes.

Navigant recommends that LADWP tie financial and performance metrics to rates by ordinance. This would mean defining and reporting a set of key metrics to decision makers on a specific schedule, in order to inform annual rate adjustments via the adjustment factors. Specifically, for each major Department program and initiative, the ordinance would require agreed-upon metrics (including budget targets and actuals, milestones, etc.) to be reported to the Office of Public Accountability, Board of Water and Power Commissioners, and City Council (Energy and Environment Committee). Issues could be elevated by the OPA to the Board and Council, establishing a clear role for the Ratepayer Advocate. These reporting requirements would not automatically impact rates; however, Council would make its decision based on the most recent, relevant, and concise information. Furthermore, establishing this procedure in the rate ordinance ensures it would be consistently followed by LADWP, regardless of management or other changes.

Tying financial and performance metrics to rates would also serve to centralize internal controls and reporting if a central office is responsible for the reporting activities. Navigant recommends that the Chief Financial Officer lead this effort within the FSO. Information from the separate organizations in LADWP would ideally be consolidated, interpreted, and disseminated from this office.

While Navigant considers it to be an improvement, this recommendation would not necessarily achieve 100 percent accountability because decision-makers are not required to act in any particular way based on the information they receive, and because there are still multiple layers of authority clouding

accountability. Having a single governing entity, for example, would address this issue more permanently. This is the type of change that can be explored during the process recommended in the next section.

## *6.2 Long-Term Recommendations*

Many utilities struggle with making long-term governance changes. As described previously in Section 5.1, since 1993 Colorado Springs Utilities has had four separate studies recommending that it move away from city council governance—without success. Seattle City Light and Austin Energy received similar recommendations in 2011 and 2012 respectively, but eventually rejected the more significant changes in favor of smaller improvements. SMUD and LADWP itself have undertaken some of the more successful change efforts, with SMUD establishing a comprehensive governance policy over a two-year process in the early 2000s and LADWP creating the OPA by Charter in 2010.

Understandably, stakeholders are often reluctant to cede control of the utility even when they acknowledge the governance structure is not working. In the case of CSU, SCL, and Austin, the city council was deciding whether or not the utility should report to city council—a clear conflict of interest, for some. Stakeholders may also feel, with or without justification, that none of the alternatives would be an improvement over the status quo. Although LADWP does not have a single governing entity, stakeholders may similarly be loath to give up what control they do have, and may also be skeptical of alternatives. With this in mind, Navigant recommends an inclusive process that emphasizes consensus among the stakeholders.

Notably, here we include representatives from union leadership. All parties involved in the management, operations, and governance of the Department would benefit from consistently positive and improved relations with the employee unions. The unions and their leadership would need to be active participants in any conversation concerning the governance of the Department.

The City of Los Angeles should take the following steps for its governance reform process:

1. City Council introduces a motion forming a committee to examine governance reforms for the LADWP, with the explicit task of reporting on its findings and recommending a measure for the 2017 ballot.
2. City Council forms a hybrid committee which includes, at a minimum, representatives from the Mayor's office, City Council Energy & Environment Committee, CAO, CLA, Controller, City Attorney, Office of Public Accountability, Board of Water and Power Commissioners, the general manager of LADWP, and a representative from labor. Navigant recommends that the CAO, CLA, and an outside third-party facilitator be assigned the role of facilitators (additional detail on facilitation in Section 6.2.1).
3. The committee defines the governance issues it seeks to address via ballot measure.
4. The committee conducts an in-depth study of solutions to the specified governance issues, including multiple opportunities for public input.
5. The committee reaches consensus on a solution and submits a final report with a proposed ballot resolution to City Council, in time for the 2017 ballot according to a schedule set by the CAO, CLA and City Attorney.

6. City Council requests the City Attorney, with the assistance of the CAO and CLA as necessary, to prepare a ballot title and finalize the resolution for placement on the 2017 ballot.

The final result of this process should be a measure that the committee in good faith believes will address LADWP's current governance issues.

### 6.2.1 Facilitation

For LADWP's 2010 governance reforms described in Section 4.3, the CAO and CLA with assistance from the City Attorney prepared the report with recommendations and eventually the ballot language. However, in that situation they had specific direction from City Council to assess a number of related motions and how to implement them—a relatively narrow scope of work. For the recommended process here, Navigant proposes forming a larger committee comprising more City stakeholders due to the wider, as yet undefined scope of the reform. The facilitator's role is especially important because of the many participants and their variety of views, as well as being tasked with defining the "what" as well as the "how."

Because of their experience with past City reform processes and other legal and administrative items, Navigant recommends the CAO and CLA undertake the project management role for the committee. We recommend they also bring in an outside facilitator to help guide the process; specifically, to maintain the schedule, help with dispute resolution, and provide research and analysis services as requested. This role would not involve decision-making, but rather serve to move the process along. An external guide for the process is important because it provides an independent view, whereas City stakeholders may have something to gain by controlling the process.

### 6.2.2 Topics of Study

City Council may wish to provide more structure for the committee's work. Navigant recommends considering the inclusion of the following topics or areas of study for the study (this list is not comprehensive, nor is it in order of importance):

- Define a vision of a functional LADWP with clear governance objectives.
- Define the governing body with authority over LADWP.
    - Specify the procedure for electing or appointing the governing body.
    - Specify membership length of term.
    - Specify membership qualifications.
    - Specify membership compensation.
    - Explore the need for and role of a professional advisory staff.
- Define the role of the Ratepayer Advocate.
- Explore the need for and specify the terms of a fixed general manager contract.
- As necessary, define terms for the City Transfer or equivalent.
- As necessary, assign responsibility for labor negotiations.

# Volume V

# Unified Water Approach

NAVIGANT

# 2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

## Unified Water Approach Report
## Volume V

**Prepared for:**
**The City of Los Angeles**

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## 1. Introduction

In this chapter, Navigant highlights the changing role of a water utility in California. While there is attention on the governance structure of LADWP, the City may find it valuable to also reevaluate its city-wide approach to water (including potable water, storm water, and wastewater). In Navigant's interviews and further review of alternative governance structures for the Department, we began to explore the City's options for creating a single, holistic water function (either within or without LADWP). This chapter summarizes our findings in order to support a discussion around how Los Angeles views and manages this increasingly valuable and scarce resource.

During Navigant's interviews regarding LADWP's governance structure, the idea was posed to combine the Water System with water functions across Los Angeles, encompassing the water-related responsibilities of the Los Angeles County Public Works Department and the City of Los Angeles Bureau of Sanitation. In response to this suggestion, Navigant reviewed several state and city-level initiatives as well as two utility case studies with a unified water approach.

The initiatives reviewed include the following:

- The California Water Action Plan: A statewide plan released in January 2014, focusing on water conservation. The plan outlines water recycling, expanded storage, groundwater management, investment in safe drinking water, and wetland and watershed restoration as imperative for the state's journey toward sustainable water management. One specific action calls for increased regional self-reliance and integrated water management across all levels of government.
- Governor Brown's Executive Order directing the State Water Resources Control Board to impose restrictions to achieve a statewide 25% reduction in potable urban water usage through February 28, 2016.
- City of Los Angeles Water Integrated Resource Plan: A 2006 IRP with plans through 2020 that call on City Departments and the community to manage all water as one water.
- City of Los Angeles One Water L.A. 2040: Builds upon the success of the IRP by expanding coordination and partnerships between City Departments, regional agencies, and new and existing stakeholders to achieve a more sustainable water future for LA beyond the year 2020.
- The Sustainable City pLAn / Mayor Garcetti's Executive Directive Number 5: A plan to reduce per capita potable water use by 20 percent by 2017, establish a Water Cabinet to implement key aspects of local water policy, expand recycled water production by at least 6 million gallons per day, and replace 95 miles of water pipe infrastructure.
- County of Los Angeles Enhanced Watershed Management Program: A program in which municipalities, non-governmental organizations, and community stakeholders work collaboratively to develop Enhanced Watershed Management Plans (EWMPs) for each of the county's five watersheds.

In these initiatives, we note a recurring theme emphasizing the need for collaboration amongst key stakeholder groups to manage all aspects of the water cycle in a coordinated fashion. Clearly, policy makers are recognizing that water issues can no longer be addressed in isolation. This, combined with

the drought emergency, presents the optimal opportunity to discuss the unified management of the City's water infrastructure.

This work has already been initiated in Los Angeles by TreePeople, a local non-profit organization which recently brought together the Los Angeles water agencies as part of the Greater LA Water Collaborative to build the case for a collaborative, systemic approach to address the region's short-term drought emergency and long-term water crisis. Navigant recommends the City not only support collaboration of this type, but conduct an additional in-depth study of the management of the three Los Angeles water agencies as one entity.

The chapter is organized into the following sections:

1. Water in California
2. Combining Water Utilities
3. Future Approach for Los Angeles

## 2. Water in California

California utilities are generally aligned with the California State Water Resources Control Board's mission "to preserve, enhance, and restore the quality of California's water resources and drinking water for the protection of the environment, public health, and all beneficial uses, and to ensure proper water resource allocation and efficient use, for the benefit of present and future generations"[1] and have moved towards greater collaboration.

Furthermore, California is in the midst of an unprecedented water crisis. According to the State Water Resource Control Board, severe drought combined with ecosystem decline, climate change, and population growth are testing California's ability to provide the clean water needed for a healthy environment, population, and economy both now and in the future. [2]

### *2.1 Drought*

In January 2014, California Governor Edmund G. Brown Jr. proclaimed a State of Emergency directing state officials to take all necessary actions to prepare for drought conditions. In April 2014, he proclaimed a Continued State of Emergency due to critically low rainfall and snowpack levels, redoubling state drought actions. California's water supplies continue to be severely depleted, with record low snowpack in the Sierra Nevada Mountains, decreased water levels in most of California's reservoirs, reduced flows in the state's rivers, and shrinking supplies in underground water basins – leading to challenges including drinking water shortages in communities across the state, diminished water for agricultural production, degraded habitat for fish and other wildlife, increased wildfire risk, and the threat of saltwater contamination to fresh water supplies in the Sacramento-San Joaquin Bay Delta.

With the possibility of the drought stretching into 2016 and beyond, Governor Brown issued an Executive Order in April 2015, calling for the State Water Resources Control Board (State Water Board) to impose restrictions to achieve a statewide 25% reduction in potable urban water usage through February 28, 2016, among other water saving initiatives.[3]

### *2.2 Water Management Plans*

The California Water Action Plan, released by Governor Brown in January 2014, focuses on conservation and lays out water recycling, expanded storage, groundwater management, investment in safe drinking water, and wetland and watershed restoration as imperative for the state's journey toward sustainable water management. One specific action calls for increased regional self-reliance and integrated water management across all levels of government. This action acknowledges that the management of infrastructure and investment for multiple functions is sometimes handled separately by individual

[1] www.swrcb.ca.gov/about_us/water_boards_structure/mission.shtml.
[2] www.swrcb.ca.gov/board_decisions/adopted_orders/resolutions/2013/rs2013_0003_a.pdf.
[3] www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/040115_executive_order.pdf.

agencies within a region. It is accompanied by guidance to integrate individual government efforts into one combined regional commitment to result in an effort with a "sum greater than any single piece."[4]

The City of Los Angeles was actually a step ahead of this advice with its 2006 adoption of the award-winning Water Integrated Resource Plan (IRP), an implementable facilities plan through the year 2020 that calls on City Departments and the community to manage all water "as one water." The IRP resulted in citywide benefits including cost savings, water conservation, and reduced dependence on imported water supplies by better utilization of recycled water and runoff.[5] The One Water LA 2040 Plan builds upon the success of the IRP by expanding coordination and partnerships between City Departments, regional agencies, and new and existing stakeholders to achieve a more sustainable water future for Los Angeles beyond 2020.[6]

Upon taking office in 2013, Los Angeles Mayor Eric Garcetti appointed the City's first Chief Sustainability Officer, Matt Petersen, and created a Mayor's Office of Sustainability. Garcetti tasked Petersen with leading the effort to create the Sustainable City pLAn – described as a comprehensive, actionable directive designed to produce meaningful results today and in the future by addressing the environment, economy, and equity together to move toward a truly sustainable future. Short-term water initiatives include meeting Executive Directive Number 5 (reducing per capita potable water use by 20 percent by 2017), establishing a Water Cabinet to implement key aspects of local water policy, expanding recycled water production by at least 6 million gallons per day, and replacing 95 miles of water pipe infrastructure. Long-term goals include reducing LADWP's purchases of imported water by 50 percent by 2025, sourcing 50 percent of water locally by 2035 (including 150,000 acre-feet per year of storm water capture), reducing average per capita water use by 22.5 percent by 2025 and 25 percent by 2035, improving stormwater quality, and reducing the number of annual sewer spills to fewer than 100 by 2025 and fewer than 67 by 2035.[7]

The Enhanced Watershed Management Program is yet another initiative within the County of Los Angeles in which municipalities, non-governmental organizations and community stakeholders are working collaboratively to develop Enhanced Watershed Management Plans (EWMPs) for each of Los Angeles' five watersheds. Each watershed has a Watershed Management Group that meets regularly to identify current and future multi-benefit projects that will improve water quality and promote conservation and will identify appropriate control measures, monitoring plans, and strategies for adaptive management of projects. [8]

Although this is not an exhaustive review of water initiatives in California, it demonstrates a strong endorsement of collaboration between agencies by state and Los Angeles policymakers.

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[4] The California Water Action Plan is available at: resources.ca.gov/docs/california_water_action_plan/Final_California_Water_Action_Plan.pdf.
[5] The Los Angeles Water IRP is available at: http://lacitysan.org/irp/documents/FINAL_IRP_5_Year_Review_Document.pdf.
[6] One Water L.A. website: www.lacitysan.org/onewater/index.html.
[7] The Sustainability City pLAn is available at: http://san.lacity.org/pdf/pLAn.pdf.
[8] Enhance Watershed Management Program: www.lastormwater.org/green-la/enhanced-watershed-management-program.

## 3. Combining Water Utilities

### *3.1 Los Angeles*

The City of Los Angeles' water infrastructure is divided amongst three agencies: the City of Los Angeles Bureau of Sanitation (LASAN), Los Angeles County Department of Public Works (LACDPW), and LADWP. These agencies have historically operated within bureaucratic silos to manage discrete, yet overlapping aspects of the water cycle. Responsibilities are currently divided into the following:

- LASAN collects, cleans, and recycles solid and liquid waste through the administration of three primary programs: wastewater collection, conveyance, treatment, and disposal; solid resources collection, recycling, and disposal; and watershed protection.[9]
- LACDPW provides sustainable water supplies and healthy watersheds while reducing flood risks. Priorities include stormwater management, groundwater banking, water conservation, recycling, and reclamation, and maintaining the Sanitary Sewer Network.[10]
- LADWP provides 666,000 customers with reliable, high quality water and leads water recycling programs and conservation efforts for the City.[11]

Independent management of these entities leads to operational redundancies, missed opportunities for water savings, and inflated costs for Los Angeles residents. However, with the current drought, new water regulations, and increased public awareness of California's water vulnerability, policy makers and the public are recognizing that these issues can no longer be addressed in isolation.

### *3.2 San Antonio*

Prior to 1992, the water system in San Antonio looked quite similar to that of Los Angeles. Water was managed by three separate agencies: the city-owned water supply utility, the government department responsible for sewage collection and treatment, and an independent city agency created to develop a system for reuse of treated wastewater.

In May 1992, the refinancing of $365 million in water and wastewater bonds made consolidation of the three agencies into the San Antonio Water System (SAWS) possible. SAWS is a separate entity from the electric utility CPSE and is governed by the San Antonio Water System Board of Trustees (the Mayor and six members appointed by City Council). The Board of Trustees is responsible for overall policy and management of the system. The leadership team comprises the President/CEO, two senior vice presidents, and ten vice presidents whose goal is to maximize productivity and efficiency. Since the formation of SAWS, San Antonio has been recognized nationally for its novel conservation efforts and proactive water management planning. It is the only U.S. city to reuse all three wastewater treatment process byproducts.[12]

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[9] City of Los Angeles Sanitation website (www.lacitysan.org/general_info/about_us/service_summary.htm).
[10] Water Resources, Department of Public Works (dpw.lacounty.gov/landing/waterResources.cfm).
[11] LADWP website (www.ladwp.com/ladwp/faces/ladwp/aboutus/a-water?_adf.ctrl-state=bnco2mpv8_163&_afrLoop=587745062990445).
[12] San Antonio Water System website (www.saws.org/who_we_are/).

### *3.3 Sacramento*

Sacramento provides another example of a water system managed independently from the electric utility. The Department of Utilities provides all critical water services to Sacramento including wastewater and storm drainage. Rates for service are set by the Sacramento City Council, which is informed by input from a seven-citizen Utilities Rate Advisory Commission.

With all aspects of the water cycle under its management, the Department of Utilities is reportedly able to streamline and enhance conservation efforts, manage regulatory compliance without redundancies, protect water rights and quality without oversight, prevent contamination of local creeks and rivers, and maintain adequate financial reserves to provide financing for long-term infrastructure improvements.[13]

[13] City of Sacramento Utilities website (www.cityofsacramento.org/Utilities).

## 4. Future Approach for Los Angeles

The Los Angeles water agencies were recently brought together by local nonprofit TreePeople as part of the Greater LA Water Collaborative to build the case for a collaborative, systemic approach to address the region's short-term drought emergency and long-term water crisis.[14] By aligning the diverse water and related infrastructure agencies' goals, investments, and programs, the three organizations would ideally be able to achieve benefits including greener and more resilient neighborhoods, a more responsive government, and decreased costs to the public.

Phase One of the three phase project encourages the agencies to establish a whole water cycle collaboration that enables necessary horizontal coordination. The system would allow agency management to gain perspective of the entire system's functionality and resilience but would not detract from individual responsibilities or hierarchy.

The Greater LA Water Collaborative partners are now moving forward into the second phase of the project to develop a framework for increased collaboration and shared prioritization, decision-making, and management across the agencies. TreePeople recommends the Greater LA Water Collaborative partners take steps to achieve no less than a systemic collaboration approach to meet the City's water needs.

The benefits of a collaborative approach may be able to be further amplified by creating a single entity with the sole purpose of managing all aspects of the City's water, wastewater, stormwater, and flood protection services. However, this is a more dramatic step than suggested by previous work. It would require a large organizational and cultural change with significant impacts on the Water Organization. It would also require several City Charter changes, the full support of City leaders and Department management, and a larger process at the County level to include LACDPW. The ultimate design of an integrated water group demands a dedicated analysis of its own. Navigant recommends the City of Los Angeles initiate a study to provide this analysis.

[14] "Moving Towards Collaboration: A New Vision for Water Management in the Los Angeles Region," TreePeople (www.treepeople.org/sites/default/files/pdf/publications/Moving%20Towards%20Collaboration_e-version.pdf).

# Volume VI

# Security and Emergency Preparedness

NAVIGANT

# 2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

## Security and Emergency Preparedness Report
## Volume VI

**Prepared for:**
**The City of Los Angeles**

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# Executive Summary

## *Security*

### Objectives & Approach

This report presents Navigant's findings on Security for the IEA Survey. Security at LADWP is critical to protecting Water and Power System infrastructure. Cyber and physical threats are pervasive in the world we live in and it is important for the Department to have the plans, processes and structure to ensure that threats and vulnerabilities are identified and mitigated. For the IEA Survey, Security includes:

- Critical Infrastructure Protection (CIP) Compliance: CIP Compliance is a North American Electric Reliability Corporation (NERC) requirement related to physical and cybersecurity. Navigant examined LADWP's CIP Compliance Program and the Department's transition from NERC CIP Version 3 to CIP Version 5 standards, including a review of the progress being made with current NERC CIP-014 (Physical Security Standard) implementation efforts.
- Cybersecurity: A cyber-risk assessment across the recognized primary domains of cybersecurity, modeled after the Cybersecurity Capability and Maturity Model (C2M2); and
- Physical Security: A physical security review to assess the abilities of the LADWP to deter, protect, detect, communicate, and coordinate in case there is a threat made or realized to the critical infrastructures of the LADWP. The review included visual inspections of certain critical facilities.

A summary of findings, including corporate policy and governance recommendations related to cyber and physical security, is provided at the conclusion of this report. Insights from interviews and document review complement these assessments.

### CIP Compliance

The North American Electric Reliability Corporation (NERC) is an international regulatory authority whose mission is to assure the reliability of the bulk power system in North America. NERC's area of responsibility includes the United States, Canada, and the northern portion of Baja California, Mexico. As the electric reliability organization (ERO) for North America, NERC is subject to oversight from the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada.

NERC develops and enforces reliability standards, monitors the bulk system through system awareness, and trains and certifies industry personnel. NERC's jurisdiction includes users, owners, and operators of the bulk power system.[1] Accordingly, LADWP must comply with NERC requirements. NERC Reliability Standards define the reliability requirements for planning and operating the North American bulk power system. The Reliability Standards focus on measurable performance, risk mitigation strategies, and entity capabilities.[2] One component of these NERC standards are the Critical Infrastructure

[1] NERC website (http://www.nerc.com/AboutNERC/Pages/default.aspx).
[2] NERC website (http://www.nerc.com/pa/Stand/Pages/default.aspx).

Protection (CIP) mandatory and enforceable standards, which address the cybersecurity, physical security, and operational security of the bulk electric system.[3]

While Version 3 of the CIP standards (CIP v3) is currently effective, FERC approved Version 5 (CIP v5) in November 2013. CIP v5 adopts new cybersecurity controls and extends the scope of the systems protected by the CIP v3 standard. CIP v5 will become mandatory and enforceable on April 1, 2016 for medium and high Bulk Electric Systems and Cyber Systems.[4] This version of the NERC CIP standard significantly increases the efforts that the Department needs to undertake to mitigate cyber risks to the bulk power system. Based on a brief overview of CIP Version 5 documentation and interviews with LADWP staff responsible for CIP compliance, Navigant found that the Department appears to have an adequately defined plan and timeline to comply with future NERC regulations. The CIP project team has a sufficient budget and is well-managed and comfortable with the milestones, deliverables, and products; however, senior leadership should be more engaged in the CIP Version 5 transition process as the deadline approaches to ensure CIP compliance risk is minimized.

Further, it is common practice that utilities such as LADWP work with regional representatives from NERC to further audit compliance plans, timelines, and supporting documentation. Accordingly, Navigant recommends that LADWP further engage with the Western Electricity Coordinating Council (WECC), LADWP's regional representative with delegated authority from NERC to monitor and enforce compliance.[5] Navigant further recommends that the Department participate in standard development bodies, NERC technical committees, and NERC national grid exercises.

Due to security restraints at the Department, access to CIP Version 5 policies, procedures, facility and BES Cyber System documentation was limited to two interviews with CIP compliance leadership. This restricted access was largely due to the preliminary status of LADWP's CIP Version 5 documentation. Consequently, Navigant only obtained a cursory review of the CIP Version 5 product and cannot opine on the detailed plans for CIP v5 compliance.

LADWP is similarly positioned to comply with CIP-014, the physical security standard. The purpose of CIP-014 is to identify and protect transmission stations, transmission substations, and their associated primary control centers from physical attack.[6] The CIP Compliance team at the Department is in the process of identifying the critical bulk power facilities and completing threat and vulnerability assessments for those facilities. The Department has a consulting firm assisting with these efforts and appears to be progressing towards compliance with the standard requirements.

**Cybersecurity**

Navigant conducted a maturity assessment of ten cyber domains and found that some of the Department's cybersecurity efforts lack documented policies and processes. According to interviews

[3] NERC website (http://www.nerc.com/pa/CI/Pages/default.aspx).

[4] The CIP v5 requirements applicable to low impact bulk electric system cyber systems will become enforceable on April 1, 2017. *See* "Cyber Security Reliability Standards CIP V5 Transition Guidance," NERC Compliance Operations, August 12, 2014 (www.nerc.com/pa/CI/Documents/V3-V5%20Transition%20Guidance%20FINAL.pdf).

[5] There are eight Regional Entities that monitor and enforce NERC compliance standards. FERC approved NERC's delegation of authority to the Regional Entities in 2007. Together, NERC and its Regional Entities are referred to as the Electric Reliability Organization (ERO) Enterprise. *See* "Improving Coordinated Operations across the ERO Enterprise," February 2014 (www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx).

[6] CIP-014-1 Standard (www.nerc.com/pa/Stand/Reliability%20Standards/CIP-014-1.pdf).

with LADWP staff, the Department is developing an Enterprise Cyber Security Plan that will identify key areas that need improvement and provide plans to address them. This document needs executive level support to ensure timely completion and consistent implementation throughout the Power, Water and Joint Services Systems.

Several major findings resulted from the cybersecurity maturity assessment, including insufficient executive level leadership and governance, resource constraints, a lack of formal policies, and limited communication among the Power, Water, and Joint Services Systems at the Department. Navigant found that the IT group within the Joint Services System is not able to quickly hire experienced, mid-level cybersecurity professionals, which limits the Department's ability to adapt and respond to the rapidly changing cybersecurity environment. Navigant also found that many cybersecurity processes are ad-hoc and inconsistent throughout the organization. For example, there are no policies, procedures, or risk register that clearly identify prioritized risks on an enterprise level. This ad-hoc approach to risk impacts the other cybersecurity domains such as threat and vulnerability management because without documented risk strategy and risk criteria, cybersecurity vulnerability assessments may not be analyzed and prioritized appropriately.

Moreover, there is little oversight from senior management and executive leadership due to the lack of formal processes and accountability. While this decentralized approach works for the management of certain Operations Technology (OT) assets, the Department is not able to appropriately prioritize cybersecurity issues on an enterprise level. Furthermore, LADWP is not able to track the completion of critical cybersecurity projects. Formalized security processes and increased communication between Power, Water and Joint Services Systems would ensure proper resource utilization, consistent implementation, and project completion for critical security needs.

**Physical Security**

The Physical Security group at the Department is restricted by a lack of authority and processes to ensure that security gaps are reported and resolved. Facility managers in the Water and Power Systems are not required to report physical security threats or vulnerabilities to the Physical Security group and they are ultimately responsible for financing and resolving these gaps. Accordingly, if security gaps are reported to Physical Security, the group does not have the authority to ensure that facility managers implement its physical security recommendations or the capital project budget to close critical security gaps at these facilities. This decentralized organizational structure and lack of formal business processes do not allow the Department to be proactive about physical security measures.

Physical Security has completed numerous assessment audits on LADWP facilities; however, according to staff interviews, the security recommendations included in these audits have not been addressed. Moreover, the facility managers do not provide any feedback or status updates back to Physical Security once these recommendations are provided. In addition to the assessment audits, Navigant reviewed a 2001 security assessment of critical Power and Water facilities that found numerous security gaps and provided recommendations to address these vulnerabilities. Similarly, interviews with Department personnel indicated that these recommendations were not implemented. Based on these findings, Navigant staff visited some of the Department's critical facilities. Navigant found that most of the security gaps in the 2001 assessment were not mitigated. Conversations with facility managers at these facilities confirmed that the lines of accountability to address security gaps are broken.

Further, the Security Planning component of Physical Security, which plans and manages physical security projects, has been moved around the Department in recent years. As a result, Physical Security does not have the capital budget, authority, or processes to ensure that physical security in the Power and Water Systems is prioritized. Navigant recommends that the Department create a clearly defined process to ensure that security gaps are addressed and communicated to Physical Security and senior management. The Physical Security group should have more oversight into the dispersion of security resources to ensure proper placement and project accountability.

**Conclusions**

Past assessments by LADWP security staff and the recent assessment conducted by Navigant have revealed a number of factors that limit the Department's ability to mitigate security threats and vulnerabilities, including a lack of formal cyber and physical security processes, limited risk assessments, constrained resources, and limited executive level support. While certain aspects of Security such as CIP Compliance and Water OT security are robust, security is not appropriately addressed on an enterprise level. Moreover, there is no formal executive governance structure to support cyber and physical security initiatives.

LADWP has the opportunity to address these issues and increase the reliability of the bulk electric system and the integrity of Los Angeles' water supply. Navigant recommends a behavioral and structural change from the top down to empower security personnel and to initiate a Department-wide shift towards proactive security measures. LADWP should create senior executive level positions for security and risk that report directly to the General Manager. A formal risk and security governance would provide the accountability needed to ensure that security processes are documented, implemented, and updated throughout the organization. Furthermore, it would provide a formalized structure to identify and prioritize risk, which is critical to effectively managing security vulnerabilities. This structure is aligned with industry best practice and will allow the Department to continuously and consistently mitigate threats and vulnerabilities. Both physical and cybersecurity personnel should have the appropriate budget and staff to support these changes. In addition to an empowered security staff, the Department should consider developing an updated Corporate Security Policy that identifies the processes necessary to communicate security vulnerabilities, mitigation efforts, and risk assessment on a corporate level.

In addition to the governance and corporate policy recommendations, a prioritized list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department and the City.

High Priority Recommendations

- Develop a Corporate Security Plan that includes sound policies, programs, and project management for cyber and physical security on an enterprise level.
- Create executive level security and risk positions that report to the General Manager to distribute and enforce the Corporate Security Plan and other cyber and physical security initiatives.
- Complete the Enterprise Cyber Security Plan to identify and address weaknesses in the cybersecurity program.
- Identify risk criteria and develop a risk register to prioritize risk assessments on an enterprise level.
- Initiate 24x7 cybersecurity monitoring to provide a common operating picture of the cybersecurity environment in near real-time.
- Develop a formalized process to identify and mitigate physical security threats and vulnerabilities across Systems.
- Move Security Planning back to Physical Security to ensure that the group has project management resources.
- Provide Physical Security with a line budget to close critical security gaps.
- Improve the hiring process for experienced, mid-level staff in the cyber workforce.
- Develop detailed continuity plans to sustain and restore operation if a disruption occurs, including a complete Business Impact Analysis to appropriately prioritize processes and resources in the event of a major incident.

Medium Priority Recommendations

- Upgrade Central Monitoring System, the camera monitoring system used by Physical Security, to include a smart system.
- Develop the relationship with the Western Regional auditors to confirm the Department's interpretation of CIP Version 5.
- Increase participation in standard development bodies, NERC technical committees, and NERC GridEx.
- Create a formalized practice for information sharing that includes horizontal and vertical communication policies, processes, and capabilities to enable real-time sharing.
- Conduct cybersecurity exercises on a regular basis.
- Complete cybersecurity vulnerability assessments for all critical assets.
- Aggregate log data for cybersecurity assessments to identify patterns, trends, and common features.

Low Priority Recommendations

- Ensure that the credentials for employees align with their current position.
- Formalize the relationship between cybersecurity requirements and supplier contracts.

## *Emergency Preparedness*

### Objectives & Approach

This report presents Navigant's findings on Emergency Preparedness for the IEA Survey. Comprehensive emergency preparedness is central to any utility's strategic and operational planning, as natural and man-made threats can significantly disrupt normal operations. As a municipal utility, the Department has a unique accountability for ensuring the design, implementation, testing, and continuous improvement of emergency preparedness programs. Indeed, such plans are critical for ensuring that the Department can achieve its Mission to provide "clean, reliable water and power in a safe, environmentally responsible and cost-effective manner with excellent customer service."

This report is a strategic and operational assessment of both the emergency response and business continuity stance of the LADWP. Emergency Preparedness and Business Continuity are closely related disciplines, which in combination provide a comprehensive framework for responding to a "worst-case disruption."

Navigant reviewed the organizational structures, accountabilities, policies, and business practices adopted by the Department to complete this report. We also conducted interviews with Department staff to gain further insight into the current and proposed emergency and continuity practices. The goal of this assessment is to identify and recommend opportunities for improving the Emergency Preparedness

and Business Continuity disciplines at the Department. For the IEA Survey, Emergency Preparedness and Business Continuity include:

- Emergency Preparedness and Business Continuity Overview: An introduction to the disciplines of Emergency Preparedness and Business Continuity.
- Emergency Preparedness and Business Continuity in Utilities: A description of common practices adopted by utilities.
- Standards in Emergency Preparedness and Business Continuity: An overview of the various standards that influence these disciplines.
- Emergency Preparedness and Business Continuity at the Department: An assessment of the current and proposed policies and practices at LADWP.

A summary of findings and recommendations is provided at the conclusion of this report.

**Emergency Preparedness and Business Continuity Overview**

Emergency Preparedness is defined as a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action in an effort to ensure effective coordination during incident response. Emergency Preparedness is directly related to other business disciplines, including most notably Business Continuity Management (BCM) and Disaster Recovery (DR). BCM is a holistic management process that identifies potential threats to an organization and the impacts to business operations those threats, if realized, might cause. This process provides a framework for building organizational resilience that safeguards the interests of the organization's key stakeholders, reputation, brand, and value-creating activities. DR is the collection of policies, plans, and actions to recover system applications and infrastructure in a tiered approach, whereby technology priorities are identified (software and hardware) to facilitate the continuation and recovery of key business processes. DR is often considered the technical aspect of business continuity.

As mentioned above, BCM is a forward-looking and holistic approach to building organizational resiliency. It is a coordinated and integrated approach that spans the entire company and all of its operations. Central to BCM is the Business Impact Analysis (BIA). A BIA identifies the critical business processes that are most affected by a worst-case disruption, and helps prioritize recovery strategies for an extended business disruption. It is important to note that the core principles of BCM – including the derivation of a BIA or DR plan – are standard in the utility industry. Despite this, the Department does not have a BCM program and has never completed a BIA.

**Emergency Preparedness and Business Continuity in Utilities**

Increasingly, utilities are being scrutinized for their response to emergencies and disasters that significantly disrupt normal operations. While focus and attention is often given to the potential impact of natural disasters, other scenarios that require planning and response include acts of terrorism, sabotage, cyberattacks, or other similar events. A variety of stakeholders – including regulators, customers, and community leaders – have focused more and more attention on the planning and recovery from all types of emergency and disaster. In light of this, utilities are designing and implementing programs to actively assess situations and respond with the execution of specific protocols to restore critical services in a phased and prioritized manner, based on a standard risk assessment.

These efforts are of great importance to investor-owned and municipal utilities alike. Erosion to the reputation of (and trust in) a utility due to an inadequate response to an emergency or disaster event can have long-term implications. Evidence confirms that overcoming a significant reputational risk event requires the dedication of significant resources (time and capital) often over a long period of time, and diverts attention away from other activities that advance the strategic plans of the company.

**Standards in Emergency Preparedness and Business Continuity**

A variety of standards define standard and leading practice in the Emergency Preparedness and Business Continuity disciplines in the energy and utility sector.

*Federal Regulatory Standards*

Principal among the federal standards is Continuity of Operations (COOP) planning. The Department has developed and implemented a COOP policy and plan. Additional relevant standards are established by the Federal Energy Regulatory Commission (FERC), North American Electric Reliability Corporation (NERC), and the Federal Emergency Management Agency (FEMA).

*California Rules and Regulations*

Although the California Public Utilities Commission (CPUC) mandates do not apply to the Department, it acknowledges and references these mandates when designing emergency response plans. Additional requirements from the California government code also influence LADWP planning efforts.

*Municipal Requirements*

The Department is required to support the City Emergency Management Department (EMD) and Emergency Operations Center (EOC) in the event of a significant regional emergency or disaster. These requirements are reflected in specific Mayoral Executive Directives.

*Other Standards*

Practices established by the International Organization for Standardization (ISO) and industry oversight groups (American Water Works Association (AWWA), Edison Electric Institute (EEI)) further inform the discipline of emergency preparedness and business continuity.

*Peer Practices*

In addition to regulatory requirements, emergency preparedness and business continuity planning is defined by utility sector peer practices. Our report broadly identifies a series of common attributes of emergency preparedness and business continuity programs. The Department's programs are out of sync with these common practices in areas such as clear accountabilities, design and roll-out of a BCM program, active training and testing programs, alignment between BCM and DR plans, and clear governance over program leadership.

**Emergency Preparedness and Business Continuity at the Department**

The following are key characteristics of the emergency and continuity programs at the Department.

*Organization*

- Office of Emergency Management (OEM): Emergency Preparedness at the Department is loosely coordinated by the Office of Emergency Management (OEM). However, significant

accountability for plan development, improvement, testing, and training resides in the Systems and Divisions.

- System Leads: At present, the Department does not have comparable leadership roles in the Water and Power Systems. While the Water System has identified a resiliency lead, the Power System has not.
- Resilience and Sustainability Programs: The Water and Power Systems do not share a common approach to preparedness or continuity.

*Continuity of Operations Plan*

The Department's plan aligns with the required phases of COOP as outlined by FEMA. However, the plan does not seem to be actively embraced by the Department. According to the plan, a COOP Program Manager (OEM) will review and update the COOP, ensure that COOP testing, training, and exercising is conducted, and define short and long-term COOP goals and objectives. The plan also states that all employees will be trained on COOP activation procedures at least once a year. However, Navigant found that employees have not been trained on the COOP in recent years. Navigant recommends that the Department train and exercise this plan to inform employees of the processes in place to maintain operations after an event and to ensure that the mission essential recovery times are appropriate and achievable. As discussed in further detail in the *Security* portion of the IEA Survey, Navigant also recommends that LADWP further develop its risk assessment processes and procedures to support the relocation decisions and timelines associated with the COOP. The Department should also consider developing disaster-specific business continuity plans for earthquakes and other major events because priorities and timelines can change depending on the type of emergency.

*Emergency Plans*

The Department has also created Emergency Response Plans (ERP) in accordance with the Mayoral Executive Directives. We believe the frequency of plan review, level of rigor and plan detail, frequency of training, and frequency, method, and rigor of testing need to be addressed. For example, the ERPs briefly discuss the Department's efforts to prepare for and mitigate the effects of specific threats and hazards likely to occur in Los Angeles; however, the documents lack detailed plans to fully prepare for these threats. Disaster-specific plans for these events would help the Department proactively prepare for these events beyond broad goals and mitigation plans.

Navigant also found that only nine employees attended the annual EMD emergency management workshop. According to Department personnel, attendance is limited to executive staff and OEM that receive an invitation from the EMD. Navigant recommends that LADWP conduct an internal Emergency Workshop to disseminate information gathered at the EMD Workshop as well as additional information that fosters emergency preparedness. Participants in the internal Emergency Workshop could include a combination of OEM, executives, and middle management that are rotated on an annual basis. In addition, 31 Department employees attended the EOC functional exercise, which was a two-hour exercise directed to the Power System. Based on this participation and scope, the effectiveness of the EOC exercise was limited. Department personnel also indicated that although the ERPs call for annual testing, the plans are not tested every year. The Department should increase the participation and frequency of emergency exercises to ensure that substantial staff in the Power, Water, and Joint Systems is involved and aware of the existing plans and procedures.

*Crisis Communication Plan*

The plan clearly identifies the communication processes and resources that should be used in an emergency situation. Moreover, the plan includes multiple scenarios and levels of communication that can be applied to a wide range of emergency situations, which aligns with best practice.

*Mutual Aid Assistance*

The Department has established mutual aid agreements with multiple regional organizations and utility peers. This reflects a best practice standard.

*Business Impact Analysis*

The Department does not have a BCM program defined by a rigorous BIA or set of DR plans. These facets of organizational resiliency are commonplace for utilities and other organizations across all sectors. Consequently, the Department is behind the rest of the industry in this area.

**Conclusions**

The Department has many of the policy frameworks that help define an emergency preparedness program. These include the COOP, ERP, and Crisis Communication Plans. However, features of rigorous programs – including evidence of routine and diverse testing, adherence to training requirements and schedules, clear accountability for plan design, development, and continuous improvement – are lacking at the Department. In addition, there is a lack of cohesion amongst the various emergency preparedness plans. While each document appears to define certain processes, resources, and strategies, it is unclear how these plans interact. Inadequate emergency preparedness can have significant impacts on operations as well as the health and safety of the employees and customers due to insufficient mitigation efforts, delayed responses and unorganized recovery.

OEM should create a strategic plan that identifies the emergency preparedness efforts that exist and the direction that the OEM will take to improve these efforts. A strategic plan would also establish timelines to complete OEM initiatives such as training employees and exercising and updating plans.

Leadership for these and other facets of good planning have been decentralized and pushed into the Water and Power Systems, which has resulted in distinct approaches for building organizational resiliency. Importantly, accountability for emergency and business continuity planning is also dispersed, and in many instances, is one of many responsibilities for an already burdened staff. These and other foundational aspects of good planning must be addressed to strengthen the emergency and continuity programs.

As discussed in further detail in the *Security* report for the IEA Survey, LADWP should create senior executive level positions for security and risk that report directly to the General Manager. In addition to the tasks outlined in the *Security* report, a formal risk and security governance would provide the accountability needed to ensure that emergency plans and processes are documented, implemented, and updated throughout the organization. Furthermore, it would provide a formalized structure to identify and prioritize risk, which is critical to effectively managing disruptions of service. This structure is aligned with industry best practice and will allow the Department to continuously and consistently mitigate natural and man-made threats.

In addition, the ERPs and COOP should address disaster resilience. While we understand that the ERPs are based on a template provided by the City of Los Angeles EMD, the Department's emergency

preparedness documents are overly broad and do not address the gradation of responses from a single pipe break to a worst-case scenario. Moreover, the ERPs should incorporate known vulnerabilities into disaster-specific response planning.

A prioritized list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department.

High Priority Recommendations

- Dedicate resources to completing an OEM Strategic Plan to define major initiatives for 2016, including the staffing and capital resource requirements to design, execute, manage and monitor programs.
- Create executive level security and risk positions that report to the General Manager to distribute and enforce the plans related to emergency preparedness and business continuity as well as other emergency preparedness and disaster resiliency initiatives.
- Clarify the emergency preparedness and business continuity governance structure, roles, and responsibilities between the OEM and the Water and Power Systems for core aspects of program design, execution, and decision-making.
- Finalize the BCM and BIA RFP.
- Execute the BCM and BIA scope of work.
- Confirm a consistent approach to plan development across Systems.
- Establish a role in the Power System to address resiliency and emergency preparedness efforts.
- Expand and enforce emergency training and exercises.
- Develop a disaster recovery plan to prioritize IT functions in the event of an emergency.

Medium Priority Recommendations

- Re-evaluate and conduct training programs in line with policies and good business practice.
- Define a rigorous testing plan for the programs, including a phased approach to tabletop and scenario tests (announced and unannounced), and testing of the "Hot Sites."

Low Priority Recommendations

- Review and standardize other aspects of the emergency preparedness programs (including templates and forms of documentation).
- Confirm performance reporting protocols to the General Manager and other members of executive management.
- Integrate emergency preparedness and business continuity programs into Department benchmarking initiatives.

NAVIGANT

# 1. Introduction

## *1.1 Study Objectives*

Section 266 of the Los Angeles City Charter requires that the City Controller conduct a Survey of the property and business of each of the City's proprietary departments, including the Los Angeles Department of Water and Power (LADWP, the Department), at least once every five years. These Surveys must be conducted jointly with the Mayor and City Council (Joint Administrators).

The 2015 Industrial, Economic and Administrative Survey (IEA Survey) of the LADWP is a comprehensive review of the strategic and operational readiness of the organization to meet critical challenges and an evaluation of current operations versus peers or leading practices. The goal of the Survey is to identify targeted recommendations for improvement through an independent and thorough series of assessments. Navigant Consulting, Inc. (Navigant) was retained to lead this effort. This report presents Navigant's findings on Security and Emergency Preparedness.

The Power, Water, and Joint Services Systems of LADWP are operating in a different environment than when the original systems were designed and built, let alone post 9-11. Cyber and physical threats to the bulk electric system and water systems are very real as witnessed across the United States and abroad. Daily cyber and physical attacks are perpetrated on critical infrastructures, our industries with proprietary secrets, and our citizenry.

Cyber vulnerabilities are aggressively pursued and exploited by hackers, political activists, rogue nations and even recognized "civil" nation states. Industrial secrets and personally identifiable information are actively sought, and critical infrastructure, EMS/SCADA and corporate networks are targeted as well. Unfortunately, cyber is the new existential threat and is currently the domain of choice in causing disruptions, espionage, and economical and reputational harm.

For physical threats, recent events are worth noting – the Improvised Explosive Device attack on the Boston Marathon runners (soft targets), Pacific Gas & Electric's (PG&E) Metcalf substation sabotage attack, and insider threat or lone wolf attacks as demonstrated in the Fort Hood and Aurora shootings. These threat scenarios are evidence that what was unheard of or unthought-of is now occurring with greater regularity in the United States.

Fortunately, government leaders and industry executives are taking action to protect and safeguard our critical infrastructures and our people. Government agencies, departments and facilities are acting, reacting, and attempting to protect critical facilities and systems. These infrastructures are operating at various security maturity levels and applying the latest "best practices" of both cyber and physical security.

As part of the 2015 IEA Survey, Navigant was asked by the City of Los Angeles to assess the physical and cybersecurity of the Department. Navigant worked closely with LADWP personnel to understand how the Department pursues its security efforts and to determine if opportunities exist to strengthen the organization and reduce risk. Navigant also benchmarked the security findings against industry best practice to provide a set of security recommendations that could improve the Department's overall security posture.

Emergency Preparedness and related programs are also a central focus of all utilities. A number of significant events over the last two decades have served to emphasize the importance of designing, implementing, and testing strategies and tactics to ensure effective and efficient response to potentially disruptive events. Clear, comprehensive, and well-communicated policies and plans in response to large scale storms and other natural disasters, civil unrest, major equipment failures, or other emergency events are central to any utility's objective of providing safe and reliable service to customers. Navigant's findings and recommendations are summarized below.

## *1.2 Approach*

Information for the Security report was derived from several primary sources:

- Documents uploaded to Navigant's secure portal;
- Sensitive material retained in a data room;
- Interviews with Department personnel, including the Chief Information Officer, Chief Information Security Officer, and senior level staff within Physical Security, CIP Compliance, and Cybersecurity;
- A limited Cybersecurity Capability Maturity Model (C2M2) assessment;
- A literature review of California regulation, common approaches to emergency preparedness and business continuity, and peer utility publications on relevant Emergency Preparedness topics;
- A tour of the Central Monitoring Station; and
- Physical Security spot checks at recognized critical facilities.

Navigant conducted interviews with leadership and subject matter experts that manage many of the compliance and security programs. See Appendix A for a complete list of interviewees. The materials reviewed for this engagement are listed in Appendix B.

## *1.3 Report Organization*

The report comprises the following chapters:

- CIP Compliance: CIP Compliance is a North American Electric Reliability Corporation (NERC) requirement related to physical and cybersecurity. Navigant examined LADWP's CIP Compliance Program and the Department's transition from NERC CIP Version 3 to CIP Version 5 standards, including the processes, schedule, budget, and tools being used. Navigant also reviewed the progress being made with current NERC CIP-014 (Physical Security Standard) implementation efforts.
- Cybersecurity: An evaluation of the current cybersecurity policies, plans, and processes. Gaps are identified and recommendations are made.
- Physical Security: An evaluation of the current physical security policies and processes as well as an assessment of the physical security at certain critical facilities.

- Security Conclusions: A summary of findings, including corporate policy and governance recommendations related to cyber and physical security.
- Emergency Preparedness and Business Continuity Overview: An introduction to the disciplines of Emergency Preparedness and Business Continuity.
- Emergency Preparedness and Business Continuity in Utilities: A description of common practices adopted by utilities.
- Standards in Emergency Preparedness and Business Continuity: An overview of the various standards that influence these disciplines.
- Emergency Preparedness and Business Continuity at the Department: An assessment of LADWP's current preparedness stance, including the Department's governance, policies, processes, and testing programs, with specific attention given to response plans and assumptions for restoration of service to normal service levels, given a "worst case disruption."
- Emergency Preparedness Conclusions: A summary of findings related to emergency preparedness.

# 2. CIP Compliance

The North American Electric Reliability Corporation (NERC) is an international regulatory authority whose mission is to assure the reliability of the bulk power system in North America. NERC's area of responsibility includes the United States, Canada, and the northern portion of Baja California, Mexico. As the electric reliability organization (ERO) for North America, NERC is subject to oversight from the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada.

NERC develops and enforces Reliability Standards, monitors the bulk system through system awareness, and trains and certifies industry personnel. NERC's jurisdiction includes users, owners, and operators of the bulk power system.[7] Accordingly, LADWP must comply with NERC requirements. NERC Reliability Standards define the reliability requirements for planning and operating the North American bulk power system. The Reliability Standards focus on measurable performance, risk mitigation strategies, and entity capabilities.[8] One component of these NERC standards are the Critical Infrastructure Protection (CIP) mandatory and enforceable standards, which address the cybersecurity, physical security, and operational security of the bulk electric system.[9] LADWP appears to be actively pursuing compliance with the NERC CIP mandatory and enforceable standards.

## *2.1 CIP Version 5*

In November 2013, FERC approved Version 5 of the CIP cybersecurity standards (CIP v5). CIP v5 adopts new cybersecurity controls and extends the scope of the systems protected by Version 3 of the CIP standard (CIP v3), which is the currently effective CIP standard. These standards significantly increase efforts to mitigate cyber risks to the bulk power system, and will become mandatory and enforceable on April 1, 2016 for high and medium Bulk Electric Systems and Cyber Systems.

### 2.1.1 Cybersecurity Compliance

The Department is currently using a detailed project plan with self-imposed milestones and timelines to transition from CIP v3 standards to CIP v5 cyber standards. The LADWP CIP compliance staff is supported through an internal matrix organizational team of subject matter experts and a hired NERC CIP consultant. The CIP team appears to be effectively driving a schedule to meet the April 1, 2016 deadline for CIP v5.

The LADWP NERC CIP cyber project team seems to embrace what the industry refers to as a "Culture of Compliance." Leadership at the implementation level is strong, competent, and dedicated to the many tasks that drive the transition from CIP v3 to v5. During senior level interviews, leadership seemed comfortable with the processes, timelines, resources, and budget in place for CIP compliance measures. Executive level support is reflected in the sufficient budget, but oversight is not apparent at the highest levels. It is clear that the technical details and CIP status are managed at the project manager level. As the CIP v5 deadline approaches, executive leadership should be more engaged in the CIP v5 transition process to ensure CIP Compliance risk is minimized.

[7] NERC website (http://www.nerc.com/AboutNERC/Pages/default.aspx).
[8] NERC website (http://www.nerc.com/pa/Stand/Pages/default.aspx).
[9] NERC website (http://www.nerc.com/pa/CI/Pages/default.aspx).

As mentioned above, the transition project appears well managed and organized at the project manager level. Specifically, LADWP NERC CIP compliance program personnel are following sound project plans that include the tracking of hundreds of milestones, deliverables, and products. These project plans were reviewed by Navigant staff at a high level and must hold up to rigorous auditing.

According to interviews, LADWP will transition to using Sigma Flow, a recognized off-the-shelf compliance management tool, in the near future. The program will enable the Department to systematically track compliance with cyber requirements and to produce the required audit trail paperwork. This pursuit is commendable and indicates that LADWP NERC CIP compliance is leveraging an industry best practice that will assist in avoiding non-compliance costs which can amount to one million dollars per day per infraction of a NERC CIP standard.

While the CIP program at the Department appears to be cohesive, and due diligence seems to be applied by key people driving the project, the NERC standards and requirements are complicated, new, and have not been explicitly defined by federal regulators. Therefore, there are opportunities for errors in the interpretation and execution of the standards. Given that these standards are new and evolving, leading practitioners are working with their regional and national-level NERC regulators to ensure the appropriate compliance measure are being taken. Accordingly, Navigant recommends that the LADWP compliance team work with its auditors from the Western Electricity Coordinating Council (WECC) during this transition period to confirm that the Department's interpretations meet the standard. WECC is LADWP's Regional Entity with delegated authority from NERC to monitor and enforce compliance.[10] This relationship development with regional auditors is a best practice and will build trust between regional auditors and the Department and limit potential violations (PVs) due to compliance misunderstandings in the future. Over the last four years, LADWP was found to have 4 CIP PVs that cost the City $65,000. Future fines could be significantly more costly if the regulators pursued the full extent of their penalty capability.

Other cybersecurity best practices include collaboration, engagement, and information sharing on a regional and national level. According to interviews with Department personnel, LADWP occasionally attends NERC or WECC CIP compliance workshops; however, the Department does not fully participate in standards development bodies, NERC technical committees, NERC national grid exercises, or NERC provided security conferences. While attending workshops is a good starting point, it does not establish the Department's proficiency or leadership in the compliance arena. This lack of participation and information sharing is a maturity indicator reflecting an area that LADWP could improve in.

For example, Department personnel stated that the annual NERC exercise requirement is met through an internal exercise every October rather than the November biennial national level NERC BES Grid Exercise (GridEx). Given these exercises occur in the same time frame and the national level exercise is free, Navigant recommends that LADWP participate in the nationally recognized NERC cyber and physical security exercise. GridEx would allow the Department to connect with the Electric Subsector Information Sharing (ES-ISAC), the National Communications and Coordination Intelligence Center (NCCIC), local and federal law enforcement, and regional partners such as its reliability coordinator and

[10] There are eight Regional Entities that monitor and enforce NERC compliance standards. FERC approved NERC's delegation of authority to the Regional Entities in 2007. Together, NERC and its Regional Entities are referred to as the Electric Reliability Organization (ERO) Enterprise. *See* "Improving Coordinated Operations across the ERO Enterprise," February 2014 (http://www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx).

balancing authority. The exercise would be customized to LADWP's resources, policies and procedures and would strengthen the cyber and physical security programs of the Department.

Due to security restraints at the Department, access to CIP v5 policies, procedures, facility and BES Cyber System documentation was limited to two interviews with CIP compliance leadership. This restricted access was largely due to the preliminary status of LADWP's CIP Version 5 documentation. Consequently, Navigant only obtained a cursory review of the CIP v5 product and there may be moderate compliance risk to LADWP in areas that were not fully investigated.

### 2.1.2 Physical Security – CIP-014 Compliance

The Department is positioned to achieve compliance with CIP-014, the physical security standard. The CIP Compliance team is working to identify LADWP's bulk power critical facilities, to undertake a threat and vulnerability assessment for those facilities, and to determine an associated security plan to protect and leverage resiliency measures as required by the standard.

Currently, the Department is undergoing the CIP-014 transmission analysis and third party review by Worley Parson and Auriga. Once complete, the Department will use a consulting firm to conduct threat and vulnerability assessments on in-scope substations and primary control centers. The Department will use the same firm to write its physical security response plans and perform third party reviews. Navigant staff was briefed on the Department's early projection of assets that would possibly be in scope, but we have not interviewed the consulting firm engaged by the Department or discussed the methodology used by the Department for the threat and vulnerability assessments.

# 3. Cybersecurity

In addition to the CIP Compliance group in the Power System, cybersecurity has several additional components at the Department. Enterprise cybersecurity is managed in the Joint Services System and OT security is also managed by personnel in the Water and Power Systems.

Navigant identified several significant findings through its assessment of the Department's cybersecurity programs. It is clear that there is limited communication between the cybersecurity programs in the Water, Power, and Joint Services Systems and there is no uniformity to the cybersecurity policies across Systems. According to interviews with LADWP staff, the Department is developing an Enterprise Cyber Security Plan. The completion and implementation of this document and its supporting policies is critical to cohesively and effectively responding to security issues at the Department.

## *3.1 Cybersecurity Capability Maturity Model (C2M2)*

Navigant evaluated the maturity of the Department's cybersecurity programs through an informal assessment that leverages the Cybersecurity Capability Maturity Model (C2M2). The model was developed in May 2012 by the Department of Energy, in partnership with the Department of Homeland Security and directed by the White House Cybersecurity Czar, to facilitate self-evaluations of cybersecurity programs. The C2M2 assesses the maturity level of 10 benchmarked cyber domains including:

- Risk Management
- Asset, Change, and Configuration Management
- Identity and Access Management
- Threat and Vulnerability Management
- Situational Awareness
- Information Sharing and Communications
- Event and Incident Response, Continuity of Operations
- Supply Chain and External Dependencies Management
- Workforce Management
- Cybersecurity Program Management

Navigant used the C2M2 model to evaluate and benchmark LADWP's cybersecurity capabilities within time constraints imposed by this engagement. Department staff that are subject matter experts in the cybersecurity of the Power, Water, and Joint Services Systems participated in the workshop. Navigant's findings are summarized below.

### 3.1.1 Major Findings

Several major findings were identified through the cybersecurity maturity assessment:

- Insufficient executive level leadership and governance;
- A limiting resource structure, support apparatus and Human Resource policies;
- A lack of an adaptable enterprise cyber security strategy with formal supporting policies and internal control policing; and

- Limited communication among the Power, Water, and Joint Services Systems at the Department.

According to cybersecurity personnel, LADWP is developing an Enterprise Cyber Security Plan that identifies key areas that need improvement and provides plans to address them. The strategic plan will align with ISO 27001, an international standard that provides requirements for an information security management system. This document will help the Department address some of the findings described below, but it needs the full support of executive leadership to ensure timely completion and implementation.

#### *3.1.1.1 Resource Constraints*

Staffing resources appear to be severely limited and restrictive across all of the cyber domain practices. In general, there is a lack of full-time employee positions to support cybersecurity. In addition, the Power and Joint Services Systems are challenged to hire experienced, mid-level cyber professionals in an expedited fashion. This is a significant limit that LADWP and the City of LA need to examine to allow for the expedited hiring of mid-level cyber professionals.

Within the current hiring structure, new IT employees typically start at entry level positions and require intensive training. The Department provides sufficient budget and training for these new employees; however, retention within IT group is not guaranteed because promotions are not necessarily within the group that the employee has been trained for. As a result, it takes years to build the mid-level LADWP cyber workforce. This lag will become more problematic as the number of employees seeking retirement increases. Additionally, if senior management needs to quickly fill a cyber-position, they are further restricted by having to hire from a specific job class. There is also little flexibility in hiring or contracting additional personnel for special skill sets. Overall, with critical security issues at stake, workforce hiring policies, promotion policies, and the filling of critical positions must be flexible.

In contrast, substantial effort has been given to leveraging new technologies within the IT group in Joint Services. LADWP is in the process of implementing several systems that will increase security surrounding access management, privileged accounts, and data logging. While the Department is making technological strides, Navigant recommends that IT take advantage of these systems beyond their core functionality. Sufficient training should also be provided on these systems to ensure smooth implementation.

Navigant also found that the Department lacks a continuous monitoring system for cybersecurity. This effort would require additional resources, but it is critical to a mature cybersecurity system. The Network Operations Center (NOC) should have 24x7 monitoring capability to efficiently track and respond to cybersecurity issues and to communicate directly to both the Power and Water operations centers. This would ensure frequent coordination between cyber security professionals and those operating the power grid and water facilities. Moreover, an enterprise-wide common cyber operating picture would improve resource efficiency and cyber security effectiveness for the entire Department. Awareness and immediate responsiveness are key to mitigating cyber harms to the operating enterprise.

#### *3.1.1.2 Cybersecurity Processes*

LADWP has a 2006 Security Plan that broadly identifies security policies, organizational structures, and system requirements; however, the cybersecurity component of this plan is limited and outdated. While the Department is moving in the right direction with the development of a cybersecurity program

strategy, Navigant found that many processes surrounding cybersecurity are ad-hoc and there is a lack of consistency throughout the organization. This finding was voiced and noted consistently throughout the C2M2 discussion. Additionally, there are limited methods and resources for monitoring, tracking and ensuring that policies and procedures are being carried out throughout the organization. As a result, it is difficult for senior security staff to review cybersecurity management activities to ensure conformance with policy. In addition to developing formalized processes, policies, standards and guidelines, Navigant recommends that LADWP regularly monitor and report day to day cybersecurity efforts. The Department should consider summarizing these results in security metrics and key performance indicators.

#### *3.1.1.3 Cybersecurity Communication across Systems*

The cybersecurity of the Water System is completely isolated from the rest of the Department Systems. In some ways, this decentralized approach seems to work well for the Water System because it has a relatively small pool of personnel that require access to its system. Accordingly, the Water System has a white list (i.e. a pre-approved list of permissible resources) to control access, an expedited access control process, a hardening process for its remote access laptops, and a clear understanding of the scale and scope of its OT assets. All of these efforts are considered best practice within the industry.

However, security within the Water System is primarily focused on OT and there is limited IT corporate visibility into its security processes, which limits the effectiveness of enterprise IT policies and security prioritization. Further, the lack of communication between the Systems does not provide executive leadership with the appropriate information to make sound strategic plans. Navigant recommends that LADWP develop additional internal controls across the organization.

In contrast, Navigant found that the Power System and IT communicate regularly especially for CIP compliance. LADWP's CIP documentation and processes are well known and accepted throughout the Department. Furthermore, the Department appends its corporate IT policies with the policies associated with CIP and the Power System. This cohesiveness provides a baseline for a comprehensive set of policies; however, the Power System should continue to develop documentation for cybersecurity processes that is separate from CIP compliance.

Cybersecurity policies and strategies should be driven by leadership at the executive level. Based on conversations with LADWP personnel, cybersecurity is constrained by a lack of forward leaning leadership, initiative and support from executive governance. Additional governance recommendations based on these findings are summarized in Section 5.

### 3.1.2 Findings by Cyber Domain

#### *3.1.2.1 Risk Management*

The Department lacks a mature risk management program. Navigant found that IT is starting to implement periodic risk assessments and application testing, but risk management is largely driven by compliance. There are no policies, procedures, or risk register that clearly identify prioritized risks on an enterprise level. As discussed above, the Water System appears to assess OT risk for system changes and investment choices. It also has a documented risk strategy that outlines the processes to create operational awareness for its small user pool. However, the other Systems have little visibility into these processes and communication surrounding cybersecurity does not extend beyond the Water System. In

contrast, Navigant found that the Power System has limited risk policies outside of CIP compliance, but that these compliance policies often spread into non-CIP areas.

Enterprise risk assessment across Systems is critical to a mature cybersecurity program. According to interviews, all of the Systems identify cybersecurity risks, at least in an ad hoc manner, but there is no formal structure to ensure that the identified risks are mitigated. Further, IT has an incident response committee but identified risks are not prioritized or documented in a formal process. This ad-hoc approach to risk impacts the other cybersecurity domains such as threat and vulnerability management because without documented risk criteria and risk strategy, cybersecurity vulnerability assessments may not be analyzed and prioritized appropriately. Navigant recommends that the Department develop a risk management strategy that includes processes for a formal risk register to identify, prioritize, monitor, and expeditiously mitigate enterprise risk.

#### *3.1.2.2 Asset, Change, and Configuration Management*

The Power and Water Systems have inventories of OT assets that include attributes to support cybersecurity efforts. The IT group within Joint Services has an inventory of IT assets throughout the Systems, but it is not fully implemented and attributes are still being populated and automated. Changes to inventoried assets appear to be evaluated, logged, and tested prior to deployment. While Power and IT have change management processes that address the full life cycle of the assets, the Water System does not have any processes to monitor these changes after deployment. Overall, Navigant found that this cyber domain is relatively mature because the Department seems to have documented practices for asset inventory, configuration, and change management activities that are followed and reviewed periodically.

#### *3.1.2.3 Identity and Access Management*

Identity management is largely implemented; however, there are some processes that need further development. Identities for personnel and other entities are provided and revoked in a timely manner, but credentials are not periodically reviewed. For example, if an employee moves into a different group, IT may not be notified to ensure that their credentials align with their current position. The Department is also developing organizational risk criteria to inform credential requirements. According to interviews, this process will be implemented this year.

Navigant found that the access management processes appear to be mature and well-documented. The Department's access controls are granted based on requirements and access requests are reviewed and approved by the asset owner. Moreover, some systems have access control down to the job description. While monitoring is ad-hoc, anomalous access attempts are monitored and additional technology is being leveraged to improve access control for privileged accounts.

#### *3.1.2.4 Threat and Vulnerability Management*

The Department uses information sources (e.g. MS-ISAC, ES-ISAC, the Water –ISAC, ICS-CERT, Los Angeles CICC, federal briefings) to help identify threats and vulnerabilities. LADWP also communicates with internal and external coordinators when addressing a threat or vulnerability. Based on these communications, threat profiles are established; however, they are not formally documented or validated. Further, threats are prioritized and addressed in an ad-hoc manner.

Cybersecurity vulnerability assessments are conducted regularly for certain assets and internal cybersecurity exercises are held periodically. As mentioned above, the lack of a risk criteria and a risk register inhibits the Department's ability to analyze and mitigate vulnerabilities. Navigant recommends that cybersecurity vulnerability assessments be completed for all critical assets and that formalized procedures be documented to guide threat and vulnerability management activities.

#### *3.1.2.5 Situational Awareness*

While the Department logs data for its critical corporate infrastructure components, more formalized logging requirements should be implemented. IT is working to aggregate log data and to extend the amount of log history that is maintained. This aggregation will support cybersecurity assessments as well as other business and security processes.

Similarly, monitoring cybersecurity on an enterprise level is performed in an ad-hoc manner. Monitoring and analysis requirements have not been formally defined, and indicators of anomalous activity are not clearly identified. While the LADWP network has a dynamic alert system with automated notifications for anomalous activity, the NOC does not have methods of aggregating data and communicating the current state of cybersecurity. Navigant recommends that the Department have cybersecurity personnel monitor the network 24x7 to provide updates on the operational state of cybersecurity (i.e., a common operating picture) in near-real-time. LADWP personnel have expressed a desire to implement this best practice.

#### *3.1.2.6 Information Sharing and Communications*

The Department does not appear to have a documented practice for information-sharing beyond the minimum required to demonstrate compliance with the CIP requirements. Accordingly, information-sharing requirements are undefined and cybersecurity reporting obligations are generally assigned to personnel but accountability is limited. Navigant recommends that documented practices be established and followed for information-sharing activities, including how to address protected, sensitive, and classified information. Navigant further recommends that the Department introduce horizontal and vertical communication policies, processes and capabilities to enable real-time sharing of potential breaches, threats, and vulnerabilities. This information sharing maturity is needed and could be met through a 24X7 LADWP NOC or, at a minimum, with a cyber-watch person.

#### *3.1.2.7 Event and Incident Response, Continuity of Operations*

According to LADWP personnel, the Department has incident response plans to address cybersecurity events. The plans identify incident response personnel, reporting mechanisms, and incident life cycle procedures. LADWP also has a well-established relationship with law enforcement and other government entities (e.g. MS-ISAC, ES-ISAC, Los Angeles CICC) to support incident response efforts. The Department conducts annual internal exercises for CIP compliance, but other joint and internal cybersecurity exercises are not conducted on a regular basis. As discussed above, the Department should establish risk criteria, threat profiles, and improved information sharing practices to adjust cybersecurity event response efforts and to identify patterns, trends, and common features.

While some system applications have recovery plans, continuity plans at LADWP are ad-hoc. The Department does not have a corporate continuity plan to guide continuity of operations activities. Furthermore, the Department does not have business impact analyses to support the ad-hoc continuity

plans. These plans and analyses are critical to the security of the Department. The *Emergency Preparedness* section of this report provides greater detail on best practices for incident response and business continuity.

#### *3.1.2.8 Supply Chain and External Dependencies Management*

LADWP has a central supply chain services organization. For IT related equipment, the Department has a change management review process that includes a bid or Request for Proposal process depending on the item procured. IT does not have rigorous supply chain controls on the sourcing of materials that go into its devices. Given the current federal-level discussions around supply chain issues, mandatory and enforceable supply chain requirements are likely in the near future. Accordingly, Navigant recommends that the Department formalize the relationship between cybersecurity requirements and supplier contracts.

#### *3.1.2.9 Workforce Management*

Cybersecurity responsibilities at the Department are identified, assigned, and documented; however, the cybersecurity team is constrained for resources and many employees have multiple roles and responsibilities. According to interviews with staff, the hiring process at LADWP is difficult and lengthy. Specifically, hiring experienced, mid-level cyber staff is a challenge due to extensive processes, stringent recruitment requirements, and policy constraints such as hiring within job classifications and identifying qualified pools of applicants. For example, if senior management needs to quickly fill a cyber-position, they cannot always hire the most experienced person because they are further restricted by having to hire from a specific job class. There is also little flexibility in hiring or contracting additional personnel for special skill sets or short timelines.

Based on this hiring structure, most new employees in IT fill entry-level positions. While the training for these entry-level roles is extensive, it is difficult for IT to retain these employees because promotions are not necessarily within the group that the employee has been trained for. As a result, it takes years to build the mid-level LADWP cyber workforce. Moreover, the need for flexible, mid-level hiring will increase as more of the Department's aging workforce retires. Navigant recommends that LADWP hire additional, mid-level cybersecurity personnel to ensure that cybersecurity responsibilities are adequately managed. More importantly, Navigant recommends that hiring policies be improved to ensure agile, qualified cybersecurity staffing for all experience levels.

#### *3.1.2.10 Cybersecurity Program Management*

As discussed above, the Department is developing a cybersecurity program strategy in alignment with ISO 27001. This plan should have the full support of senior management to ensure enforceability and accountability. The cybersecurity program should be monitored to ensure that it aligns with the cybersecurity program strategy. In addition, Navigant recommends that the cybersecurity program monitor and actively participate in industry cybersecurity standard development, cyber technical committee meetings, and various other cyber initiatives to a greater extent. The CIO and designated staff's participation in implementation of the President of the United States' initiative to develop a Cyber Framework modeled after the Department of Energy's C2M2 framework is a positive step.

### *3.2 Recommended Cybersecurity Best Practices*

As discussed in detail above, the Department should consider implementing the following best practices to achieve a fully mature cybersecurity program.

- Identify risk criteria to evaluate, categorize, and prioritize operational risk based on the Department's risk preferences.
- Design, build, and regularly update a formal risk register that is managed by a risk executive.
- Establish a formal process that prioritizes and monitors threat profiles based on likely intent, capability, and target.
- Improve cybersecurity event detection by increased logging, aggregating, and analyzing cybersecurity events to identify patterns, trends, and other common features.
- Provide a common operating picture by implementing 24x7 cybersecurity monitoring.
- Develop detailed continuity plans to sustain and restore operation if a disruption occurs.
- Complete the cybersecurity program strategy and implement it on an enterprise level with support from executive management.

# 4. Physical Security

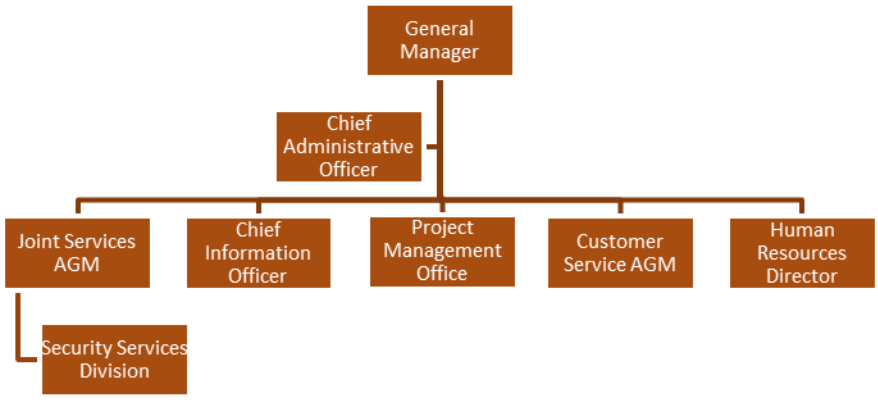
Physical Security is critical to the protection of the Department's facilities. Physical security measures impact LADWP's ability to deter, detect, and delay saboteurs, criminals, or potential terrorists. Components of Physical Security include foot patrols, cameras, access control, and perimeter detection and notification (i.e. alerts, lights, etc.). The successful implementation of physical security measures requires site-specific planning and resourcing such as consideration of vegetation growth in and around key facilities, location and condition of video surveillance, and allocation of security personnel. In addition, effective implementation requires input from experienced physical security personnel and formal business processes to ensure that physical s security measures are properly executed, enforced, and updated.

## *4.1 Resolving Security Gaps*

Physical Security at the Department is restricted by a lack of processes to ensure that security gaps are resolved. Navigant found that facility managers in the Power and Water Systems do not have formal processes to report physical security gaps. Moreover, the Physical Security group has little authority to address reported security gaps and implement security initiatives because it has no line budget for critical capital projects and limited support from executive management. As a result, facility managers are not incentivized to report security gaps because they have to finance the recommendations made by the Physical Security group. Physical Security should be actively involved in the resolution of security gaps because the group has the experience and training to ensure that the appropriate mitigation measures are taken.

Physical Security is managed under the Security Services Division in Joint Services. Figure 4-1 highlights the layers of governance between Physical Security senior executives and the General Manager. This structure limits the enforceability of security measures throughout the Department. As a result, certain security goals and processes are not fully achieved.

**Figure 4-1. Physical Security Governance**




### 4.1.1 Security Planning

Department employees stated that Physical Security used to have a Security Planning group that monitored project planning and completion. According to interviews with Department personnel, Security Planning used to have tracking sheets that would monitor physical security issues from identification to resolution. This process should be reinstated because it allows for a documented feedback loop and project accountability. While the Security Planning group is in the process of being returned to Physical Security, it is crucial that this process be expedited as the group will support the implementation of formal processes to report and resolve threats and vulnerabilities. Security Planning should also work with programmers, design and construction engineers, cost estimators, budget planners, and other disciplines to support the security program at the Department. Finally, the group should have the size, budget, and power it had prior to its dispersion.

### 4.1.2 Physical Security Assessment Audits

Over the last two years, Physical Security has completed security assessment audits on numerous facilities and business locations at the Department. These detailed reports identify a number of cost-effective solutions to resolve security gaps at these locations. The internal assessments were comprehensive and viewed each facility from a threat actor's perspective. Moreover, the assessments looked at current security technologies on-site as well as perimeter security and guard force resources. Security measures that were examined included:

- Barriers: fences, entry gates, door latch guards, hinge pins and security bars
- Locks: deadbolts, padlocks, high security combination locks
- Alarms: motion, infra-red, intrusion
- Exterior lighting and cameras

- Anti-theft: tool cribs, secure storage, interior single hinged security doors
- Vegetation management and removal from site perimeter

Most, if not all, of the suggested security recommendations or enhancements were focused on improving existing technology or fixing failing fences, alarms, and lighting. These improvements would be low cost and could be done with Department staff. Unfortunately, according to multiple interviews, the security gaps and highlighted repairs in these assessments have not been made to ensure perimeter security, access control, and early warning systems (alarms, intrusion detection, and cameras) are properly maintained and in acceptable working order.

Physical Security provides these concise reports to the relevant facility managers who are responsible for physical security implementation. However, there are no processes to ensure that these security gaps are closed. Facility managers prioritize their budget according to a wide range of needs and they are not required to report back to Physical Security (or any other senior executives) regarding outstanding gaps. Moreover, Physical Security does not have the authority or capital project budget to mitigate these issues. It currently relies on relationships rather than formal processes to complete repairs and desired projects. While these reports provide significant insight into the physical security of LADWP facilities, formal policies and processes that ensure these gaps are addressed and mitigated are essential.

#### 4.1.3 Critical Facility Physical Security Assessment

In addition to the internal assessment audits completed by the Physical Security group, Navigant reviewed an independent Security and Terrorism Threat Assessment completed by R.S. Hahn Company, LLC in 2001. Independent threat assessments provide additional insight into physical security vulnerabilities and identify best practices for mitigation measures. These assessments should be conducted regularly to review the physical security of critical facilities and to ensure that best practice measures are considered. The 2001 report appears to be the most recent independent threat assessment conducted at the Department's critical facilities. The 2001 assessment evaluated critical administrative, power, and water facilities and provided recommendations to improve security and to reduce threat vulnerabilities. According to interviews with Department personnel, these recommendations have not been implemented and security is not prioritized at these facilities. As a result, Navigant visited certain critical facilities to determine if these outstanding security issues were addressed and mitigated. Further, Navigant identified the gaps in Department processes and governance that prevented the resolution of these vulnerabilities. The [redacted] were selected for review because of their criticality to the Department's day to day operations.

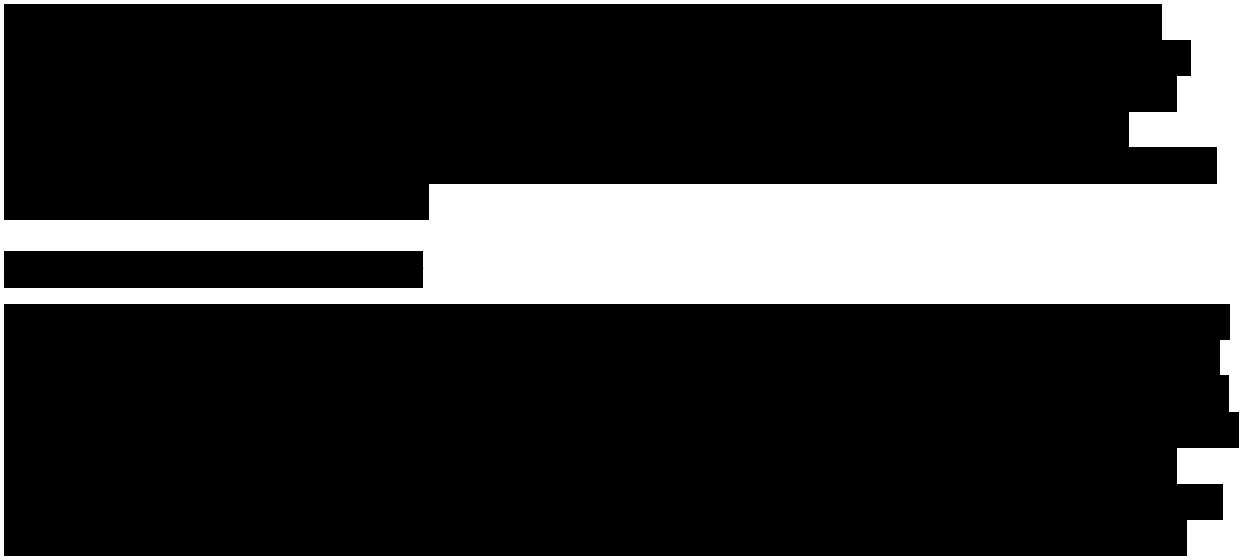
Based on the on-site review, Navigant found that the security culture differs significantly between the Water and Power Systems. Specifically, the Water System appeared to take a more proactive stance on physical security and technology. In contrast, Navigant found that the Power System facilities ignored most of the recommendations identified in the 2001 assessment. Accordingly, these facilities should increase the resources directed to physical security, especially for significant constraints such as limited camera coverage and security staff. However, the more critical finding is the lack of processes to ensure that security improvements, such as those in the 2001 assessment and the aforementioned audits, are addressed.

Navigant's conversations with facility managers confirmed that there is a lack of security process for identifying security gaps, supplying recommendations, and then following through with those recommendations to mitigate the security gap or vulnerability. Based on conversations with security staff and facility management, Navigant observed that lines of "issue ownership" and accountability are broken. Once recommendations are made, it is up to facility management to act upon those recommendations, often times resulting in significant delays in fixing the security issue or no action at all. Navigant's on-site findings are discussed in detail below.

[redacted]

[redacted]

[redacted]



Based on the findings summarized above, Navigant recommends that the Department create a clearly defined process to ensure that security gaps are addressed and to communicate these upgrades to Physical Security and senior management. The Physical Security group should have more oversight into the deployment of additional security resources at critical facilities. This will ensure proper placement, maximum coverage, and project accountability and completion.

#### 4.1.4 Upgrading Security Measures at Existing Facilities and Business Centers

According to multiple interviews, certain components of the physical security system are out of date including the Department's access control system and Central Monitoring System (CMS). The CMS should consider a smart system that actively notifies security personnel of potential physical security threats. Mandatory training for active shooters and insider threats should also be considered.

## 5. Security Conclusions

Navigant's Security assessment revealed a number of factors that may limit the Department's ability to identify and mitigate security threats and vulnerabilities, including a lack of formal cyber and physical security processes, limited risk assessments, constrained resources, and limited executive level support. While certain aspects of Security such as CIP Compliance and Water OT security are robust, security is not appropriately addressed on an enterprise level. Moreover, there is no formal executive governance structure to support cyber and physical security initiatives.

### *5.1 Recommendations*

Based on the findings above, Navigant has several policy and governance recommendations to prioritize security within the Department.

### 5.1.1 Corporate Security Plan and Budget

A corporate security plan is essential to providing the Department with sound policies, programs, and project management on an enterprise level. As discussed above, LADWP has an outdated 2006 Security Plan that broadly discusses security policies and physical, electronic, and information security requirements. Navigant recommends that the Department update and expand this plan to ensure that corporate resources are used in a productive way and to allow for visibility into the physical and cyber security programs within the Systems. The plan should identify the persons (and budget) responsible for implementing the aforementioned policies to guarantee that security issues are resolved in a timely manner.

A strategic plan or security roadmap should also be developed to outline future goals and timelines. While security-related technology is constantly changing, a strategic plan that identifies and prioritizes security needs and their associated costs will allow for more concrete planning and accountability within the LADWP security system.

### 5.1.2 Organizational Behavior Changes

Security should be a top priority throughout LADWP. Security senior executives are currently buried within the organization and there is little support for addressing and mitigating security gaps. A behavioral change is imperative for the Department to reduce outstanding security risks and to be proactive about security initiatives. Furthermore, the organizational structure changes discussed below provide recommendations to elevate security within the Department.

### 5.1.3 Organizational Structure Changes

Today's business risk environments have become increasingly more significant, complex, and interdependent, both at the local utility level and across the bulk power system. The effective management of these environments is a fundamental requirement of business. Boards of Directors, shareholders, key stakeholders, and the public correctly expect organizations to identify and anticipate areas of risk and set in place a cohesive strategy across all functions to mitigate or reduce those risks. In addition, there is an expectation that management will respond in a highly effective manner to those events and incidents that threaten the assets of the organization. Effective leadership within the top levels of the organization and its related security functions are imperative. Organizational reputation, the uninterrupted reliability of electric infrastructure and normal business processes, protection of physical and financial assets, the safety of employees, and shareholder confidence all rely in some measure upon the effectiveness of an accountable senior security executive.

LADWP is lacking a single position at the senior governance level with the responsibility for crafting, influencing, and directing an organization-wide protection strategy. At the Department, accountability is dispersed among several facility managers in different departments (Water, Power, and Joint) with potentially conflicting objectives. Navigant recommends that LADWP create a new senior level executive position, reporting directly to the General Manager, that has physical and cybersecurity as their sole responsibility. This position should be charged with the protection of the company's integrity, people, processes, and assets from attack, harm and loss.

As discussed above, risk is a crucial component of a security system and it should be assessed on an enterprise level. Navigant recommends that the Department create a senior executive position that is

responsible for enterprise risk assessment including security, financial, operational, regulatory, compliance and reputational risk. The individual should be in constant communication with the General Manager, the security senior executive, and senior risk representatives across Power, Water, and Joint Services. One way to facilitate this communication is to have a Risk Committee chaired by the senior risk executive and populated with the aforementioned representatives to ensure that the systems are communicating and resources are appropriately distributed. This individual should also have the ability to conduct internal audits to identify and mitigate risk related issues.

Best practice indicates that utilities with the above-mentioned positions are better equipped to address corporate risk and security. Moreover, these positions are a growing trend in the utility industry due to the demand for senior level executives that are aware of risk tolerances and the evolving security environment. Recent security crises have also increased the need for these positions. Examples of utilities that have similar positions include American Electric Power, Sempra Energy, and Tri-State Generation and Transmission.

### 5.1.4 Prioritized Recommendations

Navigant's prioritized list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department and the City.

High Priority Recommendations

- Develop a Corporate Security Plan that includes sound policies, programs, and project management for cyber and physical security on an enterprise level.
- Create executive level security and risk positions that report to the General Manager to distribute and enforce the Corporate Security Plan and other cyber and physical security initiatives.
- Complete the Enterprise Cyber Security Plan to identify and address weaknesses in the cybersecurity program.
- Identify risk criteria and develop a risk register to prioritize risk assessments on an enterprise level.
- Initiate 24x7 cybersecurity monitoring to provide a common operating picture of the cybersecurity environment in near real-time.
- Develop a formalized process to identify and mitigate physical security threats and vulnerabilities across Systems.
- Move Security Planning back to Physical Security to ensure that the group has project management resources.
- Provide Physical Security with a line budget to close critical security gaps.
- Improve the hiring process for experienced, mid-level staff in the cyber workforce.
- Develop detailed continuity plans to sustain and restore operation if a disruption occurs, including a complete Business Impact Analysis to appropriately prioritize processes and resources in the event of a major incident.

Medium Priority Recommendations

- Upgrade Central Monitoring System, the camera monitoring system used by Physical Security, to include a smart system.
- Develop the relationship with the Western Regional auditors to confirm the Department's interpretation of CIP Version 5.
- Increase participation in standard development bodies, NERC technical committees, and NERC GridEx.
- Create a formalized practice for information sharing that includes horizontal and vertical communication policies, processes, and capabilities to enable real-time sharing.
- Conduct cybersecurity exercises on a regular basis.
- Complete cybersecurity vulnerability assessments for all critical assets.
- Aggregate log data for cybersecurity assessments to identify patterns, trends, and common features.

Low Priority Recommendations

- Ensure that the credentials for employees align with their current position.
- Formalize the relationship between cybersecurity requirements and supplier contracts.

# 6. Emergency Preparedness and Business Continuity Overview

Emergency Preparedness is defined as a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action in an effort to ensure effective coordination during incident response.[11] Emergency Preparedness and response is often considered one facet of Crisis Management, and includes coordination, communication, and centralized command structures. Emergency Preparedness is directly related to other disciplines, including most notably Business Continuity Management (BCM) and Disaster Recovery (DR). BCM is a holistic management process that identifies potential threats to an organization and the impacts to business operations those threats, if realized, might cause. This process provides a framework for building organizational resilience with the capability of an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities.[12] BCM is an ongoing, integrated process that:

- Identifies, in advance, the potential impacts of a wide variety of worst-case disruptions, and determines tolerable losses relative to an organization's risk appetite.
- Provides a method of restoring an organization's ability to supply its critical products and services to an agreed level.
- Delivers a capability to manage the disruption and protect the organization's reputation and brand.
- Proactively improves an organization's resilience.

DR is the collection of policies, plans and actions to recover system applications and infrastructure in a tiered approach, whereby technology priorities are identified (software and hardware) to facilitate continuation of key business processes and inevitably, recovery. DR is often considered the technical aspect of business continuity. This Report includes a review of the Department's BCM and Emergency Preparedness policies, practices, and organization. A review of the LADWP's DR measures is provided in the *Technology Infrastructure* portion of the Survey.

## *6.1 Aspects of Emergency Preparedness and Business Continuity*

The concepts of Emergency Preparedness and BCM are linked; preparedness focuses on organizing people, processes, and equipment for use when a disaster occurs. BCM is founded on the on-going assessment of the potential impact of a disaster, and the design of prioritized restoration plans for key services. In this way, an organization's level of preparedness is contingent on the types of analyses conducted to understand the business impact of a disaster (as noted, typically referred to as a worst-case disruption). As noted above, Emergency Preparedness typically focuses on methods of coordination, communication, and leadership of response efforts through command and control structures. At the highest level, Emergency Preparedness plans are typically focused on three objectives: Life Safety, Incident Stabilization, and Property Conservation.[13]

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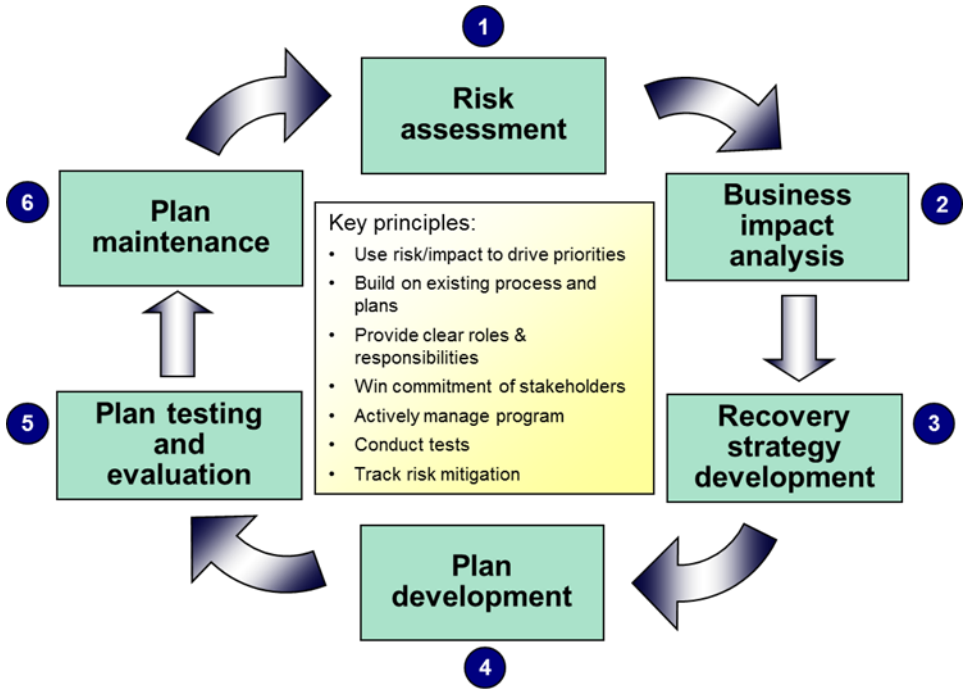
[11] Department of Homeland Security/Federal Emergency Management Agency (http://www.dhs.gov/topic/plan-and-prepare-disasters).

[12] International Organization for Standardization (ISO) 22301, Societal Security – Business Continuity Management Systems (2012).

[13] Emergency Response Plan Implementation (www.ready.gov).

BCM is the discipline of service restoration, where service in this context can also refer to an organization's most critical business processes. In the case of any utility, this would include the restoration of the most critical business processes to restore core operations to a level that enables the delivery of safe and reliable service to customers. The BCM process is comprised of the following high-level steps:

**Figure 6-1. Common Steps in Business Continuity Planning**




1. Risk Assessment: Identification and specification of risk drivers (the most critical risks to the organization, given a disruption) and their impacts (an assessment of the relative impact on the organization of a disruption in a service).
2. Business Impact Analysis (BIA): BIA identifies the critical business processes that are most affected by a worst-case disruption, and helps prioritize the recovery strategies that might be needed during an extended business disruption.
3. Recovery Strategy Development: Strategies to improve business resilience and technology resilience.
4. Plan Development: Detailed planning documents that establish recovery teams, the recovery process, and other facets of recovery.
5. Plan Testing and Evaluation: Protocols for testing the plans (including scheduled walkthroughs and unscheduled drills).
6. Plan Maintenance: Governance over the plan, testing, and program enhancement.

This is a standard "top-down" approach to continuity planning, which considers holistic threats to normal operations that could impact an entire organization. In the event of such a widespread disruption, the BCM process guides decision-makers as to the most critical services and activities that must be brought back online *from across the entire enterprise*. This approach removes functional silos and

"local" approaches to recovery, which are inappropriate when considering the impact of a worst-case disruption event. In this way, the standard BCM approach identified above prioritizes how services are returned – and dedicates corporate resources to that prioritized effort – in a manner that is closely aligned to strategic goals and objectives. Consistent enterprise-wide execution of BIA, risk assessment, testing, training, reporting, and other facets of program implementation reflect an organization that is committed to BCM. Importantly, when implemented properly, each of these steps comprise an iterative process, which is administered in a consistent fashion by a centralized function at the enterprise-level.

## *6.2 Accountability for Emergency Preparedness and Business Continuity*

BCM is a forward-looking and holistic approach to building organizational resiliency. It is a coordinated and integrated approach that spans the entire company and all its operations.[14] Clearly defining the ownership and responsibility for emergency preparedness and business continuity is an important topic. As noted above, accountability for the consistent design and administration of the program typically resides at the corporate level. (This includes ensuring appropriate testing, training and the like.) While active coordination and facilitation is provided by a corporate function, coordinators in each line of business are responsible for working closely with corporate staff to properly develop, test, and improve plans according to clearly documented protocols. Inevitably, while the corporate function provides an administrative role, each line of business executive sponsor is directly accountable for the success (or failure) of BCM for their organization.

Evidence confirms that successful and well-managed programs have clear support and active sponsorship from the highest executive levels of the organization. This sponsorship is critical for ensuring proper communication of program goals across the organization, driving engagement in the active management of the program, and confirming that BIA and other facets of the program are properly aligned to strategic objectives. Increasingly, leading practitioners integrate BCM with the organization's overall Enterprise Risk Management (ERM) process.

[14] Business Continuity and Disaster Recovery Planning for IT Professionals, 2nd Edition by Susan Snedaker. *2013*

## 7. Emergency Preparedness and Business Continuity in Utilities

Increasingly, utilities are being scrutinized for their response to emergencies and disasters that significantly disrupt normal operations. While related, definitions of emergency and disaster differ in terms of the extent of the disruption to normal operations. Specifically, an emergency is commonly defined as an unexpected or impending situation that may cause injury, loss of life, destruction of property, or cause the interference, loss, or disruption of an organization's normal business operations to such an extent that it poses a threat. A disaster, by comparison, is defined as a sudden, unplanned catastrophic event causing unacceptable damage or loss. In either case, utilities design and implement programs to actively assess situations and respond with the execution of specific protocols to bring back critical services in a phased and prioritized manner, based on a standard risk assessment.

A variety of stakeholders – from regulators, to customers, to community leaders – have focused more and more attention on all aspects of planning and recovery from all varieties of emergency. Perhaps the most prominent examples from the utility sector include the major hurricanes of the last decade (Katrina, Irene, and Sandy). Common areas of critique during these and less significant emergency situations have included the pace, sequence and quality of emergency response and service restoration, the nature of communication to customers and stakeholders during an emergency event, and the thoroughness of plans in-place to meet service disruption (among others). Importantly, while focus and attention is often given to the potential impact of natural disasters, other scenarios requiring planning and response include acts of terrorism, sabotage, cyberattacks, or other similar events.

Utilities focus on providing clear evidence of emergency and disaster planning and testing in order to mitigate multiple forms of risk. While operational risk is the most immediate form of risk mitigated by strong emergency preparedness, reputation and financial risk are also mitigated by rigorous emergency preparedness. Evidence confirms that poor preparedness and inadequate response can lead to significant financial penalty. As an example, a $25 million civil penalty was levied on Florida Power and Light (FPL) in 2009 under NERC's mandatory reliability standards for, among other things, shortfalls in emergency operating procedures. In addition to the financial penalty, NERC mandated that FPL enhance its compliance program; enhance training and certification requirements for operating employees; improve its frequency response; update emergency operating procedures; provide additional staffing for Bulk Electric System (BES) analysis; and ensure that specified equipment is properly inspected and maintained.[15]

In addition, an erosion in the reputation of (and trust in) any utility can have long-term implications. It is increasingly believed that a company's reputation is the single most important driver of value creation or value destruction, making the active management of risk to reputation a top priority. A utility's reputation is built over a long period, and determined in large part by how well several core commitments are met, including delivering reliable, safe, and cost effective services to customers, while meeting and exceeding the financial (cost and revenue) expectations of a variety of stakeholders. Inadequate response to any emergency or disaster situation can significantly erode reputation, which then impacts other forms of risk (principally, political and regulatory). Evidence confirms that emerging from a significant reputational risk event requires the dedication of significant resources (time and capital) often over a long period of time, and diverts attention away from other activities that advance

[15] Federal Energy Regulatory Commission, Docket No. IN08-5-000, Florida Blackout, October 8, 2009.

the strategic plans of the company. Evidence from the utility sector in areas such as failed storm restoration confirm the potential negative impact of reputational risk.

Given this, all utilities are focusing greater attention on planning for the most significant of disruptive events. The disciplines of emergency preparedness and business continuity are defined by a combination of regulatory standards, the recommendations of standard-setting organizations, and the peer practices of other organizations that are continuously redefining the notion of leading practice. The following section introduces several of the more important standards that are shaping the discipline of business continuity and emergency preparedness in the utility sector.

# 8. Standards in Emergency Preparedness and Business Continuity

Standards in Emergency Preparedness and BCM are driven by regulatory requirements, recommendations of oversight and standard-setting organizations, and the leading practices of organizations in every sector – including the energy and utility sector. The following is a brief overview of some of the more prominent and influential standards in Emergency Preparedness and BCM, with particular emphasis on those that define the practices of organizations in the energy and utility sector. While some of these standards may not directly apply to the Department, they help form the basis for leading practice in the discipline of emergency preparedness and business continuity.

## *8.1 Federal Regulatory Standards*

A variety of federal regulations inform a utility organization's emergency preparedness and response stance. Principal among these standards is the Continuity of Operations (COOP) and Continuity of Government (COG) Federal Preparedness initiative. COOP planning aims to ensure that Primary Mission Essential Functions (PMEFs) continue to be performed during a wide range of emergencies, including localized acts of nature, accidents and technological or attack-related emergencies. The Department has developed and implemented a COOP policy and plan, which is discussed further in Section 5.

Additional federal initiatives and mandates related to business continuity are identified below.

### 8.1.1 Federal Energy Regulatory Commission (FERC)

Federal Energy Regulatory Commission (FERC) RM01-12-00 2003 made business recovery plans mandatory for all energy companies. The standard applied to the U.S. electric power industry, and specifically larger metro utilities. Subsequent to this standard, the Energy Policy Act of 2005 created the Electric Reliability Organization (ERO), an independent, self-regulating entity that enforces mandatory electric reliability rules on all users, owners, and operators of the nation's transmission system. The FERC is given oversight authority for the ERO. In July 2006, FERC certified the North American Electric Reliability Corporation (NERC) as the ERO. In March 2007, FERC approved 83 NERC Reliability Standards, which became the first set of legally enforceable standards for the U.S. bulk power system, effective June 4, 2007. Today NERC oversees eight regional reliability entities and is responsible for establishing and enforcing mandatory reliability standards for the power grid.

### 8.1.2 North American Electric Reliability Corporation (NERC)

The North American Electric Reliability Corporation (NERC) has a number of standards that direct how a utility company assesses threats to critical infrastructure, and responds to situations that may disrupt operations. NERC standards focus on cyber and physical security protocols, which are outlined in our *Security* report. NERC has also established guidelines related to establishing an effective operations continuity plan. Specifically, the guideline describes steps that "an electricity sector organization should consider in developing plans that will strive to ensure continuity of operations during and after an incident or crisis."[16] Key aspects of this guideline include the specification of the following:

[16] NERC, Security Guideline for the Electricity Sector: Business Processes and Operations Continuity, May 2011.

- Program Policies and Management: top-level authorization, support, and commitment to preparedness
- Analysis: evaluate best practices, define and document the scope of the preparedness program, conduct risk assessment and impact analysis
- Planning: clear plans with defined end products, a specific schedule, and assigned responsibilities and resources
- Implementation: development and maintenance of comprehensive project management and control system
- Test and Evaluation: specify evaluations to examine the implementation process; use dry runs
- Maintenance, Review, and Improvement: implementing periodic formal reviews and identifying program areas that require periodic maintenance

#### 8.1.3 Federal Emergency Management Agency (FEMA)

The Federal Emergency Management Agency (FEMA) has established a number of guidance documents and standards that relate specifically to continuation of operations in an emergency or disaster situation. One of the primary guidance documents, *Developing and Maintaining Emergency Operations Plans: Comprehensive Preparedness Guide (CPG) 101 (Version 2.0)*, integrates key concepts from national preparedness policies and doctrines, as well as lessons learned from disasters, major incidents, national assessments, and grant programs. CPG 101 provides methods for planners to:

- Conduct community-based planning that engages the whole community by using a planning process that represents the actual population in the community and involves community leaders and the private sector in the planning process
- Ensure plans are developed through an analysis of risk
- Identify operational assumptions and resource demands
- Prioritize plans and planning efforts to support their seamless transition from development to execution for any threat or hazard
- Integrate and synchronize efforts across all levels of government.

## *8.2 California Rules and Regulations*

The California Government Code includes Section 3100 that requires all public employees to be "disaster service workers subject to such disaster service activities as may be assigned to them by their superiors or by law." Accordingly, all Department employees are required to be disaster servicer workers. Compliance with this rule requires a training program to learn about what it means to be a disaster service worker.

The California Emergency Services Act (CESA) provides guidelines for the state and local governments to declare a state of emergency before, during, or after a disaster. This declaration is necessary to secure mutual aid from other local, state, and federal organizations. Specifically, a state of emergency can activate the California Disaster and Civil Defense Master Mutual Aid Agreement between the State of California, its various departments and agencies, and the various political subdivisions of the state. CESA also includes a Governor-approved state emergency plan and requires cities and counties to

administer it. The plan contains information regarding the standardized emergency management system (SEMS) framework, continuity of government, emergency services of governmental agencies, mobilization of resources, mutual aid, and public information. CESA does not contain mandatory elements for local agencies to include in their emergency plans, but the state plan contains contact information for the chain of command and assistance organizations as well as sample forms and documents to ensure that emergency powers are properly exercised.[17]

In addition to the California Government Code and CESA, there are a variety of regulations and mandates from the California Public Utilities Commission (CPUC) that address emergency preparedness and continuity of operations. For example, CPUC General Order 166 requires jurisdictional electric utilities to file annual emergency response plans with the CPUC. General Order 166 also requires that the utilities develop mutual assistance agreements, perform annual emergency exercises, and develop a written communications strategy for emergencies. In addition, it sets time limits for the evaluation, communication, and restoration of the utility. Finally, the General Order benchmarks the restoration and call center performance of these utilities.[18]

In 2012, Bill AB1650 was passed to supplement General Order 166. It stated that the CPUC will establish standards for disaster and emergency preparedness and will require electric and water corporations to develop plans in compliance with these standards. It also requires that each electric corporation meet with representatives of every city and county it serves on a biannual basis to develop an effective emergency and disaster response plan.[19] According to CPUC Proceeding R1506009, the CPUC is in the process of establishing these emergency preparedness standards.[20]

While the Department is not mandated to follow the CPUC regulations, these organizations provide a relevant framework for LADWP's emergency preparedness and business continuity efforts.

### *8.3 Municipal Requirements*

In addition to coordinating and executing emergency preparedness and business continuity plans to resume core utility operations in the event of a disruption, municipal utilities commonly have an accountability to assist in the broader municipal recovery. Emergency preparedness at the Department is also driven by the broader objectives of the City. The City of Los Angeles is susceptible to 13 of the 16 federally identified natural and man-made threats. Los Angeles is particularly vulnerable to natural disasters such as wildfires, mudslides, and earthquakes. In recent years, the City of Los Angeles has significantly developed its emergency preparedness efforts. It has an Emergency Management Department (EMD) to manage the City's response to and recovery from emergencies through the operation of an Emergency Operations Center (EOC). The EMD develops training, planning, and response efforts for all City Departments, including coordination with local, state, and federal agencies. To support this development in emergency preparedness, Mayoral Executive Directives have been

[17] California Emergency Services Act (http://hazardmitigation.calema.ca.gov/docs/ESA-all8-06-final.pdf).
[18] California General Order 166 (http://www.cpuc.ca.gov/gos/GO166/GO166_startup_page.html).
[19] California Assembly Bill No. 1650 (http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120AB16500).
[20] CPUC Proceeding R1506009 (http://delaps1.cpuc.ca.gov/CPUCProceedingLookup/f?p=401:56:8450711617061::NO:RP,57,RIR:P5_PROCEEDING_SELECT:R1506009).

issued to enforce emergency planning efforts throughout the departments of the City, including LADWP.

The following table describes the Mayoral Executive Directives (Nos. 15-19) related to emergency planning and business continuity.

**Table 8-1. Mayoral Executive Directives**

| Mayoral Directive | Description |
|---|---|
| Directive No. 15 | The Department's Emergency Plan should comply with the City's Guidelines for Department Emergency Plans, which addresses preparedness, mitigation, response, and recovery. The plan should be updated annually and submitted to the Emergency Management Department. The directive also states that Department Heads should ensure that their employees are trained as appropriate on emergency management roles and responsibilities. |
| Directive No. 16 | All City employees will be Disaster Service Workers and will assist the various City Departments with disaster services pursuant to the California Emergency Services Act. |
| Directive No. 17 | The EOC will be organized around the Incident Command System (ICS) and the EMD will appoint members and develop standardized training for the EOC. |
| Directive No. 18 | The Department must incorporate NIMS into its emergency plans including planning, training, and exercises. In addition, all personnel who participate in the EOC, Department Operation Center (DOC), and other emergency response efforts must complete IS-700, IS-800, ICS-100, ICS-200, and ICS-300. |
| Directive No. 19 | The Mayor's Emergency Response Council (MERC) will advise City Council on emergency or disaster response and recovery. Members of MERC include the General Manager of the EMD, the LAFD Chief, the LAPD Chief, and the Deputy Mayor of Homeland Security and Public Safety. |

An evaluation of the Department's adherence to directives 15, 16 and 18 is included in Section 5.4.

## *8.4 Other Standards*

### 8.4.1 International Organization for Standardization (ISO)

The International Organization for Standardization (ISO) is an international standard-setting body composed of representatives from various national standards organizations. In 2012, the ISO published an International Standard addressing business continuity management. ISO 22301 provides a framework to plan, establish, implement, operate, monitor, review, maintain and continually improve a business continuity management system. More specifically, ISO 22301 establishes standards for:

- Monitoring the extent to which business continuity policies, objectives and targets are met

- Measuring the performance of processes, procedures and functions that protect prioritized activities
- Monitoring compliance with the ISO 22301 standard and business continuity objectives
- Reviewing historical evidence of deficient business continuity plan performance
- Conducting internal audits at planned intervals
- Evaluating each facet of the program during management reviews at planned intervals

Additional relevant ISO standards include ISO 27001 (Requirements for Information Security Management Systems) and ISO 27002 (Code of Practice for Business Continuity Management).

#### 8.4.2 Industry Organizations

Utility industry organizations such as the American Water Works Association (AWWA), Water Research Foundation (WRF), and the Edison Electric Institute (EEI) also contribute to the discourse on emergency preparedness and business continuity.[21]

### *8.5 Peer Practices*

In addition to the mandates and recommendations of regulatory groups and oversight organizations, it is important to consider the practices of peer utilities when assessing emergency preparedness and business continuity programs. In today's uncertain environment, municipal, investor-owned, and cooperative utilities are pursuing the design and implementation of active programs that focus on preparedness, response, and recovery. While in some instances the economic downturn of 2008 shifted attention away from business continuity due to budget constraints and competing priorities, the economic recovery has enabled utilities to shift attention back to the importance of these disciplines. In addition, many utilities are improving risk awareness and response through enterprise risk assessment techniques. And, while some utilities are playing "catch-up" to meet minimum standards, others have established rigorous and well-tested preparedness and continuity of operations programs. The following are brief descriptions of some of the more prominent program characteristics of peer utilities:

- Corporate Program: It is common practice for emergency preparedness and resiliency programs to be sponsored and managed closely at the corporate-level. This is a central aspect of driving a consistent approach to risk assessment and response prioritization, allocation of resources, communication, testing, and training.
- Executive Sponsorship: The most effective programs have clear, active and executive-level sponsorship.
- Organization: Increasingly, emergency and business continuity programs reside in a dedicated corporate risk management, compliance, or security organization. In brief, many utilities are raising the profile of program ownership to an executive level, and also consolidating residence of relevant programs.
- Accountability: Roles and responsibilities for program management and execution are very clear between the corporate function and lines of business.

[21] Water Research Foundation, Business Continuity Planning for Water Utilities: Guidance Document, 2013; Edison Electric Institute, "The Electric Power Industry Is United In Its Commitment To Protect Its Critical Infrastructure" (www.eei.org).

- Policy & Process: An integrated set of corporate policies and business processes are documented. Process "owners" from the centralized corporate function and business lines work closely to ensure that processes and protocols reflect the latest thinking in preparedness and continuity; a continuous improvement mindset is applied to the on-going management of these areas.
- Program Integration: Utilities are integrating emergency response and preparedness, disaster recovery, and business continuity efforts. As noted, many organizations are also integrating business continuity and ERM programs. In combination, these programs are seen as key aspects of a holistic approach to risk mitigation.
- Staffing: Emergency preparedness and business continuity organizations are generally staffed in a lean manner, and work with individuals in the business lines who matrix to the corporate function. The individuals in the business line provide subject matter expertise on threats and responses, while the corporate team facilitate the consistent roll-out of approaches to risk identification, response testing, training, and overall program monitoring. Significant responsibility – and authority – is placed in these organizations.
- Training: Training on all aspects of preparedness and continuity occurs on a prescribed basis. Who is trained, in what areas of the program, and with what frequency are program parameters clearly spelled out in policy documents (including training "refresh" efforts).
- Testing: All aspects of the holistic program are tested in a variety of ways – from drills, to workshops, to tabletop exercises, to planned and "surprise" functional exercises. Results are tabulated, and communication to the organization is provided in "lessons learned".
- Performance: Program performance plans and expectations are clearly identified, including policy and process review and updates, planned and unplanned exercises and review of results. Companies consolidate findings from tests and actual incident response into a consolidated readiness report.
- Cooperation: Close working relationships are maintained with internal and external stakeholders in program design, testing, and review. Ensuring coordination between the business lines and shared services (IT) is a central responsibility of the corporate function. Mutual Aid Agreements with regional peers and maintaining close working relationships with other municipal agencies and other government agencies is imperative.

While the nature of each utility's program is based on a variety of factors (including the complexity of the system and operations, and the organization's risk tolerance), the above factors generally form the basis of effective preparedness and continuity programs.

# 9. Emergency Preparedness and Business Continuity at the Department

## *9.1 Overview*

The Department's Emergency Preparedness and Business Continuity stance is shaped by a number of different factors, including federal, state and municipal mandates to which LADWP must adhere. In addition, as a municipal utility, the Department is an active participant in broader efforts to prepare and respond to a significant disaster that impacts the City. Finally, the Department should design emergency preparedness and business continuity plans that align to common utility practice and help ensure the health and safety of customers and employees, system and service reliability, and customer responsiveness. This combination of requirements confirms the need for strong and centralized coordination, clear accountabilities, and rigorous planning and testing protocols.

The remainder of this section provides an assessment of the emergency preparedness and business continuity organization, governance, policies and programs currently in place at the Department. The section also describes current status of a formalized BCM program at the LADWP.

## *9.2 Organization*

The Department's governance arrangements, roles and responsibilities, and organizational structures are important factors in the effectiveness of emergency preparedness and business continuity programs. The following is an overview of the organizational structure and governance characteristics of the programs at the Department.

### 9.2.1 Office of Emergency Management

The Office of Emergency Management (OEM) is organized under Security Services in the Joint Services System. The OEM has four full-time staff, including one director and one for each of the Systems. The group is the liaison for emergency preparedness for the Systems and communicates with the emergency command centers for the Power and Water Systems. The IT System has a command center as well, but interviews suggest that communication between OEM and IT is limited.

It is important to note that significant accountability for emergency preparedness and business continuity is pushed into the Systems. Therefore, at present, OEM is often in a facilitation and support role in areas such as emergency training and planning efforts. Navigant found that the OEM is developing relationships with division heads to encourage standardization of emergency preparedness efforts, but the OEM does not have the authority or formal processes to enforce these efforts.

In addition, there seems to be little accountability at the division and facility manager level to engage in emergency preparedness training and exercises beyond annual fire and earthquake drills. Navigant also found that the OEM has had significant turnover in recent years, which limits the stability and enforceability of emergency preparedness initiatives. In general, although efforts focus on expanding and strengthening the role of OEM in corporate-wide initiatives, significant responsibility for preparedness resides in the Systems.

### 9.2.2 System Leads for Emergency Preparedness and Business Continuity

As discussed above, a significant amount of the accountability and decision-making authority for programs has been decentralized and pushed into the Systems. This has led to distinct approaches to leadership and program development in each of the Systems. For example, while the Water System has designated a Water System Resilience Program Manager, there is no analogous Resiliency Program Manager in the Power System. More specifically, the Power System has created an executive working group to potentially discuss initiatives in this area. Navigant recommends that this working group continue to meet, until a Power System Resilience Program Manager (or equivalent) is named.

### 9.2.3 Resilience and Sustainability Programs

In 2013, the Mayor commissioned a Seismic Safety Task Force to evaluate and make recommendations to address the City's vulnerabilities from earthquakes. One component of the recommendations emerging from the evaluation focused on the fortification of water system infrastructure. Recommendations included developing an alternative water system for firefighting, fortifying the Los Angeles Aqueduct (as well as other aqueducts and dams), increasing local water sources, creating a seismic resilient pipe network, implementing a Resilience by Design Program at LADWP, and developing a statewide seismic resilience bond measure.

As a result of this evaluation, the City requested that the Water System establish a Seismic Resilience and Sustainability Program. To develop this program, the Water System sought to define characteristics of a seismically resilient Water System, to identify the current status of Water System seismic resilience, and to recognize aspects which may improve Water System seismic resilience. In September 2014, the Program provided six initial recommendations for increased resilience based on the Mayor's Resilience by Design initiative.[22] In July 2015, the Program expanded on certain recommendations through its documented preliminary plans to reduce risks from the San Andreas Fault at the Elizabeth Tunnel and to manage fires following earthquake risks.

While these initial reports are a great starting point, this Program needs additional resources to implement these recommendations. The current Water System Resilience Program Manager has several additional accountabilities (including the Trunk Line Design Group Manager and the Water System Emergency Preparedness Coordinator). Each of these roles is critical to the Water System; we suggest that these the responsibilities be dispersed among more than one individual. Further, no staff have been allocated to support the Water System Resilience and Emergency Preparedness efforts. While the assignment and goals for the Water System Seismic Resilience and Sustainability Program are clearly identified, Emergency Preparedness and Seismic Resilience need to be prioritized within the Department to accomplish them.

As noted above, according to interviews with LADWP staff, there is no analogous Resiliency Program Manager in the Power System. Navigant recommends that this working group meet regularly to prioritize emergency preparedness, business continuity, and resiliency efforts. While the Mayor's Resilience by Design program does not directly apply to the Power System, resiliency is a key component to business continuity after a major event and LADWP should consider developing a Power System resiliency initiative that is similar to the Water System.

[22] Water System Seismic Resilience and Sustainability Program, Summary Report, September 2014.

### *9.3 Continuity of Operations Plan*

As noted in Section 4.1, the Department is required to develop and actively manage a COOP. The purpose of the COOP is to provide methods to ensure that operations continue during an emergency, specifically when the primary facility is threatened or inaccessible. Activation scenarios include credible threats, natural disasters, utility failures, hazardous material incidents, and civil disturbances that close operations at the Department's primary facility or other critical facilities. According to the plan, the event is categorized into a minor, major, or catastrophic event depending on whether the event requires partial, full (for up to 30 days), or permanent relocation of personnel and agency resources. The COOP has three phases:

- Phase 1 - Activation and Relocation: This phase takes place within the first 12 hours of the event. All relevant employees will be notified and the transition to alternate operations at alternate facilities begins. The COOP Relocation Team (CRT), which includes the GM, the AGMs of Power and Water, the CAO, and the Director of Security Services and OEM, will work from the alternate location and will ensure that mission-essential functions are performed. In addition, the General Manager will ensure that the alternate facilities have the same level of security as the primary facility.
- Phase 2 - Alternate Facility Operations: This phase takes place from 12 hours after plan activation to termination. The transition to the alternate facility should be complete and essential functions should be performed. The COOP identifies mission-essential functions that must be performed within one day, one week, and one month of plan activation. Each of these functions has a CRT staff member assigned to it to ensure operations continue with minimal interruptions. The Department will also begin the transition back to normal operations at the primary facility.
- Phase 3 - Reconstitution and Termination: All personnel will be informed that the threat no longer exists and normal operations will resume. Prior to the cessation of alternate facility operations, an After-Action information collection process will begin to identify lessons learned. This information will be used to complete a COOP Remedial Action Plan with recommendations that can be incorporated into the COOP Annual Review Process.

The Department's plan aligns with the phases of COOP as outlined by FEMA, but the plan does not seem to be actively embraced by the Department. According to the plan, a COOP Program Manager will review and update the COOP, ensure that COOP testing, training, and exercising is conducted, and define short and long-term COOP goals and objectives. The plan also states that all employees will be trained on COOP activation procedures at least once a year. However, Navigant found that employees have not been trained on the COOP in recent years. Navigant recommends that the Department train and exercise this plan to inform employees of the processes in place to maintain operations after an event and to ensure that the mission essential recovery times are appropriate and achievable. As discussed in further detail in the *Security* portion of the IEA Survey, Navigant also recommends that LADWP further develop its risk assessment processes and procedures to support the relocation decisions and timelines associated with the COOP. The Department should also consider developing disaster-specific business continuity plans for earthquakes and other major events because priorities and timelines can change depending on the type of emergency.

## *9.4 Emergency Plans*

The Department maintains Emergency Response Plans (ERP) and updates them annually in accordance with Executive Directive No. 15. LADWP has a corporate ERP that is maintained by the Department's Office of Emergency Management as well as ERPs for the Water, Power, and IT Systems. Each division has a more specific ERP that is consistent with the System and corporate ERPs; however, these plans are not updated annually.

### 9.4.1 Components of the ERP

The ERPs have four core elements:

- Mitigation
- Preparedness
- Response
- Recovery

Each of these plan components is described in greater detail below.

#### *9.4.1.1 Mitigation*

Mitigation includes activities and efforts to prevent emergencies or to minimize their effects. As mentioned above, there are 13 threats and hazards to which Los Angeles is susceptible. The ERPs briefly discuss the Department's efforts to prepare for and mitigate the effects of these specific threats and hazards; however, the documents lacks a detailed plan to fully prepare for these threats. Disaster-specific plans for these events would help the Department proactively prepare for these events beyond broad goals and mitigation plans. Moreover, LADWP could apply City documents such as the Local Hazard Mitigation Plan to Department-specific plans to support this effort. For events that are very high risk such as a major earthquake on the San Andreas Fault, a detailed plan is critical to timely response and mitigation efforts.

#### *9.4.1.2 Preparedness*

Preparedness activities include planning, training, and exercising to effectively respond to emergency events. According to Executive Directive No. 16, all City employees are "disaster service workers…for the purpose of engaging in disaster service pursuant to the California Emergency Services Act."[23] As a result, all new employees at the Department are required to complete training on how to be a disaster service worker. New employees must also sign a Loyalty Oath as outlined by the California Government Code. According to Department personnel, OEM provided over 400 Power System responders with employee preparedness training in 2014, which included the Disaster Service Worker requirements, family preparedness, and alternate work site locations. Additional training requirements for emergency preparedness, response, and recovery are discussed below.

The OEM is responsible for ensuring the Building Emergency Coordinator (BEC) for each facility is appropriately trained and the BECs are responsible for training their facility staff. Specifically, the OEM

[23] Mayor Executive Directive No. 16.

is responsible for coordinating National Incident Management System (NIMS)/ Standardized Emergency Management System (SEMS) training, fire and life safety training, and conducting annual "drop, cover, and hold" drills. At a minimum, the ERP states that all Department employees should have fire, life safety, and NIMS/SEMS introductory training.

Navigant found that key emergency response personnel appear to have the necessary training for emergency preparedness; however, all Department personnel should have at least introductory SEMS and Incident Command System (ICS) emergency training. While OEM has trained approximately 4,500 staff in ICS since 2006, the training statistics in recent years are not supportive of consistent ICS training efforts. According to 2014 training statistics, two employees completed ICS 100 (Introduction to Incident Command System), two employees completed ICS 200, 90 employees completed ICS 300 (Intermediate ICS), and 23 people completed SEMS Orientation.[24] According to OEM staff, the Department recently hired an Emergency Preparedness Coordinator with credentials to teach ICS. Accordingly, efforts are underway to revive ICS and SEMS training through an in-house training program. This effort should have the support of executive level staff to ensure that the program is implemented and standardized.

Navigant also found that certain exercises such as building evacuations, annual fire drills, and five-floor relocation drills are well-attended. However, only nine employees attended the annual EMD Emergency Management Workshop. According to Department personnel, attendance is limited to executive staff and OEM that receive an invitation from the EMD. Navigant recommends that LADWP conduct an internal Emergency Workshop to disseminate information gathered at the EMD Workshop as well as additional information that fosters emergency preparedness. Participants in the internal Emergency Workshop could include a combination of OEM, executives, and middle management that are rotated on an annual basis. In addition, 31 Department employees attended the 2014 EOC functional exercise, which was a two-hour exercise directed to the Power System. Accordingly, the scope and effectiveness of the exercise were limited.

Based on these figures, training completion and exercise attendance are inadequate. Department personnel indicated that although the ERPs call for annual testing, the plans are not tested every year. Various table top exercises have been conducted over the past few years, but these are not consistent, full scale exercises of the ERP. It is important to note that each division is responsible for its own training programs. The BECs at the facility level are not monitored to ensure that facility staff are appropriately trained for an emergency and the OEM does not have any authority to enforce training beyond the facility manager level.

According to Department personnel, exercises are monitored by assigned internal staff and lessons learned are summarized in after action reports. An improvement matrix is then developed or assigned, but the implementation process for after action recommendations is not well documented. Accordingly, the Department should establish processes to ensure plans are updated according to exercise findings.

According to Water System interviews, the incident command system is routinely practiced through responses to water leak repairs. While this provides a good introduction to emergency preparedness, the Department should conduct system-wide and community-wide emergency exercises. LADWP should also consider conducting unscheduled tests to simulate a real emergency.

[24] 2014 Department Specific Emergency Preparedness/Training Activities Annual Report.

#### *9.4.1.3 Response*

Response provides the framework to put preparedness plans into action to prevent further damage and continue operations. For this component, LADWP has established three primary Department Operations Centers (DOC) that organize operational recovery efforts for each of the Systems after an emergency event. These DOCs include the Emergency Command Center for Power (EmCC), Water Emergency Command Center (WECC), and Information Technology Emergency Center (ITEC).

Each DOC has an Emergency Operations Director (EOD) who is responsible for overall emergency management for the System and each facility has a BEC that provides emergency training and exercises to facility personnel. The Department also has a Crisis Management Center (CMC) that acts as a DOC in support of the System DOCs. According to personnel, the CMC and the back-up facility are tested every year.

The CMC provides staff for a Crisis Management Team (CMT), supports Customer Service and Public Affairs in the dissemination of information to the public, supports the Joint System, Financial Services, and BECs in the collection of damage assessment information. The CMT is a group of high-level managers that disseminates emergency information to line management and identifies resources for emergency response efforts. The CMT includes a GM-appointed Disaster Planning Coordinator (DPC) to implement disaster preparedness policies.

#### *9.4.1.4 Recovery*

Recovery is the final component of the ERP and includes actions to return to normal operations following an emergency. For this element, each System ERP has a prioritized list of its critical functions; however, the lists are brief and there are limited actions and processes to support the restoration of these functions. In addition, the Department ERP does not have an enterprise list of prioritized functions, which restricts the efficient distribution of corporate resources and the communication between Systems in an emergency. (Refer to Section 5.8 below for additional information on the current status of an enterprise-wide risk assessment and BCM effort.)

LADWP has supplemented this component of the ERP with a Continuity of Operations Plan, which is discussed in more detail below.

### 9.4.2 Power Emergency Response Plan

In addition to the ERP components identified above, the Power System has operating orders that support its emergency preparedness efforts. While it is important to document these procedures, the absence of testing limits the effectiveness of these policies.

#### *9.4.2.1 Operating Order – Power System Emergency and Disaster Procedures*

The Power System has several facilities that assist with emergency response efforts. As discussed above, the Emergency Command Center (EmCC) is responsible for coordinating the Department's major emergency and disaster response and disseminating status information. The Customer Information Center (CIC) answers calls from the public during major emergency situations. CIC personnel provide information on the adequacy and integrity of the Systems, the anticipated duration of widespread service disruptions, and the measures that can be taken by customers to mitigate shortages.

#### *9.4.2.2 Operating Order – Power System Damage Assessment*

After an emergency or disaster, the Power System assesses damage according to a prioritized facility inspection list. Damage to the facilities is then rated according to its hazard to personnel safety and system reliability. These processes support the Department's disaster recovery efforts.

### 9.4.3 Water Emergency Response Plan

In addition to the ERP components identified above, the Water System has additional components to support its emergency planning efforts. The Water ERP outlines a process, Planning "P" to create an Incident Action Plan (IAP), to provide the objectives, strategies, and supporting activities that the System will use in an emergency event. According to the ERP, the IAP is centrally developed through WECC and decentrally executed through Incident Commanders. This detailed process includes developing a common operation picture, defining an operational period, goals, and objectives, designating resources, and creating a defined communications strategy. In the absence of formalized business continuity planning, this process approximates aspects of a more formal BIA and associated planning. Formal IAPs are a beneficial step to mitigating the impact of a major event. According to interviews with Department personnel, the Power System has chosen not to include this process in its ERP. Navigant recommends including a similar IAP planning process and communicating the benefits of the process to employees.

### 9.4.4 ITEC

Because a BIA has not been completed, comprehensive and rigorous DR plans have not been prepared at the Department. ITSD has established a DR site in Las Vegas, and worked with some system owners on an appropriate DR preparation. However, according to interviews, there are many systems where the system owner has not responded to requests to establish the level of DR required.

ITSD has established the replication of all centrally stored data (Network Attached Storage and Storage Area Network) to the DR site. Many major systems have servers established at the DR site and cutover has been tested. Several of the systems that system owners have not defined prioritized DR are complex, such as Supply Chain (eRSP), the Customer Service Division (LADWP.com site) and the Siebel CRM system. Therefore, while the data is preserved, restoring these systems would take considerably longer. The Power System has some systems on the enterprise network and have not transitioned their DR programs to the Las Vegas DR site. When the Data Center moves, these systems are expected to move their DR location to Las Vegas to get improved resilience to a major disaster.

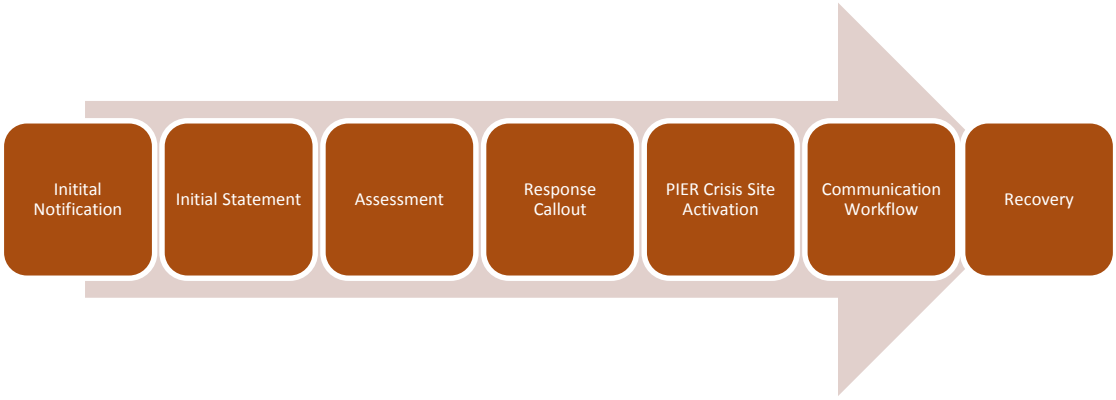
The control and critical dispatch systems (such as the Outage Management System that dispatches electric trouble crews) have their DR locations at the alternate dispatch locations, so that in the event that the networks, despite their resilience, are unavailable they can dispatch via emergency radio or other alternate means of communication.

See our report on Technology Infrastructure on the current status of Disaster Recovery efforts. Importantly, interviews suggest that OEM does not have insight into the critical IT components involved in restoration and cannot support or coordinate with these efforts.

## *9.5 Crisis Communication Plan*

In August 2014, LADWP developed a Crisis Communication Plan in compliance with NIMS requirements. The purpose of the plan is to enhance and protect the Department's reputation and public trust by providing a clear plan for communicating during crises and major events. The plan includes response activities for LADWP-led events and City-led events (i.e. an event beyond the bounds of the Department that requires a coordinated response with the City). According to the plan, the Department has four Public Information Officers (PIO) that will manage crisis communications from event confirmation through recovery. The Department will use Public Information Emergency Response (PIER), a comprehensive, web-based communications platform, to communicate with key stakeholders and the public. After the event is confirmed and an initial statement is released through PIER, the PIO in coordination with the Incident Commander, the senior executive managing the response, categorizes the event into one of three levels and identifies response resources according to the level of the emergency. Information will be communicated regarding the status of the emergency until normal operations are restored. Figure 5-1 summarizes the phases of the plan.

**Figure 9-1. Crisis Communication Plan**




The plan clearly identifies the communication processes and resources that should be used in an emergency situation. Moreover, the plan includes multiple scenarios and levels of communication that can be applied to a wide range of emergency situations. Accordingly, Navigant found the Communication Crisis Plan to be a sound planning document.

## *9.6 Mutual Aid and Assistance*

LADWP has a number of mutual aid and mutual assistance agreements to help distribute resources in an emergency. Resources may be requested from or requested by the Department to ensure continuity of operations. These agreements are utilized depending on the extent of the emergency event. The Department is also part of the California Utilities Emergency Association (CUEA), an organization that provides emergency response support, training, and mutual assistance agreements for utilities in California.

The Water System has mutual aid and mutual assistance agreements with multiple organizations including:

- California Water / Wastewater Agency Response Network (Cal WARN)
- California Mutual Aid Laboratory Network (CAMAL Net)
- Member Agency Response System with MWD
- Mutual Assistance Agreements with East Bay Municipal Utility District (EBMUD) and Las Vegas Valley Water District (LVVWD)

The Power System has the following mutual aid and mutual assistance agreements:

- Mutual Aid Agreement with American Public Power Association (APPA)
- Southern California Public Power Authority (SCPPA) Mutual Aid Playbook
- Western Region Mutual Assistance Agreement

It appears that the Department is active in mutual aid arrangements with regional peer companies and organizations.

### *9.7 Business Impact Analysis*

As described above, a BIA is a foundational and standard component of business continuity planning in companies across all sectors – including the energy and utility sector. A BIA is critical for standardizing an organization's approach for assessing risk in terms of strategic objectives, prioritizing response in terms of the criticality of business activities and processes, and designing testing and training protocols on continuity plans.

A formalized BIA helps determine the financial and intangible losses that could result in the event that the Department's systems, assets, personnel, and data are not available due to a significant disruption (worst-case scenario event). Further, a BIA is a rigorous analysis: A BIA identifies recovery point objectives, resources required for recovery, estimated recovery time, estimated costs of operation interruption, and estimated cost of recovery for each critical business process or function. Finally, a BIA not only informs the prioritized recovery of key business processes, but also the systems that support the execution of those processes (e.g. software, hardware, vital records, and critical resources/equipment).

At present, the Department does not have an active BCM program, and has never completed a BIA. Interview results suggest that while the Department has drafted an RFP to conduct an enterprise-wide BIA, the initiative has stalled and is not being pursued. According to interviews with staff, the RFP has been drafted for more than five years. There is limited accountability for the RFP because ownership has been reassigned over the years and senior leadership is not supporting the effort. For example, a BIA working group has been formed to push this initiative forward; however, the group has not met in some time.

A BIA should be a critical component of the Department's disaster recovery strategy because it identifies critical business processes that are most affected by a worst-case disruption and it helps prioritize recovery strategies on an enterprise level. In brief, LADWP cannot develop enterprise-wide strategies and distribute resources effectively or efficiently in the wake of a disaster without a BIA.

## 10. Emergency Preparedness Conclusions

The Department has many of the policy frameworks that help define an emergency preparedness program. These include the COOP, ERP, and Crisis Communication Plans. However, features of rigorous programs – including evidence of routine and diverse testing, adherence to training requirements and schedules, clear accountability for plan design, development, and continuous improvement – are lacking at the Department. In addition, there is a lack of cohesion amongst the various emergency preparedness plans. While each document appears to define certain processes, resources, and strategies, it is unclear how these plans interact. OEM should create a strategic plan that identifies the emergency preparedness efforts that exist and the direction that the OEM will take to improve these efforts. A strategic plan would also establish timelines to complete OEM initiatives such as training employees and exercising and updating plans.

Leadership for these and other facets of good planning have been decentralized and pushed into the Systems, which has resulted in distinct approaches for building organizational resiliency. Importantly, accountability for emergency and business continuity planning is also dispersed, and in many instances, one of many roles and responsibilities for already burdened staff. These and other foundational aspects of good planning need to be addressed to strengthen the emergency and continuity programs.

As discussed in further detail in the *Security* section, LADWP should create senior executive level positions for security and risk that report directly to the General Manager. In addition to the tasks outlined in the *Security* section, a formal risk and security governance would provide the accountability needed to ensure that emergency plans and processes are documented, implemented, and updated throughout the organization. Furthermore, it would provide a formalized structure to identify and prioritize risk, which is critical to effectively managing disruptions of service. This structure is aligned with industry best practice and will allow the Department to continuously and consistently mitigate natural and man-made threats.

In addition, the ERPs and COOP should address disaster resilience. While we understand that the ERPs are based on a template provided by the City of Los Angeles EMD, the Department's emergency preparedness documents are overly broad and do not address the gradation of responses from a single pipe break to a worst case scenario. The ERPs should incorporate known vulnerabilities into response planning.

A prioritized list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department.

High Priority Recommendations

- Dedicate resources to completing an OEM Strategic Plan to define major initiatives for 2016, including the staffing and capital resource requirements to design, execute, manage and monitor programs.
- Create executive level security and risk positions that report to the General Manager to distribute and enforce the plans related to emergency preparedness and business continuity as well as other emergency preparedness and disaster resiliency initiatives.
- Clarify the emergency preparedness and business continuity governance structure, roles, and responsibilities between the OEM and the Water and Power Systems for core aspects of program design, execution, and decision-making.
- Finalize the BCM and BIA RFP.
- Execute the BCM and BIA scope of work.
- Confirm a consistent approach to plan development across Systems.
- Establish a role in the Power System to address resiliency and emergency preparedness efforts.
- Expand and enforce emergency training and exercises.
- Develop a disaster recovery plan to prioritize IT functions in the event of an emergency.

Medium Priority Recommendations

- Re-evaluate and conduct training programs in-line with policies or good business practice.
- Define a rigorous testing plan for the programs, including a phased approach to tabletop and scenario tests (announced and unannounced), and testing of the "Hot Sites."

Low Priority Recommendations

- Review and standardize other aspects of the programs (including templates and forms of documentation).
- Confirm performance reporting protocols to the General Manager and other members of executive management.
- Integrate emergency preparedness and business continuity programs into Department benchmarking initiatives.

# Appendix A. List of Interviews

| Name | Title/Topic | Interview Date |
|---|---|---|
| Pat Findley | Executive Assistant to the General Manager | July 28th |
| John Dennis | Chief Compliance Officer | July 28th |
| James West | Director of Security Services – Uniform Security | July 29th |
| Sergio Sais | Director of Security Services – Special Operations | July 29th |
| Sandra Wallace | Security Services Administrator | July 29th |
| Matt Lampe | Chief Information Officer | July 29th |
| Brian Koch, Silvia Lozano, Pjoy Chua, Linh Doan, Sanda Cea, Felix Lebron | CIP Compliance Group | July 29th |
| Gary Wong | Joint Services Assistant General Manager | July 30th |
| David Alexander and Stephen Kwok | Director of Corporate Cyber Security | July 30th |
| Silvia Lozano | CIP Cyber Security Team Manager | July 30th |
| Dr. Craig Davis | Trunk Line Design Group Manager / Water System Resilience Program Manager / Water System Emergency Preparedness Coordinator | August 5th |
| Lisa Hayes | Office of Emergency Management Coordinator | July 30th, September 24th |

C2M2 Workshop Participants (August 20th)

| Name | Title/Topic | Organization |
|---|---|---|
| Matt Lampe | Chief Information Officer | ITS |
| Wai Lee | Electrical Engineer Associate | ITS |
| David Alexander | Information Systems Manager | ITS |
| Marie Park | Senior Systems Analyst | ITS |
| Bruce Untiedt | System Programmer | ITS |
| Stephen Kwok | System Programmer | ITS |
| Rafik Alsawalhy | System Programmer | ITS |
| Silvia Lozano | CIP Cyber Security Team Manager | Power |
| Paul Schultz | Power Engineering Manager | Power |
| Robert Tokashiki | Waterworks Engineer | Water |

## Appendix B. List of Documents

Navigant submitted document data requests to LADWP which were provided via a secure file sharing site. Navigant also viewed additional documents in a secure data room at the Department. Some of the documents that were viewed in the data room are not listed here for confidentiality purposes. The primary documents are listed in detail below.

| Documents Provided by LADWP | |
|---|---|
| 1 | Archangel Security Assessment Report - March 25, 2009 |
| 2 | Deployment of Access control, Alarms and Video Systems, (R Hahn & Company April 2002) |
| 3 | Report on Security and Terrorism Threat Assessment (The R.S. Hahn Company, LLC. November 2001) |
| 4 | Executive Review Status of Electronic Security Systems: Moving Forward - January 2008 |
| 5 | Bomb Incident Management Guidelines for the John Ferraro Building |
| 6 | IRP Scorecard (Output) Summary Pages for 2014 IRP Recommended Case |
| 7 | NERC Reliability Standards Compliance Program |
| 8 | NERC CIP-006 CIP Standard Compliance Program Version 3.4 |
| 9 | NERC CIP-002 CIP Standard Compliance Program Version 3.4 |
| 10 | NERC CIP-003 CIP Standard Compliance Program Version 3.4 |
| 11 | NERC CIP-004-3: Personnel & Training Version 3.4 |
| 12 | NERC CIP005-3: Electronic Security Perimeters Version 3.4 |
| 13 | NERC CIP-007-3: Systems Security Management Version 3.4 |
| 14 | NERC CIP-008 CIP Standard Compliance Program Version 3.4 |
| 15 | NERC CIP-009 CIP Standard Compliance Program Version 3.4 |
| 16 | NERC CIP Cyber Security Standards IEA Survey Version 3.4 |
| 17 | Firewall Configuration for JFB - 108 pages |
| 18 | Web Security Gateway – Diagram |
| 19 | Network Access Control – Diagram |
| 20 | Wireless Infrastructure - Drawing CSA-2670 |
| 21 | Internet Network Drawing |
| 22 | LADWP corporate wireless network summary |
| 23 | McAfee Overall IPS Infrastructure |
| 24 | Internet Infrastructure - HTTP Off-load |
| 25 | JFB Network Data Center - CSA-2601 |
| 26 | DWP Corporate Network Internet Infrastructure - CSA-2683 |
| 27 | LADWP Firewall Guideline |
| 28 | DWP Firewall Rules Implementation/Update Procedures |
| 29 | LADWP SGRDP Architecture Diagram |
| 30 | Sw4500-voip-template Documentation |
| 31 | JFB Smart Grid Firewall Configuration - 65 pages |
| 32 | BGP Routing |
| 33 | Disc - SIEM-01 (1 of 2) |
| 34 | Disc - SIEM-02 (2 of 2) |

| | |
|---|---|
| 35 | Disc - IEA Survey (IDM/McAfee/MAAS360) |
| 36 | Disc - Data Power |
| 37 | Disc - ITS-NOC 2015 IEA Survey Data (ITS-NOC) |
| 38 | 2013 Power System Reliability Plan (PSRP and IEC Report) |
| 39 | 2014 Long-Term Transmission Assessment |
| 40 | Scope of Work - Business Impact Analysis and Training Plan |
| 41 | PS Operation Procedures - Operating Order 29 |
| 42 | PS Operation Procedures - Operating Order 32 |
| 43 | PS Operation Procedures - Operating Order 36 |
| 44 | Disc - SIEM-01 (1 of 2) |
| 45 | Disc - SIEM-02 (2 of 2) |
| 46 | Disc - IEA Survey (IDM/McAfee/MAAS360) |
| 47 | Disc - Data Power |
| 48 | Disc - ITS-NOC 2015 IEA Survey Data (ITS-NOC) |
| 49 | 2013 Power System Reliability Plan (PSRP and IEC Report) |
| 50 | 2014 Long-Term Transmission Assessment |
| 51 | Scope of Work - Business Impact Analysis and Training Plan |
| 52 | PS Operation Procedures - Operating Order 29 |
| 53 | PS Operation Procedures - Operating Order 32 |
| 54 | PS Operation Procedures - Operating Order 36 |
| 55 | Mayor's Exe Dir #16 DSW |
| 56 | Mayor's Exe Dir #17 EOC |
| 57 | Mayor's Exe Dir #18 NIMS |
| 58 | Mayor's Exe Dir #19 MERC |
| 59 | LADWP Crisis Communications Plan |
| 60 | CAL WARN |
| 61 | CUEA Mutual Assistance Agreement (Electric) |
| 62 | Multi-Agency Water Mutual Assistance Agreement |
| 63 | Mutual Aid Agreement (2) |
| 64 | Western Region Mutual Assistance Agreement |
| 65 | LADWP Dept ERP 2015 |
| 66 | Power ERP - Attachment B |
| 67 | Power ERP - Final |
| 68 | Water System ERP 2015 Final |
| 69 | Annex A - COOP Relocation Team 2015-Final |
| 70 | Annex B - Alternate Facilities 2015-Final |
| 71 | Annex C - Orders of Succession 2015-Final |
| 72 | Annex D - Delegations of Authority 2015-Final |
| 73 | Annex E - Definitions and Acronyms 2015-Final |
| 74 | Annex F - Security and Access Controls-Final |
| 75 | Continuity of Operations Plan (COOP) 2015 - Final |
| 76 | LADWP Pandemic Influenza Plan 2015 Final |
| 77 | 2014ladwp |

| | |
|---|---|
| 78 | Recovery Final November 2014 |
| 79 | Earthquake_report_FINAL_Dec_8_full_report_compressed |
| 80 | OO-29-Damage Assessment |
| 81 | 2014 After Action Report Final 3 05 15 |
| 82 | AAR |
| 83 | EmCC PDOC Organization Chart |
| 84 | OO-32 – Power System Emergency and Disaster Procedures |
| 85 | OO-36 – Communications |
| 86 | ITEC_manual |
| 87 | LADWP June 2015 BEC List – IEA Survey |
| 88 | IT Restoration |
| 89 | BIA Statement of Work – Prelimary |
| 90 | Mid Valley Water Facility – EOC Preliminary info |
| 91 | Mid Valley Water Yard Preliminary Layout 2015 |
| 92 | SOW Emergency Base Camp Final |
| 93 | Water Master Exercise Calendar – IEA Survey |
| 94 | IEA Survey 2 |
| 95 | IEA Survey file 3 |
| 96 | IEA Survey 4 |
| 97 | IEA Survey 5 |
| 98 | IEA Survey 6 |
| 99 | IEA Survey 13 |
| 100 | IEA Survey 18 |
| 101 | IEA Survey 19 |
| 102 | IEA Survey 11 |

# Volume VII

# Technology Infrastructure

NAVIGANT

# 2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

## Technology Infrastructure Report
## Volume VII

**Prepared for:**
**The City of Los Angeles**

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# Executive Summary

## Objectives & Approach

This report presents Navigant's findings on Technology Infrastructure for the IEA Survey. Technology infrastructure plays a critical role in the effective management and continuous improvement of the Department's operations. As a key driver of business processes, technology has a significant impact on the ability of LADWP to effectively and efficiently pursue its mission to provide safe, reliable, and affordable water and power utility services for the ratepayers of the City of Los Angeles.

This report is a strategic and operational assessment of the technology infrastructure of the LADWP, and in particular, the Information Technology Services Division (ITSD). ITSD is the Department's internal technology services organization, and the primary vehicle through which the Department drives and manages its technology infrastructure. Navigant reviewed the business practices adopted by the ITSD to formulate and implement the strategic direction of the Department's IT infrastructure and the tools with which the Department manages IT operations and evaluates performance. The goal of this assessment was to identify and recommend opportunities for the ITSD and, more broadly, the Department, to improve its approach and management of its technology infrastructure. For the IEA Survey, the *Technology Infrastructure* report includes:

- IT Standards: An overview of several of the most prominent industry standards related to technology infrastructure.
- Functions and Services: A review and assessment of the Department's Information Technology Infrastructure Library (ITIL) in relation to best practices, including roles and responsibilities, the services offered, processes to be followed, and primary contact persons for each area of enquiry.
- IT Strategic Planning and Governance: A review of LADWP's current IT environment for both corporate and System services and applications, as well as relationships with other functionality-specific Operational Technology (OT) environments.
- Primary Applications and Suites Supported: Navigant identified all of the major software applications used by the Department to gain an understanding of its current and future technological direction.
- Hardware, Network and Telecommunications Infrastructure: A review of the current standards for network operations, hardware, and telecommunications to determine if LADWP's strategy is sustainable and consistent with best practices.
- Portfolio and Project Management: A review and assessment of the processes and tools used to manage the portfolio of IT assets, vendor relationships, and project management.
- Information Security and Disaster Recovery: Navigant assessed the Department's information security policy and disaster recovery program.

A summary of findings and recommendations is provided at the conclusion of this report. Insights from interviews and document review complement our assessment.

## Information Technology Standards

The discipline of information technology management is defined by specific standards established by oversight groups, as well as by the ongoing practices of technology professionals. Utilities with a large number of system applications commonly reference and apply control and management standards as defined by oversight groups such as the IT Governance Institute. The IT Governance Institute has two sets of widely accepted IT standards: Control Objectives for Information and related Technology (COBIT) and the IT Infrastructure Library (ITIL).

COBIT provides a framework to establish controls that ensure high levels of information quality, the establishment of clear policies, and adoption of good business practices. This framework is provided in four domains: planning and organization, acquisition and implementation, delivery and support, and monitoring. ISO 20000 is a global standard established by the International Organization for Standardization (ISO) that describes the requirements for an information technology service management (ITSM) system. The standard was developed to mirror the best practices described within the IT Infrastructure Library (ITIL) framework. ITIL provides a set of best practices related to IT service management, and includes practices that are categorized into five core areas, including service strategy, service design, service transition, service operation, and continual service improvement. The themes contained in these standards have been used to evaluate the maturity of the Department's technology-related policies and practices.

**Information Technology Functions and Services**

The Information Technology Services Division (ITSD) is LADWP's internal technology services organization. The division provides information systems technology to support the delivery of utility services. As a division in LADWP's Joint System under the Chief Administrative Office (CAO), the ITSD is responsible for management, policy setting, strategic planning, and leadership in the use of computer, radio, and telecommunications technologies with more than 450 full-time positions.[1] The ITSD is also involved in providing and managing the Department's telecommunication services through its fiber-optic network for both the City of Los Angeles and private companies.

The services provided by ITSD are categorized into six main areas:

- **Infrastructure**: Communications; Servers; Storage; Data Management; Disaster Recovery; and Training Facilities.
- **Applications:** Corporate; Vertical; and Infrastructure Applications.
- **Security:** Security Policy; Critical Infrastructure Protection; Risk-based Policy; Incident Management; Vulnerability Assessment and Remediation; Information Security Monitoring and Operations.
- **Projects and Processes:** Project, Incident, Problem, Change, Release, and Configuration Management; System Integration; Quality Assurance; and Business Process Improvement.
- **Administration:** Budget; Management Analysis; System Architecture; Safety; Personnel Management; and Training Management.
- **Commercial Services:** Fiber-optic and other technology services.

[1] ITSD Strategic Agenda 2014-15.

**Information Technology Strategic Planning and Governance**

*Strategic Plan*

In 2008, the ITSD began an effort to define a strategic vision for technology infrastructure at LADWP. This effort culminated in the drafting of the ITSD Strategic Agenda, a document which presents the ITSD's vision for the Department's technology infrastructure for the next five years. The most recent version (2014) identifies five key strategic goals to pursue from 2014 to 2018, including:

1. **Operational Effectiveness**: Provide the "most appropriate services to meet customer IT needs and objectives in a cost-efficient manner," including identifying and implementing innovative technologies to meet business challenges, deploying best practices in the area of service management, while also retaining, developing, and attracting an "outstanding workforce."
2. **Enterprise Architecture**: Develop and improve "an integrated, modern infrastructure and implement an application portfolio built upon technology standards."
3. **Customer Service**: Support and help to strengthen the LADWP customer service experience of end-users (i.e. rate-payers) as well as ITSD's internal customers within the Department.
4. **Security and Continuity of Services:** Drive to maintain "the confidentiality, integrity and availability of information and communications to support LADWP operations."
5. **Technology Leadership:** Provide leadership in setting the direction of the Department's technology in alignment with its broader strategic goals and direction.

While the Strategic Agenda defines a vision and general direction for the ITSD for the next five years, it has a limited scope compared to comprehensive strategic planning documents adopted by similarly situated utilities. In particular, the Strategic Agenda does not provide a detailed outline of the resources and direction required to comprehensively meet the needs of the organizations that ITSD serves.

Navigant recommends that ITSD expand the Strategic Agenda into a comprehensive IT Strategic Plan that addresses major technology initiatives, desired outcomes, performance metrics, and specific target dates for key activities. To the extent that a formal LADWP Strategic Plan is developed per Navigant's recommendations in other Survey reports, the IT Strategic Plan should align with that plan and define the IT resources and capabilities that are needed to achieve LADWP's overall strategy.

In addition, many utilities have developed a Technology Roadmap that provides an overview of the major technology initiatives required to achieve the IT Strategic Plan. Specifically, this document provides the timing for these major initiatives and can be used to develop IT-related budgets for the coming years. In addition to a comprehensive strategic IT plan, Navigant recommends that the Department develop a Technology Roadmap to support enterprise-wide IT and technology investments and operating costs.

*Governance*

While the Department employs project-level governance and oversight, our understanding is that the Department lacks an executive-level steering committee to help establish, monitor, and evaluate the overall technology strategy across a long-term horizon. The absence of such a governance structure leads to a lack of clarity in strategic direction for the use of technology within the organization and may result in inconsistent alignment of IT goals and objectives with those of the Power, Water, and Joint System

more broadly. Over the past seven years, an informal approach to IT governance has been employed by the Chief Information Officer (CIO) to gain support for the Department's IT needs. At the executive-level, this practice has proven to be problematic in light of the frequent changes in Department leadership. Frequent changes in leadership have resulted in repeated changes in priorities and inconsistent support from Department leaders for major IT projects. Clear priorities and consistent support for IT are both critical factors for a robust IT strategy, as well as for providing ITSD with the necessary financial and human resources.

Navigant recommends that LADWP establish a formal, executive-level committee tasked with the following:

1. Design, align, and implement strategic plans with an adequate view towards and understanding of the joint-business requirements of the Power, Water, and Joint System.
2. Provide support for the process that identifies technology needs, justifying and prioritizing IT initiatives in the form of projects.
3. Discuss and coordinate annual budgeting processes to ensure that adequate financial and human resources are allocated to ITSD to adequately support the strategic priorities and activities of the Power and Water System, as well as the broader Joint System organization.
4. Include a Technical Advisory Committee that focuses on the establishment of standards and technology direction for the Department.

**Primary Applications and Suites Supported**

The ITSD manages a portfolio of over 160 corporate and business applications to support the business activities of the Department. Dedicated ITSD teams of analysts, developers, programmers, and contractors manage these applications. Applications are organized into three categories:

- Vertical Applications (Customer Service, Asset and Work Management, Capital Project Management, etc.);
- Infrastructure Applications (Web access, Email, GIS, etc.); and
- Corporate Applications (Joint Systems—Enterprise Resource Planning, Human Resources, Payroll, etc.).

*Vertical Applications*

The Department has engaged in several projects to replace legacy systems. Most notably, the Customer Information System (CIS) was implemented and the Asset and Work Management systems is being upgraded.

The ITSD continues to address the issues that emerged as a result of the launch of the CIS system, including fixing meter configurations, adjusting calculations of bills and billing errors, and by returning collection activity to focus on customers owing the Department $250 or more for more than 60 days. ITSD actively manages the outstanding issues with this implementation, working closely with the Customer Information, Communication and Technology (CICT) group, which resides within the Customer Service Division (CSD). At the time of this writing, work continues to identify and remediate

defects and test system functionality in the hopes of bringing increased stability to the deployment and achieve a base level of CIS functionality.

The ITSD is also in the process of upgrading and integrating the Department's asset and work management systems (i.e. Maximo) for the Water and Power System. The project launched in 2011 and is expected to be complete before the end of the year. This system upgrade will provide a consistent approach to asset management across Water and Power by unifying the relevant data into a common application and instance.[2] Navigant believes that adopting a consistent approach to asset management activities across the Power and Water Systems is an important and valuable objective, which can be further facilitated through the adoption of common technologies. ITSD should ensure that the Water and Power Systems take advantage of this collaborative approach.

*Infrastructure Applications*

ITSD has also been working on the standardization of geographic information systems (GIS) to improve enterprise level planning, work and asset management, customer visibility and emergency response. While the Water System uses GIS, the Power System is still in the initial stages of implementation. According to the IT Strategic Agenda, the core GIS software has been acquired for Power, an RFP has identified the consultant to lead the implementation, and the project is underway. However, the Power System has not allocated resources to manage its GIS program, which is delaying the implementation process. ITSD should continue to consolidate and integrate the Water GIS into a common standard, and assure that the Power GIS is consistent with this standard. The silos between the Water and Power System will also need to be overcome if the Department is to optimize the information sharing synergies which can be leveraged through the integration of GIS across Systems.

Navigant found that the Department's use of web services is limited but expanding. For example, the ITSD has developed MYDWP, an intranet portal for employees to review data and information from Human Resources, Supply Chain, and Retirement Systems. ITSD is also developing a MYDWP mobile application to provide employees with remote access to this information.

*Corporate Applications*

Perhaps the biggest challenge the ITSD and the Department must face with regard to technology infrastructure will be the implementation of an enterprise resource planning (ERP) system, which would consolidate and upgrade old and unsupported platforms, including payroll, human resources, financials, and budget.

The ERP implementation will be a large and complex undertaking for the Department, similar to that of the CIS implementation. While lessons learned from CIS implementation will hopefully improve the Department's ability to implement the ERP system, ITSD should do extensive planning to ensure that the project has the appropriate resources and a rigorous approach to project management. Specifically, the ITSD should develop a detailed project plan, including end of life planning, the identification and documentation of business requirements, resource planning, and deployment timelines. In addition, a clear set of business requirements should be documented, working closely with stakeholders across the Department. Prior to launching the ERP, the ITSD should allocate adequate testing resources to ensure the system is functioning properly and that the staff are comfortable with the system processes. These

[2] In a technical context, an Instance can be defined as a single copy of a running program. Multiple instances of a program mean that the program has been loaded into memory several times.

measures will reduce the risks associated with implementing such a large system. The Department has taken some early steps to advance this implementation, including the hiring of a QA firm, the completion of a Strength, Weakness, Opportunities and Threats (SWOT) analysis, and the use of Oracle Insight to strategically implement ERP to address critical objectives and challenges.

In general, meeting future system upgrade and deployment needs will require more rigorous planning at the project and portfolio level, the ability to hire and retain specialized technology and program management professionals, a dedication to business process change, and a continuous focus on training. In the absence of these, the Department may encounter challenges related to large-scale implementation efforts.

**Hardware, Network, and Telecommunication Infrastructure**

Navigant found that the Department's current standards for network operations, hardware, and telecommunication infrastructure are consistent with best practices.

One of the key challenges in this area will be the integration and data migration to its new data center in Los Angeles. For example, ITSD has ten positions allocated to this effort and three of these positions are currently vacant.

The telecommunications infrastructure at LADWP has maintained a data reliability rate in excess of 99.9% across its network. ITSD able to maintain a high availability for its internal customers and third parties through its fiber optics network. Most critical in-basin telecommunications are over fiber infrastructure, with over 300 facilities fiber connected. The ITSD's continued ability to provide a high data reliability is contingent upon an adequate allocation of resources. Navigant found that ITSD staff are often diverted from day-to-day operational responsibilities because of ad-hoc projects. This finding is apparent throughout the ITSD.

**Portfolio and Project Management**

Portfolio and project management are critical components to successfully maintaining existing information systems and effectively managing new technology initiatives. With over 160 applications and new projects on the horizon, project management tools could be extremely helpful for ITSD to overcome its current work backlog. This backlog includes upgrading and consolidating applications as well as removing legacy systems. While some progress has been made in managing this workload, ITSD still faces challenges in this area.

A key aspect of portfolio and project management is change management, an area where ITSD has improved via a Change Management Policy and implementation of a Change Management Process that includes the Remedy software tool for receiving and tracking change requests. However, an overall IT Portfolio Management and Project Management Office has not been implemented at LADWP, although an effort has been made to do so. The ITSD is allocated limited and almost non-existent resources around project management. For example, there is only one Project Management Office (PMO) position on staff, which is also currently vacant. While the ITSD's project management approach is relatively effective, it is lacking and ad-hoc when it comes to smaller projects, which represent the bulk of the day-to-day activities of the ITSD.

**Information Security and Disaster Recovery**

*Information Security*

An Information Security Policy (ISP) is a common and important business policy in any organization. At the highest level, an information security policy provides management direction and support for information security across the organization. The objective of an ISP is to guide or control the use of systems to reduce the risk to information assets in terms of breaches of confidentiality, integrity and availability. Documentation of the ISP is one step in an overall information security process, which includes an information security risk assessment.[3] Ongoing monitoring and management of the ISP are additional steps in an overall security framework.

In 2008, the ITSD formalized an Information Security Policy (ISP or Policy) to provide protocols for managing LADWP computer systems, data, and network infrastructure. The ISP provides a foundation for standards, procedures and guidelines that govern LADWP's information security. The Department has executed numerous updates to the ISP and developed documentation to supplement policies. While the supplemental documentation refers to the specific section(s) of the ISP to which it relates, the ISP itself does not refer to the supplemental standards, procedures, and guidelines which have been developed.

*Disaster Recovery*

Emergency preparedness, business continuity, and IT disaster recovery (DR) are critical focus areas for utilities and the organizations that oversee them. Increasingly, utility organizations are exhibiting heightened risk awareness and focus on business resiliency. A variety of high-profile events over the last several years (both natural disasters and manmade events) have moved disciplines that support on-going business resiliency to the forefront of utility planning.

DR planning addresses the recovery of critical IT assets – including systems, applications, databases, storage, and network assets – given a significant operational disruption. DR is often considered the technological component of Business Continuity Management (BCM), which is defined as the management process that identifies:

- The most significant threats to an organization's on-going operations,
- The impacts to business operations that those threats, if realized, might cause, and
- The phased and prioritized approach to service recovery.

A rigorous business continuity management (BCM) process is central to business resiliency. As an aspect of that process, a disaster recovery (DR) plan that defines the phased approach for bringing vital forms of technology back in a phased manner in the event of an emergency is critical. While the ITSD provided a variety of documents that point to emergency and disaster recovery related procedures, there is no single and comprehensive plan along with related policies, procedures, and guidelines to direct employees in the event of an emergency or disaster recovery scenario. Furthermore, the extent to which ITSD employees are aware of or have been trained on their roles and responsibilities in the event of an emergency or disaster recovery situation is unclear.

Navigant found that accountability for DR has been decentralized, and resides in the Power, Water, and Joint Systems, and then within each Division in each System. According to the Department's Information Security Policy, the Assistant General Managers of the Systems or their designees (System Owners) are responsible for defining the business parameters for disaster recovery plans, including both the required

[3] Ryan Mazerik, "Information Security Policies", General Security, April 2014.

recovery time and the required recovery point. The System Owners also must ensure that adequate back up and system recovery procedures are in place to ensure the continued operation of a System. The policy states that system operators should work with the Assistant General Managers and other System personnel to prepare disaster recovery plans. We requested, but did not receive, the current DR plans in place at the Department. Further, we learned that DR plans have not been developed consistently across the Systems or Divisions, and that appropriate DR preparation has only been developed for some System Owners. For these reasons, we believe that the Department lacks consistent protocols that define how DR plans are to be derived, tested, and maintained across the Department.

Perhaps most importantly, the Department does not have a business impact analysis (BIA), which forms the foundation of business continuity planning. The BIA specifies the impact of disruptive events on business operations, financial performance, reputation, employees and supply chains, and the systems and networks that support them. As a result, the Department's overall DR priorities are not defined. Stated differently, how ITSD would work with each System to bring back critical applications in a prioritized manner is not defined. Consistency across all lines of business in BIA, testing methodologies, reporting schedules and other aspects of BCM are all characteristics of an organization that takes BCM/DR seriously. Navigant recommends that the LADWP prioritize the development and completion of these BCM components. Refer to our report on *Emergency Preparedness* for additional considerations on BCM and BIA.

**Conclusions**

In general, ITSD is appropriately organized and performs well in many of the critical areas for which it has responsibility. Specifically, the telecommunications network, the information communications network, and the provision and maintenance of mainframes and servers are all areas that are performing well. ITSD has also placed significant focus on maintaining the current state of operations, continuously working to overcome issues with the CIS implementation, and attempting to upgrade or replace a wide variety of diverse technologies currently in use. ITSD's biggest challenge is in the area of software applications, which is due in part to the age and diversity of the applications, but also due to the absence of a clear IT governance framework and an IT Strategic Plan. Accordingly, ITSD's current focus is more tactical than strategic.

Establishing a Strategic Agenda has provided a positive step in the right direction, but a more detailed Strategic IT Plan is necessary to transform and modernize the Department's use of technology. As noted, the Department should also establish an IT executive committee structure to ensure that the Strategic IT Plan is supported by the entire organization. A central aspect of this strategic plan would include an approach to address current and potential staffing limitations, which may hinder the achievement of IT objectives.

A prioritized list of additional recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department and the City.

High Priority Recommendations

- Ensure that ITSD has the staff and contracting resources to address its current system challenges as well as future upgrades and platform implementations.
- Develop an IT Strategic Plan that builds on the IT Strategic Agenda to address major technology initiatives, desired outcomes, performance metrics, and specific target dates.
- Establish an executive-level governance that is tasked with setting, monitoring, and evaluating the direction of the Department's technology infrastructure.
- Create an additional budget for ITSD to address unplanned projects and budget reallocations by project managers in the Power and Water Systems.
- Extend project management practices used for major projects to all IT projects.
- Develop a disaster recovery plan to prioritize IT functions in the event of an emergency.

Medium Priority Recommendations

- Remove legacy systems and consolidate applications into one version or instance for the entire organization.
- Monitor the transition period between system upgrades to ensure the removal of older instances of systems.
- Establish a formal project management office for technology infrastructure to ensure that projects are monitored and completed.
- Ensure that the Maximo upgrade establishes an enterprise asset management program that encourages communication between the Water and Power System, including linking the new version of Maximo to other systems such as GIS.
- Develop a detailed implementation plan for an enterprise resource planning (ERP) system.
- Complete the new data center to consolidate data and enhance data security.

Low Priority Recommendations

- Expand the "My Account" section of the website to provide customers with additional usage and billing metrics.
- Complete the development of a mobile application for employees to access MYDWP information.

NAVIGANT

# 1. Introduction

## *1.1 Study Objectives*

Section 266 of the Los Angeles City Charter requires that the City Controller conduct a Survey of the property and business of each of the City's proprietary departments, including the Los Angeles Department of Water and Power (LADWP, the Department), at least once every five years. These Surveys must be conducted jointly with the Mayor and City Council (Joint Administrators).

The 2015 Industrial, Economic and Administrative Survey (IEA Survey) of the LADWP is a comprehensive review of the strategic and operational readiness of the organization to meet critical challenges and an evaluation of current operations versus peers or leading practices. The goal of the Survey is to identify targeted recommendations for improvement through an independent and thorough series of assessments. Navigant Consulting, Inc. (Navigant) was retained to lead this effort. This report presents Navigant's findings on technology infrastructure.

As defined by the scope of work for the Survey, the objectives for this report include an assessment of the following technology infrastructure focus areas:

- Current and proposed information technology infrastructure, including, but not limited to, a new financial system, purchasing system, human resources system, and other major legacy system replacements.
- Technology acquisition strategies and the effectiveness of project implementation strategies.
- Incorporation and use of technology in conservation and departmental efficiency efforts, customer service and education.
- Technology infrastructure with relation to emergency preparedness and business continuity.

Navigant worked closely with LADWP personnel to understand how the Department pursues technology infrastructure and to determine if opportunities exist to strengthen the organization. Navigant's findings and recommendations are summarized below.

## *1.2 Approach*

Information for the *Technology Infrastructure* report was derived from several primary sources:

- Documents uploaded to Navigant's secure portal;
- Interviews with Department personnel including ITSD division and functional leaders;
- Navigant's experience in the management of IT and business functions of major municipal and investor-owned utilities; and
- Best practices with regards to management of technology infrastructure.

Navigant conducted interviews with leadership and subject matter experts that manage many of the technology infrastructure programs. See Appendix A for a complete list of interviewees. The materials reviewed for this engagement are listed in Appendix B.

### *1.3 Report Organization*

The report comprises the following chapters:

- IT Standards: An overview of the industry standards related to technology infrastructure.
- Functions and Services: A review and assessment of the Department's Information Technology Infrastructure Library (ITIL) in relation to best practices, including roles and responsibilities, the services offered, processes to be followed, and primary contact persons for each area of enquiry.
- IT Strategic Planning and Governance: A review of the current IT environment of both corporate and enterprise-wide services and applications as well as relationships with other functionality-specific Operational Technology (OT) environments.
- Primary Applications and Suites Supported: Navigant identified all of the major software applications used by the Department to gain an understanding of their current and future technological direction.
- Hardware, Network and Telecommunications Infrastructure: A review of the current standards for network operations, hardware, and telecommunications to determine if the strategy is sustainable and consistent with best practices.
- Portfolio and Project Management: A review and assessment of the processes and tools used to manage the portfolio of IT assets, vendor relationships, and project management. Navigant also assessed the Department's emergency preparedness and disaster recovery program.
- Information Security and Disaster Recovery: Navigant assessed the Department's information security policy and disaster recovery program.
- Conclusions: A summary of findings and recommendations related to technology infrastructure.

# 2. Information Technology Standards

Information technology standards provide best practice guidance for optimally managing and continuously improving technology infrastructure programs. In addition to peer practices of similarly situated utilities, we referenced the themes included in the standards below to assess the Department's technology practices and programs.

## *2.1 IT Governance Institute*

Utilities with a large number of system applications commonly reference and apply control and management standards as defined by oversight groups such as the IT Governance Institute (Control Objectives for Information and related Technology (COBIT) and the IT Infrastructure Library (ITIL)). These and other standards (including ISO 20000) provide guidance on a variety of topics that facilitate effective management of technology-related activities.

### 2.1.1 COBIT

COBIT provides a framework to establish controls that ensure information quality, clear policy, and good practices. According to COBIT, control activities take place in four domains:

- Planning and Organization: This domain includes defining a Strategic IT Plan, an information architecture, and an IT organizational structure to ensure compliance, assess risks, and manage projects and IT investments. These tactics ensure that the strategic vision of IT aligns with the business objectives of the organization.
- Acquisition and Implementation: This domain includes the identification, acquisition, and integration of IT solutions. The change and maintenance of existing systems is also covered in this domain.
- Delivery and Support: This domain ensures that the necessary support processes are established to consistently deliver the required services, including the management of service levels, third party services, training, customer assistance, data, and facilities.
- Monitoring: This domain assesses the quality and compliance of an organization's control requirements through internal and external audits.

### 2.1.2 ISO 20000

The International Organization for Standardization (ISO) is an international standard-setting body composed of representatives from various national standards organizations. ISO 20000 is the international standard for IT service management, defined as the activities – directed by policies, organized and structured in processes and supporting procedures – that are performed by an organization to plan, deliver, operate and control IT services offered to customers.

ISO 20000 specifies requirements for the service provider to plan, establish, implement, operate, monitor, review, maintain and improve a Service Management System (SMS). The requirements include the design, transition, delivery and improvement of services to fulfil agreed service requirements. In this

way, deployment of an SMS is necessarily concerned with the appropriate mix of people, process and information technology required to deliver service to technology users.

#### 2.1.3 ITIL

ITIL provides a set of best practice related to IT service management that reinforces ISO 20000, the international IT standard for service management. These practices support the alignment of IT services with the business requirements of an organization. ITIL best practices are provided in five core areas:[4]

- ITIL Service Strategy: This area covers the development of an IT service strategy that generates business outcomes, identifies potential challenges, targets improved customer satisfaction, and helps to identify business opportunities.
- ITIL Service Design: This area identifies the principles, methods, practices, and tools needed to design effective IT services.
- ITIL Service Transition: This area provides an approach to IT service transition, including specification, configuration, test, release, and deployment.
- ITIL Service Operation: This area describes the processes and technology involved in controlling service outages, monitoring performance, automating operations, and maximizing the value of business services.
- ITIL Continual Service Improvement: This area includes the continuous review of an IT System's cost effectiveness and capability against current and future business needs.

### *2.2 CIP Compliance*

As part of the push for increased reliability for the electric grid, the National Electric Reliability Corporation (NERC) has been charged by FERC with establishing reliability standards for the electric power grid. Among those standards are a group of reliability standards related to telecommunications and critical infrastructure protection (CIP). The CIP standards provide requirements for both physical perimeter and electronic perimeter protection to assure continued operations of critical assets in the generation and transmission functions. These standards apply to items such as control rooms, SCADA, control systems, and data management tools. Among the standards are requirements for a number of activities that are standard practices among information technology environments. A discussion of the Department's processes and procedures to comply with CIP standards can be found in the *Security* report for the IEA Survey.

[4] ITIL Best Practice Solutions, Axelos website (https://www.axelos.com/best-practice-solutions/itil/what-is-itil).

## 3. IT Functions and Services

The Information Technology Services Division (ITSD) is LADWP's internal technology services organization. The division provides information systems technology to support the delivery of utility services. As a division in LADWP's Joint System under the Chief Administrative Office (CAO), the ITSD is responsible for management, policy setting, strategic planning and leadership in the use of computer, radio, and telecommunications technologies with more than 450 full-time positions.[5] The ITSD is also involved in providing and managing the Department's telecommunication services through its fiber-optic network for both the City of Los Angeles and private companies.

The services provided by ITSD are categorized into six main areas:

- **Infrastructure**: Communications; Servers; Storage; Data Management; Disaster Recovery; and Training Facilities.
- **Applications:** Corporate; Vertical; and Infrastructure Applications.
- **Security:** Security Policy; Critical Infrastructure Protection; Risk-based Policy; Incident Management; Vulnerability Assessment and Remediation; Information Security Monitoring and Operations.
- **Projects and Processes:** Project, Incident, Problem, Change, Release, and Configuration Management; System Integration; Quality Assurance; and Business Process Improvement.
- **Administration:** Budget; Management Analysis; System Architecture; Safety; Personnel Management; and Training Management.
- **Commercial Services:** Fiber-optic and other technology services.

### *3.1 Organization*

The organizational structure of ITSD reflects a structure that is commonly used by other large utilities to manage their information technology needs. ITSD is centrally organized as a shared service, establishes policies and standards related to telecommunications, hardware selection, and software applications, and communicates with end use IT customers within the Power, Water and Joint Systems. Importantly, governance is a key aspect of organizational effectiveness. Currently, the CIO at the Department reports to the CAO who reports to the General Manager. Many utility organizations have the CIO position report directly to the General Manager or CEO to ensure that technology infrastructure issues are appropriately addressed on an enterprise level. Where adopted, this governance and reporting relationship elevates the role of technology in the organization,

### *3.2 Workforce Management*

All aspects of "Human Capital" – from recruiting, to compensation, to talent management – have become critical to the on-going management of technology organizations. Increasingly, new skills and competencies are required as organizations look to replace legacy systems, embrace new technologies, and more broadly engage in a transformation in the use of technology and data. This is particularly

[5] ITSD Strategic Agenda 2014-15.

important as technology is increasingly seen as a means of not simply supporting the current business, but helping drive achievement of strategic objectives. In this context – and given the significant legacy system replacement and/or upgrade requirements that will be required at the Department over the next decade – ensuring that the Department is able to quickly attract and retain the right technology resources is critical.

Results from our interviews with multiple members of Department leadership confirm that ITSD has difficulty filling open positions with qualified candidates. While this challenge is not unique to ITSD, it is especially challenging given the unique skills and aptitudes that are required to successfully deliver on the group's mission in the short and intermediate term. Due to the civil service rules and hiring processes currently in place in the City that apply to LADWP, the pool of potential qualified candidates for any particular technology-related position is necessarily limited. Further, ITSD cannot go directly to the open market to find well-qualified candidates with specific skills. This combination of factors is especially troublesome when ITSD is looking for candidates with specialized skills and experiences with newer technology that does not currently exist within ITSD or the City. In addition, due to the active competition for existing resources, our interview results suggest that many IT resources have left ITSD and taken promotions in the operating divisions. While shifting resources across groups is common in matrix organizations, it limits the opportunity to build the "next generation" of IT professionals. Finally, as with other utilities, LADWP has a "graying" work force with a significant percentage of its current staff either eligible or within a few years of eligibility for retirement.

As ITSD begins to transform its business and operations applications to new platforms and applications, the likelihood of acquiring these skills within the existing civil service pool may be low. To effectively meet the needs for unique technical skills that will be needed by ITSD, consideration should be given to an exception to the standard hiring and placement processes in use at LADWP.

Navigant also found that ITSD lacks the ability to hire outside contractors for relatively small and unplanned technology requirements. In major utilities, the practice of IT business functions to hire outside contractors to address ad-hoc requests, unplanned and emergency scenarios, and provide specialized expertise represents a source of critical support in ensuring the effective and efficient provision of services to internal and external customers. Given the existing structure and restrictions within the civil service system and labor union agreements under which the Department operates, the ITSD lacks the ability to pursue this avenue. The ITSD must then almost exclusively rely on existing resources to fulfill not only its day-to-day operational functions, but also unplanned or emergency response scenarios and the multitude of ad-hoc requests from the City of LA and Department leadership. As a result, ITSD employees are required to switch focus from day-to-day operational functions to unplanned requests and scenarios, which diverts focus and comes at the expense of effectively executing primary functions. Navigant recommends the Department consider alternative avenues to hire the appropriate skilled staff for ITSD.

# 4. Strategic Planning and Governance

## *4.1 ITSD Strategic Plan*

Successful IT planning requires consistent business participation. Accordingly, IT Strategy should be an ongoing process that addresses both creating new business capabilities and sustaining existing ones. IT Strategy establishes the linkage between future business capabilities and their related IT capabilities to maximize the value of IT investments. Specifically, an IT Strategy helps in the following ways:

- Set the direction for IT
- Improve business and IT alignment
- Prioritize IT investments and resources
- Enable effective decision-making through IT principles
- Improve IT project delivery through IT governance and IT principles
- Improve business support through IT governance
- Establish an IT initiative and Roadmap to deliver on business objectives
- Establish the right mix of skills and sourcing options

A strategy should include the following components:

- IT Principles – statements of intent or purpose that guide decisions about the use of technology
- Governance - key decision rights, accountabilities and measures to ensure desirable behavior in the use of technology
- Directions & Priorities – future products or services needed to enable strategic business capabilities
- Skills & Sourcing – critical technology competencies and sources to develop and sustain future IT capabilities
- Roadmap – high-level plan depicting an implementation path for future IT capabilities within the constraints of budget, external influences and organizational change.

According to interviews with Department personnel and the documents provided, LADWP has neither a formally adopted Technology Roadmap, nor an enterprise-wide IT Strategic Plan that is approved by the General Manager. In recent years, utilities have found that with the introduction of new technologies, greater customer expectations in the use of technology, the emergence of a new utility business model in the electric industry, and the convergence of operations technology and traditional corporate information technology, enterprise-wide strategic planning is critical to a successful transition from the status quo.

In 2008, the ITSD began an effort to define a strategic vision for technology infrastructure at LADWP. This effort culminated in the drafting of the ITSD Strategic Agenda, a document which presents the ITSD's vision for the Department's technology infrastructure for the next five years. The most recent version (2014) identifies five key strategic goals to pursue in the 2014 to 2018 period, including:

1. **Operational Effectiveness**: Provide the "most appropriate services to meet customer IT needs and objectives in a cost-efficient manner," including identifying and implementing innovative technologies to meet business challenges, deploying best practices in the area of service management, while also retaining, developing, and attracting an "outstanding workforce."
2. **Enterprise Architecture**: Develop and improve "an integrated, modern infrastructure and implement an application portfolio built upon technology standards."
3. **Customer Service**: Support and help to strengthen the LADWP customer service experience of end-users (i.e. rate-payers) as well as ITSD's internal customers within the Department.
4. **Security and Continuity of Services:** Drive to maintain "the confidentiality, integrity and availability of information and communications to support LADWP operations."
5. **Technology Leadership:** Provide leadership in setting the direction of the Department's technology in alignment with its broader strategic goals and direction.

While the Strategic Agenda defines a vision and general direction for the ITSD for the next five years, it has a limited scope compared to comprehensive strategic-planning documents adopted by similarly situated utilities. In particular, the Strategic Agenda reflects the view of ITSD as to the Department's plans and needs, and this may not necessarily be in alignment with the vision of the enterprise wide needs. Additionally, it does not provide a detailed outline of the resources and direction required to comprehensively meet the needs of the organizations that ITSD serves.

Navigant recommends that ITSD expand the Strategic Agenda into a comprehensive IT Strategic Plan that addresses major technology initiatives, desired outcomes, performance metrics, and specific target dates for key activities. To the extent that a formal LADWP Strategic Plan is developed per Navigant's recommendations in other Survey reports, the IT Strategic Plan should align with that plan and define the IT resources and capabilities that are needed to achieve LADWP's overall strategy.

In addition, many utilities have developed a Technology Roadmap that provides an overview of the major technology initiatives required to achieve the IT Strategic Plan. Specifically, this document provides the timing for these major initiatives and can be used to develop IT related budgets for the coming years. In addition to a comprehensive strategic IT plan, Navigant recommends that the Department develop a Technology Road Map to support enterprise-wide IT and technology investments and operating costs.

## *4.2 IT Governance*

A well-organized IT governance establishes clear roles and responsibilities for making decisions and delivering results. The governance framework identifies the accountabilities, empowerment and performance expectations for each role. IT Governance should include the following:

- Established rules, processes and roles for decision making and action.
- Identified stakeholders that play a significant role in planning, managing and deploying IT services, including external suppliers and partners.
- Communicated roles and responsibilities for each stakeholder.

- Documented processes and tools for full service lifecycle including planning, design, implementation, operations, maintenance, and retirement.

The Department lacks an executive-level governance framework (including a strategic technology committee) that is tasked with setting, monitoring, and evaluating the direction of the Department's technology infrastructure. The absence of such a governance framework leads to a lack of clarity for strategic direction on the use of technology within the organization and may result in inconsistent alignment of IT goals and objectives with those of the Power, Water, and Joint System, more broadly.

Over the past seven years, an informal approach to IT governance has been employed by the CIO to gain support for the Department's IT needs and develop specific plans from those communications. At the executive-level – including specifically, the GM and CAO – this practice has proven to be problematic in light of the frequent changes in Department leadership. This has resulted in repeated changes in leadership priorities and wavering buy-in from Department leaders for major IT projects, both factors which play a critical role in driving a consistent strategy around IT, as well as provide overall support for the resources required to achieve strategic goals and objectives, such as the allocation of necessary financial and human resources.

Navigant recommends that LADWP establish a formal IT governance framework – including a strategic technology committee – that is tasked with the following:

1. Design, align, and implement strategic plans with an adequate view towards and understanding of the joint-business requirements of the Power, Water, and Joint System.
2. Provide support to the process for identifying technology needs, justifying and prioritizing IT initiatives in the form of projects.
3. Discuss and coordinate on annual budgeting processes to ensure that adequate financial and human resources are allocated to ITSD to adequately support the strategic priorities and activities of the Power and Water System, as well as the broader Joint System organization.
4. Include a Technical Advisory Committee that focuses on the establishment of standards and technology direction.

### *4.3 ITSD Budget*

Organizations of all types struggle with IT-related budgeting. This often occurs due to a lack of alignment between the IT, finance, and the operating functions. In the case of the Department, results from our interviews and data requests confirm that several issues impact the proper budgeting of – and use of funds for – IT-related needs.

The Department lacks a consistent and formal approach to gathering business requirements from end-users and incorporating them into annual budgets. The approach to budgeting at the Department has often led to a misalignment of the needs of ITSD and those of the Power, Water, and Joint Systems because resources are not appropriately allocated to meet business requirements. Given the critical functional support that ITSD provides to the Systems, the Department's budgeting process should align the critical needs of the Systems to ITSD.

In the past, the Department allocated a division budget to ITSD that provided adequate financial resources to pursue and support both its internal priorities and those of the Department. However, the

Department currently allocates the budget by project rather than by division. While this practice is not uncommon amongst major utilities, the Department's approach to this practice has proven to be particularly problematic for the following reasons:

1. The aggregate cost to maintain ITSD infrastructure, telecommunications and existing systems is often not included in the budgets by project.
2. ITSD cannot support the incremental costs of IT requests made by the divisions.
3. When project costs are managed under operating divisions, the most cost-effective or beneficial technologies are not always selected because ITSD is not actively involved in this process. Operating divisions can also reallocate the IT portion of project budgets to other budget areas.

As a result, the current budget allocation process has resulted in, and continues to expose the Department to, substantial risks, including the under-funding of the IT components required to support critical projects and a lack of flexibility for the ITSD to effectively respond to ad-hoc requests and emergency scenarios. As an example, in FY14, Navigant found that ITSD did not have the budget for the IT equipment, software, and support for the unplanned hiring of an additional 300 and 200 staff in the Power and Water Systems, respectively.

Further, according to interviews with Department personnel, the availability and "roll-over" of the contingency funds in the previous budget allocation structure represented a valuable resource that enabled ITSD to respond to challenges such as those that emerged when the Customer Information System (CIS) went live. Such contingencies do not currently exist and must go through both an internal process and Board processes to be approved.

Navigant recommends that the budget not only reflect major projects and ITSD's cost involvement in those projects, but also include an operating budget for ITSD to maintain the current environment. This allocation will allow ITSD to support the IT components of projects being pursued by the Power, Water, and Joint System and to fulfill internal needs and provide it with the necessary flexibility to respond to ad-hoc requests and emergency situations. The budget should align with the ITSD Strategic Agenda and the IT Strategic Plan proposed above.

# 5. Primary Applications and Suites Supported

The ITSD manages a portfolio of over 160 corporate and business applications to support the business activities of the Department. These applications are organized into three categories: Vertical Applications (Customer Service, Asset and Work Management, Capital Project Management, etc.); Infrastructure Applications (Web access, Email, GIS, etc.); and Corporate Applications (Joint Systems—Enterprise Resource Planning, Human Resources, Payroll, etc.). Dedicated ITSD teams of analysts, developers, programmers, and contractors manage these applications. This section identifies the findings related to the Department's application portfolio.

## *5.1 Vertical Applications*

Vertical applications at the Department include:

- Customer Service and Meter to Cash
- Asset and Work Management
- Incident/Outage Management
- System Modeling and Management
- Capital Project Management

### 5.1.1 CIS Implementation

The Customer Information System (CIS) facilitates the management of the billing and revenue generation activities for the Department. The Department selected and implemented Oracle's Customer Care and Billing (CCB) solution for customer service.

Since the initial roll-out of CIS, the Department has made progress towards resolving some of the most significant issues that adversely influenced the launch of the CIS system. Key actions have included:

- Customer bills: Resolved estimation and calculation of customer bill.
- Meter Configurations: Completed data conversion and meter configurations for nearly 180,000 meters.
- Rate Trend Estimates: Improved rate trend estimates by granulizing trend areas by zip code rather than the four major areas adopted during launch.
- Collection Activity: Generally returning to normal collection activity.

Based on these findings, IT appears to have successfully addressed many of the most significant deployment challenges that undermined adoption of the core features of the system. Work continues to address defects, with the eventual goal of increasing system functionality and moving toward a more optimized use of the system. Challenges remain in the integration and further use of the smart data stored in the Meter Data Management System, the potential implementation of new rate structures, and the transfer of service documentation to the CIS. ITSD has developed a detailed plan for the remainder of the project and has implemented project management tools to identify and mitigate the remaining challenges. ITSD Project Managers are managing the implementation of this plan, including the execution of key milestones against an MS Project Gantt Chart. The Customer Service Division (CSD) has an IT group (CICT) that works with ITSD on these issues. The role of CICT is discussed in the *Customer Service* report of the Survey.

One key concern in this area is the number of vacancies in ITSD's CIS Programming Group, which is the function tasked with managing the IT components of CIS. According to the July 2015 organizational chart, 25 of the 65 staff positions in the CIS Programming Group are unfilled, including 7 vacant positions, 9 new positions for FY 15-16, and 9 newly authorized positions. These vacancies and openings may limit operations support for and necessary upgrades to the CIS system. In addition, this group will support the planned Mobile Workforce Management (MWM) upgrade and the CC&B transitions from premiere support in 2016 to no support in 2018. Given the imminent CIS-related challenges, this resourcing gap should be addressed immediately.

Our experience confirms that an organization's overall morale and corporate culture are important determinants of successful system deployment. Large-scale system selection, implementation, issue remediation, and continuous improvement are long-term efforts that require a significant amount of capital and staff resources. These efforts also require a significant level of positive organizational "energy". Challenges to large-scale IT deployments can have a lingering negative impact on an organization. In several interviews, Navigant found that the Department is hesitant to aggressively pursue other system roll-outs such as those related to asset management (Maximo) and ERP because of the CIS implementation issues. This environment is exacerbated by related challenges in areas such as staffing and staff retention. A review of the most significant system implementation plans and requirements are discussed below.

### 5.1.2 Maximo Implementation

Maximo is a work management system used by both the Water and Power Systems to track and record maintenance. The platform is also used to track material requirements for supply chain management and, in some instances, to complete asset management assessments.

In May 2011, the Department retained Total Resource Management (TRM) to improve its enterprise asset management capabilities and facilitate the migration of Maximo to then-current versions. In April 2014, Department approved an increase in the contract amount and also increased the contract term by three years.[6] The Department explained that the contract was extended, in part, because the staff significantly underestimated the complexity of the necessary configuration and implementation tasks. The initial contract also did not provide adequate contingency funds to address unexpected costs associated with an aggressive implementation timeframe. While it is not uncommon for utilities to delay the implementation of major IT systems, the Department should heavily monitor the project to ensure that future deadlines are met.

During the interviews conducted with ITSD personnel, Navigant was informed that the Maximo upgrade is expected to be complete in the next couple of months. Navigant recommends that the Department use the Maximo upgrade to link to other systems to create a more cohesive and integrated technology infrastructure. According to the IT Strategic Agenda, the Maximo upgrade will also provide a consistent approach to asset management across Water and Power by unifying the relevant data into a common application and instance. ITSD should ensure that the Water and Power Systems take advantage of this collaborative approach.

[6] According to Los Angeles City Council Resolution documents, the original contract amount totaled approximately $9.9 million. The additional contract amount totaled approximately $2.5 million.

## *5.2 Infrastructure Applications*

Infrastructure applications include:

- Web and Mobile access
- E-mail
- Content/Document/Record Management
- Identity Management
- Systems Management
- GIS

### 5.2.1 GIS Integration

In addition to the Maximo upgrade, ITSD has been working on the utilization of geographic information systems (GIS) to improve planning, work and asset management, customer visibility and emergency response on an enterprise level.[7] GIS is a comprehensive tool that identifies where assets and activities are geographically distributed. It also manages data on the characteristics of these assets and activities. One component of effective GIS utilization is integration across Systems. While the Water System has a GIS system that ITSD is working to consolidate and integrate into a common standard, this standardization will also need to extend to the GIS system that is being developed for the Power System. According to the IT Strategic Agenda, the core GIS software has been acquired for Power and an RFP has identified the consultant to lead the implementation. However, the Department will encounter challenges with GIS integration, in part, due to the Power System not having allocated resources to the project, which is one of several recurring issues with the Department's approach to project management. This project should be closely monitored to ensure that every effort is made to establish an enterprise infrastructure that allows ITSD to integrate GIS data into its applications. Moreover, the GIS integration should link to the Maximo upgrade to support enterprise asset management, information sharing, and communication across Systems.

### 5.2.2 Web Services

Navigant found that the Department's use of web services is limited but expanding. Web services (or application services) are applications that enable the seamless exchange of information between internal business units, customers, and business partners. Many utilities are using web services to interact with both staff (internal) and customers (external). For example, the ITSD has developed MYDWP, an intranet portal for employees to review data and information from Human Resources, Supply Chain, and Retirement Systems. ITSD is also developing a MYDWP mobile application to provide employees with remote access to this information. We envision the continued advancement of web services for use by Department staff to meet a variety of business requirements.

For residential and commercial customers, ITSD has established MyAccount, a web portal that enables customers to manage their account, view area outages, apply for various products and services, and to use social media notifications for sharing program announcements and other uses. The Department should continue to expand the range of services and metrics provided in the "My Account" section of the LADWP website. For example, once the Power and Water Systems upgrade to automated meter

[7] ITSD Strategic Agenda, 20145 draft v2 clean, page 13.

infrastructure (AMI), the web portal should provide customers with the ability to monitor usage on a day-to-day basis. The Department's progress on AMI implementation is discussed in further detail in the *Power* and *Water* reports of the Survey.

Finally, the Department has also adopted an IT Service Request System (ITSRS) to improve the management and tracking of service requests from its customers. This system has automated the service request process and provided a tool that consolidates and prioritizes these requests. This system automation is best practice.

## *5.3 Corporate Applications*

Corporate applications at the Department include:

- Core Financials and Budget systems
- Human Resource management and Payroll
- Procurement and Materials Management

### 5.3.1 ERP Implementation

According to the IT Strategic Agenda, the ITSD is developing a plan to replace certain key applications with an enterprise resource planning (ERP) system. This system would consolidate and upgrade old and unsupported platforms, including payroll, human resources, financials, and budget. Given the aging workforce, an ERP is a critical project because the current applications are essential to Department operations, but they are often internally developed or highly customized, which limits the number of employees that have the skills and knowledge required to maintain these systems. An ERP would standardize business processes, and provide a consistent approach to these applications.

The ERP implementation will be a large and complex undertaking for the Department; however, it will create an opportunity to remove legacy systems and to more fully address the business requirements of the organization. A formal ERP system will also eliminate ad-hoc systems that have been developed and implemented. The project will be challenging because it will involve every function within LADWP, and will require at least five years to fully implement. The Department has taken some early steps to advance this implementation, including the hiring of a QA firm, the completion of a Strength, Weakness, Opportunities and Threats (SWOT) analysis, and the use of Oracle Insight to strategically implement ERP to address critical objectives and challenges.

Given the importance of ERP applications to process management and financial reporting, the ERP should be implemented in phases to ensure a smooth transition and continuous operations. A phased approach is also important, inasmuch as ERP implementations can have a significant impact on the normal workflow of staff. In addition to the initial steps that are already underway, ITSD should develop a detailed project plan, including end of life planning, the identification and documentation of business requirements, resource planning, and deployment timelines. Due to the impact on the existing staff of legacy systems, this effort should begin as soon as possible.

## *5.4 Current Application Portfolio Management*

Navigant found that ITSD faces significant challenges in managing its current portfolio of applications.

While most Vertical applications have a current and supportable technological direction, there are Corporate and Infrastructure applications with legacy systems that are currently in use and need to be replaced. For example, certain corporate applications that are based on protocols such as Information Management System (IMS) and Customer Information Control System (CICS) are twenty to thirty years old and still in use. Finding staff with experience in these old technologies is difficult, and today's technology hires have little interest in learning these technologies.

There are also applications that need conformity between the Water and Power Systems to minimize the number of instances that are required to meet future needs. For example, the planned Maximo upgrade will require older instances of Maximo to be maintained in the Systems until the projects that are managed in that instance are closed.

ITSD has adopted certain application standards to create consistency in the selection and implementation of applications throughout the organization; however, ITSD should work towards enforcing these standards on an enterprise level. For example, ITSD appears to use FileNet to provide a standard application framework for document and records management. ITSD is also using newer technologies (i.e. web services and .net) to develop many of the ad-hoc systems in the operating divisions. Navigant recommends that the Department continue to pursue these initiatives and upgrades. These efforts should also be extended to the portal services for LADWP customers.

Meeting future system upgrade and deployment needs will require more rigorous planning at the project and portfolio level, the ability to hire and retain specialized technology and program management professionals, a dedication to business process change, and a continuous focus on training. In the absence of these, the Department may have challenges related to large-scale implementation efforts.

## *5.5 Operations Technology*

While ITSD provides desktop equipment, servers, and telecommunication networks to the Power and Water Systems, Navigant found that divisions in the Systems own, operate, and maintain operations technology that has little oversight from ITSD. The Systems also have software applications that are maintained within their own IT environments to support certain critical operations. Examples include energy management systems, outage management systems, geographic information systems (GIS), and power management systems. However, the data and processes supporting these systems often interact with systems that ITSD supports. For example, an effective outage management process requires a close relationship between the data maintained in GIS, Maximo, CIS, and outage management. While ITSD has selected a platform firm for both CIS and ERP and standardized many platform and middleware services, Navigant recommends that the Department continue to take key steps towards establishing an enterprise technical architecture that simplifies the integration of these systems across the "siloes" of the organization.

Navigant also found that ITSD's lack of involvement in the operational technology of the Power and Water Systems has created an environment that allows the Systems to bypass the involvement of ITSD and develop applications with functionality that could be met through existing ITSD technology. As a result, synergies such as the implementation of a GIS server that is used by all Systems are not leveraged. In fact, according to interviews with personnel, "shadow systems" exist within the operating divisions. This arrangement can result in wasted resources and internal competition for both budget and staffing

resources. A further implication of this practice is related to Disaster Recovery; because ITSD does not have a clear understanding of all of the systems and technologies in Power and Water (or the role of those systems in key business processes), ITSD will not be able to adequately support all of the recovery needs in the event of a significant service disruption. (This issue is covered in greater depth in Section 6.5 below.)

Navigant recommends that LADWP conduct an inventory of all applications to identify and eliminate "shadow systems" and to maximize the use of ITSD resources. An inventory would also identify legacy systems and applications as well as parallel instances of systems. Accordingly, Navigant further recommends a detailed plan be developed for end of life for these systems, including plans to replace existing systems and consolidate the platforms on which these systems operate (such as Oracle, SQL Server or .net). While some of these needs have been identified by ITSD personnel, day-to-day activities have limited the resources available to develop a detailed plan to address these issues.

# 6. Hardware, Network, and Telecommunication Infrastructure

This section reviews the Department's current network operations, hardware, and telecommunications and discusses how the adopted strategy is consistent with best practices and sustainable into the future.

## *6.1 Hardware*

ITSD provides all of the server and desktop requirements other than certain proprietary critical systems for electric operations to the Systems. As a result, ITSD has been able to establish and maintain certain hardware standards with the exception of a few instances where technology needs were not communicated to ITSD. For example, ITSD has standard work station technologies (i.e. PC, keyboard, mouse, etc.) based on a tiered system as well as laptops, printers, and projectors, among others. These hardware standards are best practice and should be extended to all systems in the organization, where absent.

The Department primarily uses Windows and Linux software with a 60% and 40% share, respectively. On servers, the Department uses mostly HP servers with standards that are reflective of best and common server standards. Over the past two years, the ITSD has taken steps towards upgrading the hardware for its data infrastructure. These upgrades should be continued to remove inefficiencies due to aging hardware.

In the last five years, the ITSD has also significantly improved its capabilities for patching servers, the processes by which it can update, fix, and improve computer programs and supporting data. The ITSD has deployed BMC's automated solution to patch servers, which includes identifying missing patches and areas of vulnerability, and deploy fixes to affected devices without interrupting use. The automation of patching has been the norm for utility IT organizations and as a result of this effort, the ITSD can now patch servers on a monthly basis, while in the past, they had remained consistently between 2 and 3 years behind on patches.

## *6.2 Network*

The Department's network is essential to the management of the delivery of water and power. The Department's network engineering and operation function supports this network, including network engineering and security, voice engineering, wireless transport engineering, the network operations center, cable transport engineering and drafting, along with related maintenance support services.

ITSD's enterprise data infrastructure team manages the devices and systems on this network including data centers, servers, storage, backup, and voicemail.

### 6.2.1 New Data Center

LADWP is working to establish a new data center in Los Angeles that will allow it to consolidate data and enhance its data security. The consolidation will also reduce costs and improve data management. The data center is not fully operational yet because key challenges remain, including the selection of reliable and efficient equipment and the transfer of existing data. The ITSD has ten staff positions allocated to enterprise data infrastructure, which includes the establishment of the new data center;

however three staff positions are vacant. As discussed above, resourcing is an issue in this division and this area needs additional staffing resources to ensure continuous project monitoring and timely project completion.

### *6.3 Telecommunications Infrastructure*

ITSD provides a telecommunications infrastructure that serves the Department's facilities and requires various levels of service for its internal and external customers. This demand notwithstanding, ITSD has been able to maintain a data reliability rate in excess of 99.9% across its network. Not only is ITSD able to maintain a high availability for its internal customers, it also has system capability to offer telecommunications services through its fiber optics network and other assets to third parties outside LADWP. Fiber infrastructure is used for most critical in-basin telecommunications, with more than 300 facilities fiber-connected. In addition, according to Department personnel, fiber connectivity to Owens Valley is nearly complete. The ability of the ITSD to maintain a near complete system availability is critical to supporting Department operations and the execution of day-to-day activities.

While the Department's telecommunications infrastructure is mostly a copper cable system, there are existing plans to transition from copper to fiber optics, of which plan details and deployment timelines have yet to be determined. The Department has also upgraded its telephone system to VoIP and established a video conference system to facilitate business operations. The Department is also upgrading its aging and decentralized radio systems with a single 900 MHZ standard.

ITSD has also delivered the telecommunications infrastructure for the new customer service call center associated with CIS implementation, and has been mandated to deliver the same infrastructure for a new call center in Chatsworth. According to interviews, this call center project was unplanned and has diverted resources away from day-to-day operations. This further highlights the resourcing challenges that ITSD faces.

# 7. Portfolio and Project Management

Portfolio and project management are critical components to successfully maintaining existing information systems, and effectively managing new technology initiatives. With over 160 applications and new projects on the back burner, project management tools can be especially important to ITSD managing its way out of its current work backlog. While some progress has been made in gaining control of this workload, ITSD still faces challenges in this area.

## *7.1 Change Management Process*

Change management is a critical discipline in effective IT organizations. The purpose of the change management process is to ensure that:

- Standardized methods and procedures are used for efficient and prompt handling of all changes
- All changes to service assets and configuration items are recorded in the configuration management system
- Business risk is managed and minimized
- All authorized changes support business needs and goals

The Department has significantly improved its change management process in recent years. Specifically, ITSD has created a Change Management Policy and implemented a Change Management Process that includes the Remedy software tool for receiving and tracking change requests. These documented policies and processes are based on the ITIL Best Practices Model, which is aligned with best and common practices amongst utilities. At its core, effectivity using ITIL Change Management best practices serve to minimize the risks of exposure, impact and disruption to IT services. The successful implementation of changes on the first try reduce the likelihood that an organization will incur additional costs and detrimental operational impacts. The Change Management Process is being used to manage standard and non-standard change requests related to the various software applications, hardware needs, and telecommunication changes. Through this process, ITSD is able to assure that change requests are approved by business unit management, that the costs to implement the changes are reasonable, and that standards related to software applications, hardware and telecommunications are enforced and maintained.

The Remedy tool has the capability to track change requests, develop metrics for use by project managers, and provide a dashboard for those metrics. While Navigant found that this tool has recently been used for the CIS project, it is unclear how consistent the use of this tool is between the three applications groups, the infrastructure group and the telecommunications group.

In general, the use of the Change Management Process has had a positive impact on ITSD's ability to manage the day to day change requests that it receives. This process should continue to be used, but the broader methodology of portfolio management and project management may have an effect on the Change Management process for larger projects such as the ERP, given the complex scope and actions required to seamlessly implement change. Accordingly, the distinctions between the management methods for day to day operations and large projects should be recognized, and as a request comes in, the project should be immediately categorized to determine which process applies to the request.

Ultimately, these processes will converge when there is an established and comprehensive IT governance framework, a comprehensive IT Strategic Plan, and a standardized portfolio and project management methodology.

## *7.2 Overall Project Management and Portfolio Management Function*

Although an effort has been made, an overall IT Portfolio Management and Project Management Office has not been implemented at LADWP. Due to hiring issues, this program has not be fully implemented across the three applications groups, hardware and infrastructure, and telecommunication groups. The ITSD's Strategy & Project Delivery function has approximately 200 allocated positions and there is one Project Management Office position, which is currently vacant. The ITSD has limited structure around managing its numerous smaller projects, and while they have implemented certain project management tools, the benefits have been limited.

As with many applications and potential new projects, most large utilities have adopted and implemented a Project Management Office which manages project portfolios and uses standard approaches to the management of projects. Such a program usually follows a standard set of processes as defined in the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) and IBM's Rational Unified Process (RUP). While CIS and Maximo have used Rational tools for project management, Navigant recommends that the Department consider developing a formal project management program that utilizes the standard processes and templates available through PMI. This program would require additional resources, but ITSD would greatly benefit from an organized project management structure because it would identify the risks associated with a project implementation, monitor the progress made against a project work plan, and identify areas of concern as the project moves forward.

### 7.2.1 Service Maps

Service maps are utilized by IT organizations to "clarify dependencies between Service Level Agreements (SLAs), Operational Level Agreements (OLAs), technologies, customers, and the impact to the service delivery."[8] More specifically, service maps can help organizations identify the resources to deliver services, clarify the staff responsible for delivering the services, and specify the pertinent end-user customer. Components of service maps include:

- "Customers. A categorized list of individuals and groups who use the service.
- Hardware. The hardware platforms necessary for service delivery.
- Applications. The operating system(s) and other applications the service requires.
- Settings. The configuration settings necessary for the service to function.
- Internal/External Services. The components that help ensure availability for the services."[9]

[8] Microsoft Operations Framework (MOF) 4.0. Process 2: Identify and Map Services (https://technet.microsoft.com/en-us/library/cc543319.aspx).
[9] Microsoft Operations Framework (MOF) 4.0. Process 2: Identify and Map Services (https://technet.microsoft.com/en-us/library/cc543319.aspx).

Navigant found that the Department does not have comprehensive service maps. According to interviews with Department officials, the key reason that LADWP lacks service maps is the lack of resources. Navigant recommends that the ITSD develop service maps that are aligned to the IT Strategic Plan and the existing (or expanded) services that the ITSD is envisioned to provide.

# 8. Information Security and IT Disaster Recovery

Information security and disaster recovery are topics that have grown in importance across all sectors over the last many years. The potential impact of failures in information security to an organization's operations, reputation, and financial resiliency have been well-chronicled. Evidence confirms that gaps in information security can be exploited by employees and outsiders alike. Meanwhile, rigorous IT disaster recovery is an important feature of any organization's resiliency planning.

## *8.1 Information Security Policy*

An Information Security Policy (ISP) is a common and important business policy in any organization. At the highest level, an information security policy provides management direction and support for information security across the organization. The objective of an ISP is to guide or control the use of systems to reduce the risk to information assets in terms of breaches of confidentiality, integrity and availability. Documentation of the ISP is one step in an overall information security process, which includes an information security risk assessment.[10] Ongoing monitoring and management of the ISP are additional steps in an overall security framework.

In 2008, the ITSD formalized an Information Security Policy (ISP or Policy) to provide protocols for managing LADWP computer systems, data, and network infrastructure. The ISP provides a foundation for standards, procedures and guidelines that govern LADWP's information security. The Department has executed numerous updates to the ISP and developed documentation to supplement policies. While the supplemental documentation refers to the specific section(s) of the ISP to which it relates, the ISP itself does not refer to the supplemental standards, procedures, and guidelines which have been developed.

## *8.2 IT Disaster Recovery*

Emergency preparedness, business continuity, and IT disaster recovery (DR) are critical focus areas for utilities and the organizations that oversee them. Increasingly, utility organizations are exhibiting heightened risk awareness and focus on business resiliency. A variety of high-profile events over the last several years (both natural disasters and manmade events) have moved disciplines that support on-going business resiliency to the forefront of utility planning.

DR planning addresses the recovery of critical IT assets – including systems, applications, databases, storage, and network assets – given a significant operational disruption. DR is often considered the technological component of Business Continuity Management (BCM), which is defined as the management process that identifies:

- The most significant threats to an organization's on-going operations,
- The impacts to business operations that those threats, if realized, might cause, and
- The phased and prioritized approach to service recovery.

[10] Ryan Mazerik, "Information Security Policies", General Security, April 2014.

When defined as one aspect of a comprehensive BCM process, technology recovery priorities are defined and tested to enable the resumption of key business processes in the event of a significant disruption to normal operations. The key business activities and related processes – and risks to those processes – are identified through a structured approach to risk assessment and prioritized recovery. The combination of business continuity planning and DR are two of the most critical features of an effective approach to enterprise wide resiliency. The following is a brief overview of some of the more prominent and influential standards in DR, followed by an evaluation of the Department's DR policies and practices. This section should be read in conjunction with our review of LADWP's Emergency Preparedness and BCM plans (provided in the *Emergency Preparedness* portion of the Survey).

### 8.2.1 Standards and Peer Practices in Disaster Recovery

A company needs to have a detailed perspective of the types of risks it will need to be protected from and the impact that those risks represent to the organization. Both a Risk Analysis (RA) and Business Impact Analysis (BIA) should be performed to determine where to focus resources in the DR planning process and how much to invest in building and maintaining those resources. These efforts should be part of a comprehensive, standardized approach to BCM and extend to key aspects of technology. Several standards that help define BCM and DR practices include:

- The global risk management standard, ISO 31000, *Risk Management -- Principles and Guidelines on Implementation*, was released by the International Organization for Standardization (ISO). It is recognized as the benchmark standard for risk management worldwide.
- ISO 31010:2009, *Risk Management -- Risk Assessment Techniques*, which provides guidance on how to organize and conduct a risk assessment. It complements ISO 31000, in that its specific focus is how to prepare for a risk assessment.
- A key standard further defining risk assessment practices is SP 800-30, *Risk Management Guide for IT Systems*, by the National Institute of Standards and Technology (NIST). This standard shifts the focus of the risk management process to IT systems and technology, and is a useful companion to ISO 31010.
- A new global business impact analysis standard is ISO 22317, *Societal Security -- Business Continuity Management Systems -- Business Impact Analysis*. It is the first formal standard that addresses the BIA process. Similar to the above risk standards, this new standard sets out the principles of the BIA, and also offers good practice guidance on how to prepare for and conduct a BIA.[11]

Standards from the Disaster Recovery Institute International (DRI) and other oversight groups provide additional guidance to energy and utility organizations.

#### *8.2.1.1 Role of Business Impact Analysis*

As discussed in our *Emergency Preparedness* report, a BIA forms the foundation of business continuity planning. The BIA specifies the impact of disruptive events on business operations, financial performance, reputation, employees and supply chains, and the systems and networks that support them. These categories are specific to each organization, and defined in the course of executing the BIA.

[11] TechTarget, "Risk analysis boosts disaster recovery planning process", Paul Kirvan (2015).

The BIA is the starting point for risk identification in a disaster recovery context; the results of a BIA help define the maximum period of time for which the business can survive without its people, process, technology and physical locations.

BIAs generate a number of important metrics, which in combination help evaluate and prioritize recovery requirements. Two metrics are particularly critical for defining service priorities. First is the Recovery Time Objective (RTO), which is the maximum amount of time a system can be down before the business suffers. Next is the Recovery Point Objective (RPO), which defines the point in time when systems and data were last used (and therefore when recovery efforts need to be focused). From the derivation of these metrics, an organization can derive DR priorities by-software application and hardware requirements. These and other measures are derived in the course of completing a BIA, and are based on the specific nature of an organization's strategies, operations, threats, and risk tolerances.

### 8.2.2 Disaster Recovery at the Department

A rigorous BCM process is central to business resiliency. As an aspect of that process, a DR plan that defines the phased approach for bringing vital forms of technology back in a phased manner in the event of an emergency is critical. While the ITSD provided a variety of documents that point to emergency and disaster recovery related procedures, there is no single and comprehensive plan along with related policies, procedures, and guidelines to direct employees in the event of an emergency or disaster recovery scenario. Furthermore, the extent to which ITSD employees are aware of or have been trained on their roles and responsibilities in the event of an emergency or disaster recovery situation is unclear.

Further, it is our understanding that accountability for DR has been decentralized, and resides in the Power, Water, and Joint Systems, and then within each Division in each System. According to the Department's Information Security Policy, the Assistant General Managers of the Systems or their designees (System Owners) are responsible for defining the business parameters for disaster recovery plans, including both the required recovery time and the required recovery point. The System Owners also must ensure that adequate back up and system recovery procedures are in place to ensure the continued operation of a System. The policy also states that system operators should work with the Assistant General Managers and other System personnel to prepare disaster recovery plans. We requested, but did not receive, current DR plans in place at the Department. Further, we learned that DR plans have not been developed consistently across the Systems or Divisions, and that appropriate DR preparation has only been developed for some System Owners. For these combination of reasons, we believe that the Department lacks consistent protocols that define how DR plans are to be derived, tested, and maintained across the Department.

Perhaps most importantly, because there is no Department-wide BIA, the Department's overall DR priorities are not defined. Stated differently, how ITSD would work with each System to bring back critical applications in a prioritized manner is not defined. Consistency across all lines of business in BIA, testing methodologies, reporting schedules and other aspects of BCM are all characteristics of an organization that takes BCM/DR seriously. Refer to our report on *Emergency Preparedness* for additional considerations on BCM.

## 9. Conclusions

Navigant's prioritized list of recommendations for improvement are included below. Some actions are already underway, but others will require additional attention and resources from the Department and the City.

High Priority Recommendations

- Ensure that ITSD has the staff and contracting resources to address its current system challenges as well as future upgrades and platform implementations.
- Develop an IT Strategic Plan that builds on the IT Strategic Agenda to address major technology initiatives, desired outcomes, performance metrics, and specific target dates.
- Establish an executive-level governance that is tasked with setting, monitoring, and evaluating the direction of the Department's technology infrastructure.
- Create an additional budget for ITSD to address unplanned projects and budget reallocations by project managers in the Power and Water Systems.
- Extend project management practices used for major projects to all IT projects.
- Develop a disaster recovery plan to prioritize IT functions in the event of an emergency.

Medium Priority Recommendations

- Remove legacy systems and consolidate applications into one version or instance for the entire organization.
- Monitor the transition period between system upgrades to ensure the removal of older instances of systems.
- Establish a formal project management office for technology infrastructure to ensure that projects are monitored and completed.
- Ensure that the Maximo upgrade establishes an enterprise asset management program that encourages communication between the Water and Power System, including linking the new version of Maximo to other systems such as GIS.
- Develop a detailed implementation plan for an enterprise resource planning (ERP) system.
- Complete the new data center to consolidate data and enhance data security.

Low Priority Recommendations

- Expand the "My Account" section of the website to provide customers with additional usage and billing metrics.
- Complete the development of a mobile application for employees to access MYDWP information.

## Appendix A. List of Interviews

| Name | Title/Topic | Interview Date |
|---|---|---|
| Flora Chang | Assistant Director of the Customer Service System | August 3rd |
| Gene Gamachi | Assistant Director of Infrastructure and Operations | August 5th |
| Hy Phan, Anh Wood, Mark Arthur, Quang Han, Kenneth Chan, Natalie Duran, Hain Zhou | Network Engineering & Operations | August 5th |
| Jim Levesque | Project Manager, Data Center | August 3rd |
| Mona Guirguis | Information Systems Manager, Business Support Systems | August 6th |
| Matt Lampe | Chief Information Officer | August 5th |
| Mark Townsend | Assistant Director – Applications and Services | August 3rd |
| Rita Khurana-Carwille | Information Systems Manager, Corporate Applications Data | August 4th |

## Appendix B. List of Documents

Navigant submitted document data requests to LADWP which were provided via a secure file sharing site. The primary documents are listed in detail below.

| Documents Provided by LADWP | |
|---|---|
| 1 | CIS Org Chart 2015 draft v9 |
| 2 | Infrast Eng org chart 16403 |
| 3 | Network Engineering and Operations Section Org Chart |
| 4 | ORG CHART - Org 16870 IT Service Desk July 2015 |
| 5 | VISIO-16050 FOE Org Chart with pos numbers 2015-05-28 |
| 6 | CIS Governance Life Cycle |
| 7 | Weekly Status Meeting - 20150625 |
| 8 | Procurement Timeline |
| 9 | IT Service Desk ROLES and RESP |
| 10 | SystemsContactList |
| 11 | HelpDeskSupp-OffHrsCallOutList |
| 12 | BillPrintMailOperationsRolesResponsibilities |
| 13 | FOE Staff Roster 20140606 |
| 14 | Appendix D - service order process flowchart |
| 15 | SQLDPA1_PA2 042209 |
| 16 | SQLDPA1_PA2 091609_b4_HPSIM_request |
| 17 | SQLDPA1_PA2 091709 b4 NetApp NTP request |
| 18 | SQLDPA1_PA2 102709 |
| 19 | SQLDPAx blade storage apr 2009 |
| 20 | SQLDB1_PB2 100509 blade storage v2 |
| 21 | SQLDBPB1_PB2 100509 H_I_J tier 2 later |
| 22 | ITIL_DWPCMProcessGuide |
| 23 | MetroErequestForm5 |
| 24 | ME EVC Acceptance Form3 |
| 25 | IBMServiceCallInfoSheet |
| 26 | ACF_CollectionForReview [1] |
| 27 | 2013-01 Updated Contacts for IPPD |
| 28 | ITIL_ChangeManagerGuide |
| 29 | ITIL_ChangeMgmtProcessOvrvw |
| 30 | ITIL_ChangeMgmtProcess Summ |
| 31 | ProcessPTD |
| 32 | AccidentIncidentPaperTrail |
| 33 | FOE_SCEDTA_WORKFLOW_20130617R_cjolle |
| 34 | ProductionTurnoverDocCklist |
| 35 | Visio-CWP_FJ_WORKFLOW |
| 36 | Workflow Processes Contact Admin.20060706P |
| 37 | IT Service Desk 3.5 IM Workflow Diagram |

| | |
|---|---|
| 38 | CircuitCompletionNotification |
| 39 | FOE Deliquency Process October 2010 (2) |
| 40 | Information Security Documentation - Guideline Docs: 4.1., 11.1, 11.2, 12, 13.1, 13.2, 13.6 (Hard Disk Erasure), 13.6 (Unwanted Document and Media) |
| 41 | Procedure Docs: BasicNet, NOCBasic, AssignedStateIPPDErrors, AutomatedSystemShutdown, CircularFlowError, CorporateBackupRestoreProduction, ICN, InsertingVTSLLogicalVolumes, ITIRT Procedure Final, NOCAccess, OutageNotification, InfoSec Exception, MobileDeviceRemoteWipe, MainFrameOperSafetyDocs, ResetUserPasswordGoogleAppls, TerminateCircuit, Shutdown, PwrOnReset, ReportingEmpInjury, SACACFPassword |
| 42 | 1 B - NOC RR WS 2015-6-26 |
| 43 | Appendix A - Service request form |
| 44 | Appendix B - sample ladwp estimate form |
| 45 | Appendix C - sample ita job order |
| 46 | FOE Standby Assignment Info v2 |
| 47 | CallOutList4CISCONServersandCCBIssues |
| 48 | CISProdProbCallList |
| 49 | CkList4MoIPLOccasionPOR |
| 50 | EmailVirusLADWPdotComStatusCkOffHrs |
| 51 | Standard - 11.4 - Host Naming |
| 52 | Information Security Policy - Version 1.2.1 - Final |
| 53 | IT Security Communications Plan v2.6 - Redacted |
| 54 | Exchange2010Upgrade |
| 55 | Release readiness review phase |
| 56 | 3 C - NS Pri Esc 041217 |
| 57 | Exchange 2010 DR Failover_v2 |
| 58 | QuarterlyMaintenanceWindowCRQ's |
| 59 | 3 D - Emergency Response Procedure |
| 60 | DisasterRecoveryTeam Activation |
| 61 | LADWP Disaster Recovery |
| 62 | Incident Response Plan v1.0 |
| 63 | AccidentAnalysis |
| 64 | 4 F - ETS Response Level Definitions |
| 65 | DataCtrOperCtr - OperProced |
| 66 | EmergencyEvacEmpCallList |
| 67 | ETSResponseLevel (Storm Level) Broadcasts and Support |
| 68 | NoticeAccident Injuries |
| 69 | 9B - Boylston Backup NOC Layout |
| 70 | 9 F-Backup NOC Sys Testing |
| 71 | 10 B new Valley NMS Stat Ck Lst |
| 72 | LADWP DWDM MetroE Sonet |
| 73 | BACK-UP NOC System Checklist |
| 74 | C200specfinal |
| 75 | ITSD Strategic Agenda 20145 draft v2 clean |

| | |
|---|---|
| 76 | DWP_hdwStandards |
| 77 | Current Exchange 2010 Infrastructure with Google |
| 78 | Exchange 2010 DR Failover_v2 |
| 79 | DWP - sftwStandards |
| 80 | LADWP Wireless Infrastructure Info - 2015 |
| 81 | 7 - Visio -ME arch - Opt2 (2) |
| 82 | SYSTEM_MAP |
| 83 | CISCON Production Diagrams_v2 7 |
| 84 | LADWP Telepresence Logical Diagram - Final Architecture |
| 85 | VOIP Deployment Presentation |
| 86 | Infrast Eng HI 2014 Goals v2 |
| 87 | CorePC_SWLifecycle_MasterSched |
| 88 | Contact Center 10.5 Upgrade |
| 89 | FOE Revenue trends |
| 90 | Copy of BP 02 BL 02 Returned Mail To Be Business Process v3 |
| 91 | Categories – Requested from IT Interview with Flora Chang |
| 92 | CIS Org Chart 2015 draft v9 |
| 93 | CISCON Interfaces |
| 94 | Copy of CCBMWM_Items_List_asof_073015_Critical_Cat1-4 |
| 95 | Rational Dashboard Screen Print |
| 96 | CAO Org Chart |
| 97 | ITS Org Chart Jan 2015 |
| 98 | CMPolicies |
| 99 | SRM_Lifecycle |
| 100 | ITSD_Org 16 Itemized Budget by FI_Job_CE |
| 101 | Corporate Applications Org Chart August 2015 |
| 102 | Matrix Org Chart August 2015 |
| 103 | Business Support Section-application2015MG |

# Volume VIII

# Customer Service

NAVIGANT

# 2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

## Customer Service Report
## Volume VIII

**Prepared for:**
**The City of Los Angeles**

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# Executive Summary

## Objectives & Approach

This report presents Navigant's findings from a Customer Service benchmarking study, and provides a review of the Customer Service Division's (CSD) use of technology. Customer Service continues to receive significant attention across the utility sector in response to multiple market, regulator/stakeholder, customer, and technological forces.

In many respects, Customer Service is at the "frontline" of utility operations, given the increasing number of possible touchpoints with consumers on a daily basis. That utilities will reflect high-levels of customer service is increasingly the expectation among regulators and customers alike. Meanwhile, the continued growth of new methods of interacting and conducting business with the utility bring together the topics of service quality and technology. Research reflects that customer service is at the forefront of utility continuous improvement planning, given the intersection of: 1) focus on the "customer experience" as central to providing exemplary utility service; 2) increasing stakeholder and customer expectations regarding exceptional service; and 3) the role of technology in customer service operations.

## Customer Service Benchmarking

Our team selected 20 performance measures across six (6) areas to evaluate the Department. These areas include:

- Contact/Call Center
- Meter Reading
- Customer Billing
- Customer Payments
- Credit and Collections
- Field Service

In addition to these areas, we also included a category that focuses on the Department's reliability, satisfaction, and employee availability.

LADWP provided 2014 results for a total of 14 of the requested 20 performance measures, which are standard metrics used across the utility industry. Collectively, these measures provide the foundation for active and on-going monitoring of utility Customer Service operations. The Department was unable to provide data on 30% of the metrics selected for our study. Navigant has been informed that work is underway to address issues with the Department's historical customer service data. Resolving these issues may improve the results of the 2014 benchmarking reflected in our report. We encourage the Department to continue to pursue and adopt methods of improving data management practices in customer service.

A tabular representation of the benchmarking results is provided below.

| | LADWP | Q | Mean | Q1 | Q2 | Q3 |
|---|---|---|---|---|---|---|
| **Contact/Call Center** | | | | | | |
| Service Level (Live Contacts) | NA | | 64.7% | 75.9% | 66.9% | 61.4% |
| Abandonment Rate (Live Calls) | NA | | 6.6% | 4.4% | 5.5% | 9.5% |
| Average Speed of Answer (Live Contacts) | 1362.0 | 4th | 100.9 | 46.0 | 90.0 | 111.5 |
| Percent of IVR Self-Service Contacts with a Completed Transaction | 41% | 3rd | 46% | 62% | 45% | 35% |
| First Contact Resolution Measure (Contact Center Process) | NA | | 78.0% | 85.0% | 78.0% | 72.0% |
| **Meter Reading** | | | | | | |
| Annual Meter Read Rate | 94.0% | 3rd | 92.3% | 98.4% | 96.5% | 93.1% |
| Meter Reading Error Rate | NA | | 0.13% | 0.04% | 0.10% | 0.19% |
| Meters with Chronic No Read (no bill 3-6-9 billing periods) | 0.84% | 2nd | 1.35% | 0.01% | 0.84% | 1.10% |
| **Customer Billing** | | | | | | |
| Percent of Bills Issued Electronically | 14.4% | 3rd | 18.5% | 22.6% | 16.1% | 14.4% |
| Percent of Bills with Post-Bill Adjustments Due to Errors | NA | | 0.240% | 0.098% | 0.159% | 0.309% |
| Percent of Bills Mailed Within Billing Window | 98.0% | 4th | 98.95% | 100.00% | 99.62% | 99.34% |
| Percent of Bills Estimated | 4.9% | 4th | 4.39% | 0.82% | 1.28% | 4.9% |
| **Customer Payments** | | | | | | |
| Percent of Payments Received from Customers Electronically | 35% | 4th | 53% | 50% | 54% | 58% |
| **Credit and Collections** | | | | | | |
| Write-offs as Percent of Revenue | NA | | 0.95% | 0.38% | 0.79% | 1.40% |
| Days Sales Outstanding | 36 | 2nd | 35 | 31 | 36 | 40 |
| Percent of Customers in 30/60/90 Days Arrears | 56% | 4th | 28% | 15% | 27% | 37% |
| % of Accounts Scheduled for Disconnect Actually Disconnected | 2.6% | 4th | 44% | 42% | 44% | 49% |
| **Field Service** | | | | | | |
| Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC) | 66.9% | 4th | 18.83% | 3.70% | 10.83% | 20.61% |
| **Overall Business – Customer Satisfaction** | | | | | | |
| Customer Satisfaction - J.D. Power - Business | 646 | 3rd | 657 | 670 | 659 | 645 |
| Customer Satisfaction - J.D. Power - residential | 641 | 4th | 651 | 661 | 647 | 643 |

As reflected above, where data was provided, the Department was found to generally fall in the 3rd or 4th quartile for the selected measures.

**Review of Customer Service Technology**

Technology plays a central role in moving customer service organizations toward leading practices, and delivering core operations in a more optimal manner. The current and proposed future state of the Department's technology infrastructure is a key determinant of how customer service will be delivered and how work will be conducted. As noted, the Department has commissioned a number of studies that provide specific guidance on how technology can be further optimized to meet strategic objectives (including how to move the company toward more customer-focused service). According to one of these studies, the Department has an opportunity to deploy technology more effectively to meet their goals: The CEB Study (2014) found that *Technology Management*[1] was the fourth highest opportunity area ranking, behind *Live Phone Experience*, *Quality Assurance*, and *Service Organization Culture*.

Focusing on technological change in concert with business process improvement and enhanced staffing, we believe the Department has an opportunity to make significant progress on customer service objectives. Pursuing excellence in customer service should be a continuous goal of the Department. We reiterate many of the goals recommendations described in the CSD strategic planning documents and findings from other assessments, and offer several additional recommendations below.

[1] The CEB defined the Technology Management assessment area as follows: "We make technology investments to better enable our existing processes—technology does not define process. We methodically approach vendor-fit evaluations, technology investment priorities, and implementation plans."

High Priority Recommendations

- Evaluate and more clearly define functional accountabilities for key activities between CICT and IT – confirm and draw "brighter lines" between functional responsibilities.
- Create an overarching strategic plan for customer service technology for the next 5-years (including prioritized technology requirements (remediation and new systems), high-level deployment schedules, and estimates of required resourcing (staff and capital) requirements).
- Strengthen the system selection process, and confirm business requirements as a central driver for system selection.
- Continue to develop the training program for CSD, focusing on both technical and business-focused modules. Also continue focus on staff cross-training and staff rotation to enhance flexibility and resiliency in workforce.
- Address staffing and hiring concerns as best as possible, with particular emphasis on specific subject matter expertise and program management acumen.
- Pursue documentation and training on key business processes that align to use of new technologies.
- Measure and evaluate key business activities, processes and personnel; specify Key Performance Indicators (KPI) and define performance targets; incorporate benchmarking as a normal aspect of performance evaluation.
- Conduct workload / workforce balancing analysis to more precisely understand the number of staff and types of skills required

# 1. Introduction

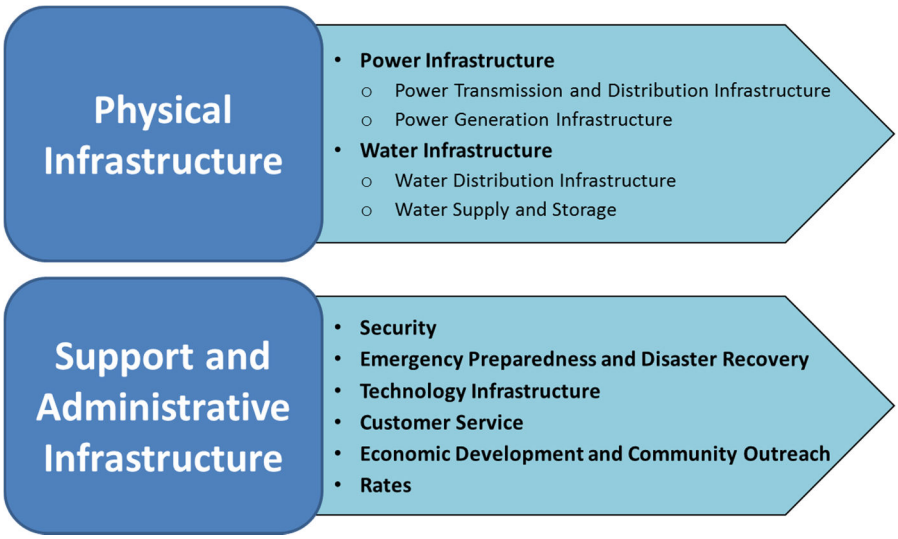
## *1.1 Study Objectives*

The City of Los Angeles, by virtue of Section 266 of the Los Angeles City Charter, requires that the City Controller conduct an Industrial, Economic and Administrative Survey (IEA Survey) of the Los Angeles Department of Water and Power (the Department, LADWP). For the 2015 edition, the City Controller has retained Navigant Consulting, Inc. (Navigant) to conduct this study.

The primary objective of the IEA Survey is to assess how well-prepared LADWP is to address current and future challenges, while providing safe and reliable water and power to its ratepayers at reasonable costs.

For the LADWP, the most critical challenges currently revolve around power and water physical infrastructure and certain areas of administrative infrastructure. To address these, the Joint Administrators included the following focus areas in the scope of the 2015 IEA Survey:

**Figure 1. Focus Areas of the 2015 IEA Survey**




This report presents Navigant's findings from a Customer Service benchmarking analysis, and a review of the CSD's use of technology. Benchmarking is a common tool for evaluating performance on standard metrics and in relation to a defined peer panel. In this context, benchmarking has been conducted on key and common customer "touch point" metrics. The review of CSD's use of technology examines the role of the Customer Information, Communication and Technology (CICT) group in the adoption of technology to continuously increase the maturity of customer service practices.

## *1.2 Approach*

Information for this report was derived from several sources:

- A detailed data request was provided to the Department to collect customer service benchmarking information;

- Interviews with LADWP staff;
- Documents collected and reviewed in response to Navigant's data request; and
- Navigant's experience with LADWP's prior reports and practices.

Navigant conducted 10 interviews. See Appendix A for a full description of the interviews conducted. The documents produced by the Department are listed in Appendix B.

### *1.3 Report Organization*

The report comprises the following chapters:

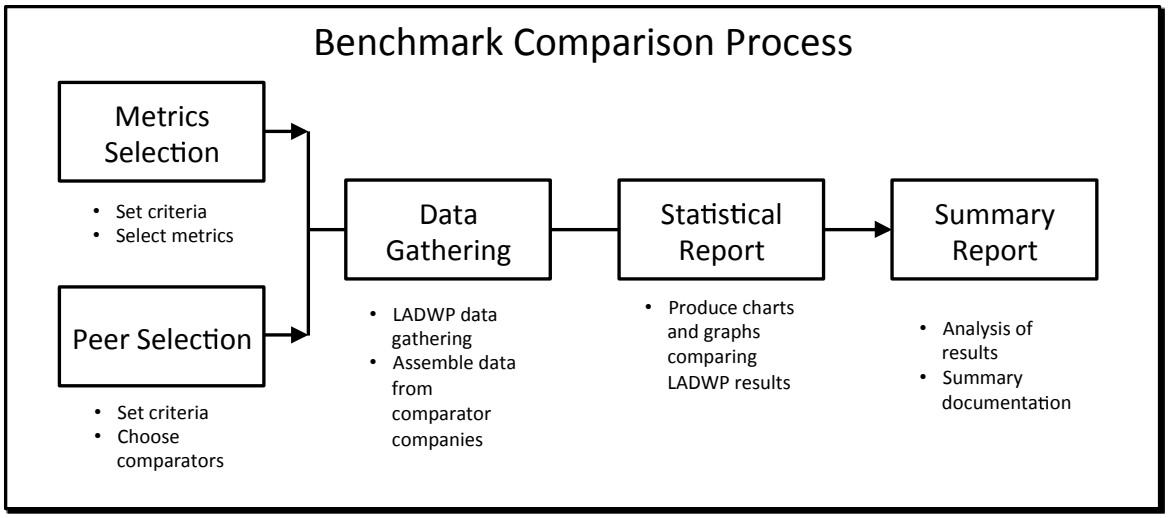
- Customer Service Benchmarking: This section includes an introduction to benchmarking, methods of choosing the best performance metrics, selecting the comparison panel, and a review of the results on the reported measures in relation to peers.
- Review of Customer Service Technology: A description of the use of technology in the CSD in areas such as Strategy, Governance, Organization & Staffing, Roles & Responsibilities, and Training.

# 2. Customer Service Benchmarking

## *2.1 Introduction*

A component of the IEA Survey was to provide benchmarks and performance comparisons for the Customer Service operations of LADWP. This was executed by comparing the performance of LADWP against a panel of peer utilities from across North America. In so doing, the team performed a series of tasks, as summarized in the figure below.

**Figure 2: Benchmark Comparison Process**




The benchmark study was designed to determine an appropriate set of performance measures for customer care, compare LADWP on those metrics versus a comparison panel of other utilities, and draw conclusions regarding the results of the comparison. This report summarizes the results of each of the steps. The remainder of this report is structured into the following major sections:

- Choosing the Right Performance Metrics
- Selecting the Comparison Panel
- Results of the Performance Comparisons
- Appendix – Detailed Charts of Performance Results

## *2.2 Choosing the Right Performance Metrics*

Selecting the right metrics for use in monitoring performance in a utility customer service operation involves a balance of cost and service level metrics, with the goal of full coverage without such a deep array that tracking them becomes overtaxing to the organization. In this particular study, costs are being analyzed elsewhere, so the entire focus is on the service and volume metrics. The measures selected for this study were designed to provide coverage across the full range of activities, including contact center, meter reading, billing, payment processing, credit & collections, field service, and overall customer satisfaction, all at a relatively high level.

An issue in a benchmark analysis is assuring that all metrics in use can be compared across companies, so it requires that all measures either be normalized in some fashion. To that end, the project team developed a comprehensive set of metrics to address the stated requirements, and selected those that are presented in this section of the report. Taken together, the collection of performance measures provides a profile of performance of the customer service organization within a utility, in this case for LADWP. All of the metrics included in this list are ones that are routinely tracked by electric, gas, and water utilities across the U.S., and thus lend themselves to comparisons for LADWP.

The remainder of this section discusses the performance metrics selected for this Survey and why they are important, including three (3) perspectives: The value and benefit of the metric to: 1) supporting customers/key constituents, 2) managing the LADWP business, and 3) coordinating efficient and effective internal business processes.

For each of the metrics listed below, the following are presented to enable an understanding of the metric, its importance, and value.

1) Overview of the metric: what the metric is, how it is defined, what it measures
2) What the metric represents and why it was selected
3) The importance of the metric---to customers/key constituents, the LADWP business, and in managing the business process

The following Customer Service metrics are discussed. The metrics themselves can be grouped by function or process and are categorized below for purposes of understanding where the source of the metric should be. This should not limit the reporting of the respective metric to solely the respective functional organization. Metrics are assumed to be shared cross-organizationally to promote joint accountability.

**Contact/Call Center**

1) Service Level (Live Contacts)
2) Average Speed of Answer (Live Contacts)
3) Abandonment Rate (Live Contacts)
4) First Contact Resolution
5) Percent of IVR Self-Service Contacts with a Completed Transaction

**Meter Reading**

6) Annual Meter Read Rate

7) Meter Reading Error Rate
8) Meters with Chronic "No Read" (no bill 3-6-9 month billing periods)

**Customer Billing**

9) Percent of Bills Mailed Within Billing Window
10) Percent of Bills Estimated
11) Percent of Bills with Post-Bill Adjustments Due to Errors
12) Percent of Bills Issued Electronically

**Customer Payments**

13) Percent of Payments Received from Customers Electronically

**Credit and Collections**

14) Percent of Customers in 30/60/90 Days Arrears
15) Percent of Accounts Scheduled for Disconnect Actually Worked
16) Days Sales Outstanding
17) Write-offs as Percent of Revenue

**Field Service**

18) Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC)

**Overall Business—Reliability, Satisfaction, Employee Availability**

19) Electric System Reliability
20) Customer Satisfaction - J.D. Power

The following is a more detailed review of each of these major metric categories.

### 2.2.1 Contact/Call Center Metric Group

Metrics 1-5 below are all metrics related to the performance and service of the Contact/Call Center.

**Service Level (Live Contacts)**

Metric Overview: Service level is defined as: "X percent of contacts answered in Y seconds," e.g., 80% of calls answered in 30 seconds. For this metric "contacts" are live, inbound calls from customers seeking to speak to a company representative. Directionally, the higher the % measure, the higher the number of customer contacts that have been handled within the time interval, and thus the fewer customers waiting or possibly abandoning a call.

The metric is used at both the operational level (for example, this metric is often used at 30 minute intervals by contact center and workforce managers in utilities) and business level where it is a key component of service "dashboards" indicating service in the Contact Centers, most typically being reported weekly or monthly at the executive level. Service level is typically available directly from ACD (the call routing system) or workforce management system (WFMS) reports.

Metric Representation and Selection: The metric represents a view into how accessible the center is to LADWP customers, a view into how many call handling representatives are needed to provide efficient

service and when, and is a solid benchmark on how the center's service compares to others in the industry.

It was chosen because it is often viewed in the Contact Center Industry as the single best measure of Contact Center performance, and, along with First Contact Resolution it is one of the best predictors of Customer Satisfaction as well. ◎It is a classic metric that is used by nearly 100% of contact centers in the utility and all other industries.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric is critical for customers as it measures how well the company is getting customer contacts through its call handling systems and into the hands of available agents. It is the clearest indication of what customers experience when they attempt to reach the LADWP contact center.
To the business it is essential for planning and budgeting, where service level objectives can be set to provide customers the desired experience and then tied to the resources (phone agents) needed to be available to handle incoming contacts at that level. The importance of the metric is not only in achieving an overall stated service objective, but how consistently the contact center hits those objectives throughout any given day, and therefore its use not only as an annual or periodic metric, but a real-time indicator of customer accessibility.

It is important to the business process because it should drive staffing levels, scheduling decisions, and performance management and ultimately provide a better view into accessibility. While accessibility means that contacts are getting in and being handled efficiently, if quality is poor, things such as repeat contacts (see the FCR metric), unnecessary contacts and escalations and complaints will eventually drive the Service Level Metric down due to increased caller volume and customer frustration. In this manner this metric works together with FCR as a good indicator of the customer experience.

**Average Speed of Answer (ASA) for Live Contacts**

Metric Overview: The average speed of answer is measured in seconds and is the time interval from when a call enters the ACD (the company's call distribution system) to the time that an agent/representative answers the call, including the time the customer spends listening to any messaging from the company and the wait time in the queue. (Note: This metric should only utilize live caller data, and not blend any self-service contacts in its calculation)

Metric Representation and Selection: The metric is a simple way of understanding the average wait time that a customer experiences in reaching a live agent. The metric moves directionally inverse to the Service Level metric, so as service level goes up, meaning more calls are being answered within the established time interval, the average amount of time that a customer waits to have their call answered (ASA) goes down.

The vast majority of benchmarked utilities and call centers outside of the industry use this metric as well. For regulated utilities, state regulatory commissions often use this metric as a customer service performance target. ASA is ordinarily available directly from ACD (routing system) or workforce management system (WFMS) reports.

Importance of the Metric: Customers/Constituents, Business, and Business Process: ASA is a way to measure service from the perspective of the customer and for contact center managers; it provides further insight into staffing and scheduling needs.

**Abandonment Rate (Live Contacts)**

Metric Overview: Abandon rate is calls abandoned, e.g. the customer hangs-up the call while waiting for an agent, divided by calls offered, e.g. all of the attempts callers make to reach the call center typically as measured by the ACD (Automated Call Distribution system).

This measure does not take into account calls that may be 1) blocked at the point of entering the system, or 2) calls that may get a "busy" for reasons including not enough telecommunications capacity to handle inflowing calls. The company should have separate measures for these occurrences. (Note: This particular metric should only utilize live caller attempts, and not blend any self-service activity in its calculation). Abandonment rate is available directly from ACD (routing system) or workforce management system (WFMS) reports.

Metric Representation and Selection: The abandon rate metric best represents a contribution to the ability for LADWP to understand callers' tolerance levels (desire to wait for a call to be answered). It is used as a key operational metric in almost all utilities and like ASA, moves directionally inverse to the Service Level Metric, so as service level goes up, meaning more calls are being answered within the established time interval, the Abandonment Rate typically goes down.

Importance of the Metric: Customers/Constituents, Business, and Business Process: As a customer metric it allows the company to start to understand customers' behavior and willingness to wait. For customers this is important as long wait times can lead to frustration, complaints and callbacks.
Operationally, the metric is most often used in concert with the Service Level Metric, where companies monitor both at frequent intervals throughout a day to help understand drivers of customer behavior. For example, the degree of motivation -- how important the call/contact is to the customer, availability of self-service substitutes -- can they get the answer somewhere else (i.e., your Web site, or IVR, etc.), level of expectations -- do they have to wait a long time every time they call and will therefore continue to wait for a long period of time, or did they get right through the last time they contacted you.
The metric's use also helps in supporting decision-making around the kind of messaging to provide customers in the queue, what menu options to provide, callbacks to offer, etc. as well as determining the amount of telecommunications capacity needed to handle customer queues.

**First Contact Resolution**

Metric Overview: First-Contact Resolution (FCR) is defined as the percentage of initial customer contacts that do not require any further contact (call back) by the customer to address the customer's reason for calling. In other words, the customer does not need to contact the company again to seek resolution. Ideally, first-contact resolution should be defined from the customer perspective. The metric is usually measured on a monthly basis, using a combination of in-contact questions (e.g., "Is this/ was this the first time you are calling about this issue?" and "Has/was the reason for your call been resolved?"), post-contact and post-order transactional surveys. Companies often use statistical sampling of a % of contacts to derive the metric on a timely basis, rather than attempting to use every single contact measured.

For utilities, the metric can be taken from two main perspectives: 1) those contacts that only the contact center is needed to address the customer issue, such as a service inquiry (customer education, account maintenance, taking an order), and/or 2) those contacts where someone other than the call center is needed. Examples are a meter request (meter or field orders, construction-related) that entails downstream work outside the contact center, such as by Meter Reading, Billing, or Field Service. Generally, high performing utilities measure both, often in one metric in order to understand the entire customer experience and not just the contact center experience, as well as stratifying the measure by transaction type.

Metric Representation and Selection: FCR represents one of the best indicators of customer satisfaction. Operationally it is also an indicator of the level of increased/additional operating costs (e.g., lower FCR will mean more customers calling back for issue resolution, creating increased call volume), which drives more staffing or overtime to handle contacts. It also indicates downstream rework if the issue has not been resolved, such as a second field visit, or billing issue investigation. For these reasons the metric is selected as a valuable one to review, discuss and understand root cause issues as to why customers are not experiencing resolution of their issue on the first contact.

Importance of the Metric: Customers/Constituents, Business, and Business Process: To understand the customer satisfaction of customers specifically transacting with LADWP, FCR is one of the best metrics. Out-of-industry studies show a direct correlation between FCR and satisfaction. The process of measuring FCR entails talking to customers and understanding their experiences with specific transactions that can lead to identifying opportunities to improve the business and underlying processes. It also serves as a measure to understand the potential for improvement. For example, consider a company experiencing 25% of its live customer contacts as not experiencing FCR and therefore having to call back. If the measure isolates specific transaction types, e.g. repeat high bill issues, missed appointments, etc., this information can be used to investigate the underlying process.

**Percent of IVR Self-Service Contacts with a Completed Transaction**

Metric Overview: The metric measures the percentage of self-service contacts that were successfully completed by the customer out of the total number attempted. In this case the measure is for the IVR (Interactive Voice Response, the technology that allows customers to transact through the use of voice and or input via keypad). A "successfully completed" contact is one where 1) the customer does not have to transfer to an agent to complete a transaction intended to be completed in the IVR, 2) the customer does not hang-up and call back to speak to a live agent for support. It should not be measured as "successfully completed" when 1) a customer simply enters the IVR, and 2) a customer simply hangs up after going into the IVR.

Metric Representation and Selection: The metric was selected to represent the level of success customers are having in transacting through the IVR self-service option provided by LADWP. The majority of utilities use this metric. It is measured through the use of IVR reporting as well as post-contact and post-transaction surveys, and should be evaluated operationally at a level that isolates specific transaction types (as opposed to one broad metric encompassing all contacts which may suffice at the executive reporting level)

Importance of the Metric: Customers/Constituents, Business, and Business Process: A review of this metric to understand customer access and ability to complete in the IVR is necessary. The metric can also be used to identify underlying issues that are causing customers to "opt out" and not self-serve, and, similarly to the FCR Metric, the volume of additional live contacts that are caused as a result of unsatisfactory performance in a specific self-service option.

### 2.2.2 Meter Reading Metric Group

Metrics 6-8 below are all related to the performance and service of the Meter Reading function.

**Annual Meter Read Rate**

Metric Overview: The Annual Meter Read Rate is defined as the total number of meters read within the meter reading window regardless of attempts, divided by the total number of meters to be read. The metric measures the ability of LADWP to read its customer meters as per its reading commitment in order to utilize an actual meter read for the calculation of the customer bill. It is typically measured monthly and by meter reading cycle at a business unit level and aggregated to derive an annual rate (% of meters read). The metric can be derived from meter reading reports generated in the reading software, (e.g. MV 90) or an AMI system.

Metric Representation and Selection: The metric was selected as a measure of effectiveness for the Meter Reading function and to support having a base metric that can then lead to investigating and understanding of controllable (staffing, routing) and non-controllable (e.g. weather) factors in the reading process.

Importance of the Metric: Customers/Constituents, Business, and Business Process: For customers, having a meter read taken within the committed reading window is critical to getting an actual meter read in support of an accurate bill. For the LADWP business, and in managing the business process, the read rate provides a metric as to the efficiency of the reading process. Supporting metrics at the regional or local level can help pinpoint where the reading process is working or not, allowing for corrective action to be taken.

**Meter Reading Error Rate**

Metric Overview: The Meter Reading Error Rate is defined as the number of reads that have an error, divided by the total number of reads taken (% meter read error rate). A meter reading error is most typically identified when a read does not pass a hi-low validation (parameters normally set based on previous history and previous reads/usage). Errors can be captured for reporting through the meter reading software at the point of the read (manual reading). An error can also be produced by the billing system, or by the customer and reported. However, errors are best captured in the Billing function as a check of the Meter Reading Process. Most errors in a manual reading process are due to misread and mis-keyed data. For AMI meters the issue will typically be with telemetry or technology at the meter point.

Metric Representation and Selection: The metric was selected as a measure of quality of the Meter Reading process and to support having a base metric that can then lead to investigating and understanding drivers of errors. For example, training in a manual read environment or technology

issues in an AMI environment. Erroneous meter reads also drive back-office work in Billing (exceptions processing) and rework in the field such as sending out a Meter Reader to re-read the meter a second time, thus impacting cost and resource allocation.

Importance of the Metric: Customers/Constituents, Business, and Business Process: To support the accuracy of customer bills, this metric provides the business with a view of meter reading quality. In the event that bills that are generated with erroneous reads, customer calls in the Contact Center and rework in the field can result. The Billing function will also have the added burden of investigating and following-up on reading errors.

**Meters with Chronic "No Read" (no bill 3-6-9 month billing periods)**
Metric Overview: Meters with Chronic "No Read" (no bill 3-6-9 month billing periods) is defined as the number of active customer meters where no read has been taken over the aforementioned period.

Metric Representation and Selection: The metric was selected as a measure of LADWP's ability to effectively address "no read" situations that result in a customer not being billed over extended periods of time or receiving multiple estimates. In both cases, this can lead to customer dissatisfaction and a loss of revenue to the company. "No read" situations can arise due to several factors including access issues (to the meter) or the meter not placed on a reading route, to technical issues in the case of automated meters.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric's importance is that it allows the company to measure the volume of and drive the identification of the customers whose meters are consistently not being read (a probable cause of dissatisfaction and calls from customers). As a target measure it can move the company toward resolving chronic no-read situations with targeted process steps or activities aimed at solving the problem.

### 2.2.3 Customer Billing Metric Group

Metrics 9-12 below are all related to the performance and service of the Customer Billing group.

**Percent of Bills Mailed Within Billing Window**
Metric Overview: Percent of Bills Mailed Within the Billing Window is defined as the number of bills mailed within the billing window divided by the total number of bills that should have been mailed in the billing window. The billing window is normally a period of 2-5 days within each billing cycle (usually monthly) that a bill is to be mailed. This ensures that a customer is getting a bill that reflects roughly the same amount of usage as per the meter read (e.g. close to 30 days for customers on a monthly billing cycle) each month. The metric measures the timeliness of the bill issuance process.

Metric Representation and Selection: The metric was selected as a representation of a timely billing process. It is a common metric for Billing Departments and contributes to better cash flow and timely payment by customers.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric is a key measure to ensure billing consistency and as a result, customer understanding of usage and what they

are being billed for. From a business process standpoint, the metric helps to understand how effectively bills are going out.

**Percent of Bills Estimated**

Metric Overview: The metric is defined as the number of bills that are issued as estimates divided by the total number of bills sent (the sum of estimated bills and non-estimated bills, e.g. those using actual meter reading to calculate the bill). The metric measures the ability of LADWP to provide its customers with a bill reflecting actual usage.

Metric Representation and Selection: The metric was selected to represent a measure that shows the effectiveness of the Meter Reading process and the translation of meter reads into actual bills through the Billing Process. For example, an organization that can effectively and accurately read meters on a timely basis should generate fewer exceptions and likely fewer estimated bills. If the Meter Reading process is good, but bills cannot be issued, then this may reflect issues within Billing (either process, systems or capacity). The metric is thus a broad indicator of the effectiveness of both of these processes. It is a standard metric for almost all utilities that can be readily benchmarked. The metric should be tracked through reporting in the Billing Department.

Importance of the Metric: Customers/Constituents, Business, and Business Process: Customers receiving estimated bills, especially in cases where they receive multiple consecutive estimates are more likely to seek to understand why. In cases where subsequent periods lead to adjustments to prior estimated bills once an actual read is made, customers may also seek to understand, thus driving calls and contacts into the utility. The metric can therefore help elevate the issue of billing estimates and allow the company to take corrective action. If such estimates are due to non-controllable events (such as weather), it can also lead to actions and communications with customers to proactively address the issue.

**Percent of Bills with Post-Bill Adjustments Due to Errors**

Metric Overview: Percent of Bills with Post-Bill Adjustments Due to Errors is defined as the total number of bills that are identified as erroneous and require an adjustment, divided by the total number of bills sent to customers. A billing error is measured after the bill is sent to the customer. The error can be one that is identified by the customer (most common) who notifies the company, or by the company in the course of its normal business processes, however the measure should only account for those identified "errors" that result in an adjustment to the bill. A post-bill adjustment results from either an office review of the bill and a cancel and re-bill, or a field activity such as a re-read resulting in a correction. The metric measures the quality of the Billing Process and can be derived by the capture and tracking of such adjustments in Billing.

Metric Representation and Selection: This metric was selected as a representation of the quality with which customer billing is done.

Importance of the Metric: Customers/Constituents, Business, and Business Process: Measuring the quality of bills serves to support customer satisfaction and also serves as an indicator of how well the Billing Process is working. For the business, higher levels of actual errors can drive customer contact volume into the Contact Center and drive rework in the form of office reviews and second field visits to

verify meter reads. The metric can serve to trigger root-cause issues that may warrant training, process changes, or enhanced communications across departments.

**Percent of Bills Issued Electronically**

Metric Overview: The metric is defined as the total number of bills issued to customers electronically (often referred to as "e-bill") divided by the total number of bills issued to customers. Electronic bills are defined as bills that are sent to customers in non-paper forms, including email, web (posted on internet through the customer's on-line account), text, or electronic source such as EDI, or bill consolidator site such as a bank or Checkfree. (Note: the metric should be measured at net customers receiving e-bills to account for customers who enroll and then later dis-enroll). The metric is typically tracked via Billing reports off of the Customer Billing System.

Metric Representation and Selection: The metric represents the level at which LADWP is electronically sending bills to customers (bill presentment). The metric can also serve to measure the impact of LADWP efforts to convert customers to e-bill, eliminating the need and cost of sending a paper bill.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric is important as a measure of LADWP's efforts to convert customers to e-bill. Customers on e-bill tend to have higher levels of satisfaction and often enroll in ancillary communications such as on-line or email notification that their bill is ready, etc. As a process metric, LADWP can use it to help evaluate initiatives, promotions, and conversion levels.

### 2.2.4 Customer Payment Metric Group

Metric 13 below is the metric related to the performance and service of the Customer Payment function.

**Percent of Payments Received from Customers Electronically**

Metric Overview: The metric is defined as the total number of payments made electronically by customers divided by the total number of payments received. Electronic payments are differentiated by 3 means:

- Payment through the utility website (whether or not a 3rd party is used to process the payment)
- Direct debit, automatic bill pay, pre-authorized payment (utility goes and gets the money from the customer's bank etc.)
- Customer sends the utility the payment via ACH, EDI, Checkfree, or the customer pays through their bank, or through a low income agency (such as LIHEAP).

Metric Representation and Selection: Similar in nature to the prior Electronic Bill metric, the metric represents the level at which LADWP is receiving electronic payments from customers (bill payment). The metric can also serve to measure the impact of LADWP efforts to convert customers to e-pay, eliminating the need and cost of processing a cash or check payment.

Importance of the Metric: Customers/Constituents, Business, and Business Process: E-Pay as a payment option makes it more convenient for customers to pay LADWP bills. It can also support the payment of delinquent bills in a more expeditious manner. As with e-bill, Customers on e-pay tend to have higher levels of satisfaction and often enroll in ancillary communications or programs such as automated

payment. As a process metric, LADWP can use it to help evaluate initiatives, promotions, and conversion levels.

### 2.2.5 Credit and Collections Metric Group

Metrics 14-17 below are all metrics related to the performance and service of the Credit and Collections operation.

**Percent of Customers in 30/60/90 Days Arrears**

Metric Overview: The metric is defined as the number of customers that are in arrears (delinquent) at each time interval—30, 60, and 90 days—divided by the total number of customers. The metric can be measured by customer class, e.g. Residential, Small Commercial etc. or in aggregate. In this case the metric is an aggregate measure. Each interval is represented as a percentage, with the total percentage representing the total of customers in arrears. The annual metric is calculated as the average of the actual performance at the month end of the last 12 months.

Metric Representation and Selection: The metric was selected as a representation of the percentage of customers that are in arrears and for how long over the 3 time increments. This is a metric that is tracked by almost all utilities and can be benchmarked across the industry. Operationally the metric is often tracked at frequent intervals (monthly) to monitor movement and support understanding of the impact of credit actions being taken by the company

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric allows the business to understand the arrears level and severity of the arrears. It also is useful as an indicator of cash flow and a predictor of write-offs.

**Percent of Accounts Scheduled for Disconnect Actually Worked**

Metric Overview: The metric is defined as the number of accounts that are actually disconnected for non-payment (as per the company policy or regulatory agreements that govern service provision) divided by the total number of accounts eligible for disconnect. The measure is presented as a percentage. As defined, the same account can be counted in as many months as it is eligible for disconnect.

Metric Representation and Selection: The metric was selected to represent the actual application of disconnect actions as a proportion of the total actions (disconnects) that could have been taken. The metric can have numerous drivers, ranging from the company deciding not to enforce policy to business process or condition reasons such as staffing shortfalls in the field or ability to take action due to moratoriums etc., and the metric does not allude to those, but presents a rate that can be benchmarked against other utilities.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric is important to the business as an aggregate measure of the level of action taken when compared to the possible level of action taken. The measure can lead to further investigation as to whether or not credit actions are being executed as planned.

**Days Sales Outstanding**

Metric Overview: The Days Sales Outstanding (DSO) measure is defined as the average number of days that the utility takes to collect revenue after the revenue is recorded/realized. A low DSO number implies that it takes the company fewer days to collect its accounts receivable. A high DSO number shows that the company is selling more to customers on credit and taking longer to collect the amount owed. For purposes of calculation, the DSO is the Average month-end accounts receivable divided by the total annual revenues times total days.

Metric Representation and Selection: The metric was selected as a measure of the ability of the utility to collect revenue over time (days). The metric is utilized by utilities across the industry.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric is of importance as an indicator of the speed of collection of dollars that are due the company.

**Write-offs as a Percent of Revenue**

Metric Overview: The Write-offs as a Percent of Revenue metric is defined as the net percent of total revenue written off (e.g. less any recoveries). Write-offs are the annual "net" cost of bad debt. By definition, any recoveries (less fees) should be subtracted from gross write-offs to arrive at the net, which is then divided by the total revenue.

Metric Representation and Selection: The metric was selected to represent the percentage of revenue that is written-off by the company in the given year.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metric represents a critical measure of the company's ability to manage its receivables.

### 2.2.6 Field Service Metric Group

Metric 18 below is the metric related to the performance and service of Field Service.

**Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC))**

Metric Overview: The Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC) is defined as the number of CGI or UTC orders divided by the total orders actually issued to be worked by Field Service in the field. The metric measures the ability of Field Service to complete the work intended in issued work orders. CGI is defined as orders where Field Service could not gain access to the premise to conduct the needed field work and coded the status of the order as such; UTC is defined as an inability to complete the order for any reason, including a wrong order issued, wrong skill set, improper tools or equipment, etc. and coded the order as such.

Metric Representation and Selection: The metric was selected as a representation of the percentage of access and other conditions preventing the Field Service representatives from completing the intended work. It is also seen in the industry as a measure of needed rework, as such orders most often require a second trip to the premise to complete the work once the access or other issue is resolved.

Importance of the Metric: Customers/Constituents, Business, and Business Process: For the business this metric represents the percentage of intended orders that could not be worked. The higher the percentage of UTC and CGI orders, the greater the amount of rework (or in some cases non-completion of the work at all). Rework results in increased costs via second trips to the premise, staffing reallocations, and overtime etc., so as an indicator it can indicate the need to address and understand root cause issues of the results, ranging from obtaining premise access prior to sending a field representative to better training or scheduling etc. For the customer, incomplete orders or unmet commitments can have a negative impact on satisfaction and result in further unnecessary communications or calls to the utility.

### 2.2.7 Overall Business – Reliability and Customer Satisfaction

Metrics 19-21 below are all metrics related to the performance and service of the Overall Business

**Electric System Reliability**

Metric Overview: Electric System Reliability metrics are comprised of 3 measures, each mutually exclusive:

1. SAIFI, or system average interruption frequency index, is the average frequency of sustained interruptions per customer over a predefined area. It is the total number of customer interruptions divided by the total number of customers served. ◎
2. SAIDI, or system average interruption duration index, is commonly referred to as customer minutes of interruption or customer hours, and is designed to provide information as to the average time the customers are interrupted. It is the sum of the restoration time for each interruption event times the number of interrupted customers for each interruption event divided by the total number of customers. ◎
3. CAIDI, or customer average interruption duration index, is the average time needed to restore service to the average customer per sustained interruption. It is the sum of customer interruption durations divided by the total number of customer interruptions. ◎

Metric Representation and Selection: These metrics were selected as representing the three most commonly used measures of reliability (as defined by the IEEE). They serve as the most comparable measure of customer interruptions, restoration time, and interruption duration.

Importance of the Metric: Customers/Constituents, Business, and Business Process: The metrics are important as indicators of electric service quality. Minimizing interruptions, minimizing their duration when they do occur, and restoring power in a timely manner are critical to successful utility operations and customer satisfaction.

**Customer Satisfaction- J.D. Power**

Metric Overview: The metric is defined as the JD Power reported score for Electric Residential and Electric Business Customers (2 scores). The score is an annual one and reports the results of its customer satisfaction survey which measures satisfaction with power quality and reliability, price, billing and payment, corporate citizenship, communications and customer service. The metric can be benchmarked against a panel of utilities that is diverse, such as is done here, or against utilities that are comparable in size and geographic region. LADWP is placed in the Western Region, Large Customer Segment in the survey.

Metric Representation and Selection: The metric was selected to represent an aggregate customer satisfaction measure that is used across utilities in the United States. The results can be benchmarked from one utility to another

Importance of the Metric: Customers/Constituents, Business, and Business Process: The survey is the most publicly communicated customer satisfaction survey. Customers can, from media channels, hear about the performance of their utility. The utility can also gain insights as to its performance from interviewed customers' perceptions of the company.

## *2.3 Selecting the Comparison Panel*

### 2.3.1 Overview of selecting a benchmarking comparison panel

A key part of any benchmarking study for a utility in the U.S. is selection of an appropriate group of utilities for comparison. Theories about the "ideal" comparison panel begin with a debate about whether the comparators should be as much like the utility under study as possible, or should contain a diverse array of comparators. Those arguing for a homogeneous group point out that it's only fair to choose utilities with the most similarity of circumstance, in order to truly understand the relative performance of the test utility within those circumstances. Those arguing for diversity suggest that a comparison group with a wide array of comparators allows the greatest opportunity to identify better practices, factors that affect performance, and the range of performance that customers might expect from their supplier.

After having performed dozens of benchmarking studies in the utility customer service arena over a 25-year span, our consultants have concluded that the best possible comparison groups are those that have variation within the group on an array of factors, thus enabling the best possible learning opportunity. Using a homogeneous comparison group misses the opportunity for greater learning in an effort to find the drivers of small differences between very similar companies. A comparison group that represents the entire industry is most often the best, since it gives a better indication of the performance of the test utility within the industry, regardless of specific circumstances.

With that background, the project team worked to develop a panel for comparison in the benchmark analysis that included utilities with the following characteristics:

1) Similarities to the utility under study
2) Differences from the utility under study
3) Broad geographic coverage
4) A range of ownership structures (Municipal, IOU)
5) Some single-commodity and some multi-commodity utilities
6) Different regulatory jurisdictions

The goal is to get an accurate representation of the industry, and that was the focus of the selection process. The comparators in the selected group face some different circumstances (e.g. regulatory structure, customer base, economic conditions) as well as some similar ones, and have some different characteristics, along with some similarities. The broad, diverse comparison panel provides the greatest learning opportunity in terms of practices, as well as the best way to compare overall outcomes in a broad context.

Having done the analysis using the panel described below, and looking at the results of the performance comparisons, the peer panel selection process turned out to have been a good choice. The relative performance for LADWP within this group, or within a homogeneous comparison panel would have worked out about the same (see results below), and now the results can be seen within a national industry context, rather than just against a homogeneous group of utilities.

### 2.3.2 The selected comparison panel

The comparison panel chosen for LADWP has the following characteristics:

1) Nationwide coverage
2) Very large utilities
3) Smaller utilities
4) Municipalities and IOUs
5) Utilities with multiple commodities and with only one commodity
6) Utilities in multiple regulatory jurisdictions

The net result for the selected group of utilities is the comparison panel provides a broad cross-section of the industry, with demanding customer groups, regulators, and management teams. While the study did not endeavor to investigate the underlying practices in depth, it is clear there are some significant differences in approaches and levels of success that LADWP can learn from through future process improvement efforts.

The list of companies finally selected for the study includes the following utilities:

**Table 1: List of Benchmark Peers**

| | |
|---|---|
| Austin Energy | Iberdrola USA – RG&E |
| CPS Energy | Jacksonville Electric Authority |
| DTE Energy | Lakeland Electric |
| Entergy | Oncor Electric Delivery |
| Exelon -- BGE | PSE&G |
| Exelon – PECO Energy | PSEG Long Island |
| Exelon -- ComEd | Tacoma Public Utilities |
| Hydro-Quebec | Tucson Electric |
| Iberdrola USA – Central Maine Power | Westar Energy |
| Iberdrola USA -- NYSEG | |

While questions can be asked about why one or another utility was not included in the comparison group, the project team has great confidence that the conclusions reached through use of this comparison panel will withstand scrutiny, and would be the same if a different group of comparator companies had been selected.

## *2.4 Results of the Benchmarking Comparisons*

This section of the report is divided into two sub-sections. The first describes the ability of LADWP to report against the set of metrics described above, while the second summarizes findings about the relative performance of LADWP on those metrics for which they were able to report results.

### 2.4.1 Ability to Report Performance

LADWP provided results for a total of 14 of the requested 20 performance measures, which are standard metrics used across the utility industry. Collectively, these measures provide the foundation for active and on-going monitoring of utility Customer Service operations. The Department was unable to provide data on 30% of the metrics selected for our study. Navigant has been informed that work is underway to address issues with the Department's historical customer service data. Resolving these issues may improve the results of the 2014 benchmarking reflected in our report. We encourage the Department to continue to pursue and adopt methods of improving data management practices in customer service. A brief commentary on each metric grouping follows.

**Table 2: LADWP Ability to Measure and Report the Metric**

| | Yes | No |
|---|---|---|
| **Contact/Call Center** | | |
| Service Level (Live Contacts) | | ✓ |
| Abandonment Rate (Live Calls) | | ✓ |
| Average Speed of Answer (Live Contacts) | ✓ | |
| Percent of IVR Self-Service Contacts with a Completed Transaction | ✓ | |
| First Contact Resolution Measure (Contact Center Process) | | ✓ |
| **Meter Reading** | | |
| Annual Meter Read Rate | ✓ | |
| Meter Reading Error Rate | | ✓ |
| Meters with Chronic No Read (no bill 3-6-9 billing periods) | ✓ | |
| **Customer Billing** | | |
| Percent of Bills Issued Electronically | ✓ | |
| Percent of Bills with Post-Bill Adjustments Due to Errors | | ✓ |
| Percent of Bills Mailed Within Billing Window | ✓ | |
| Percent of Bills Estimated | ✓ | |
| **Customer Payments** | | |
| Percent of Payments Received from Customers Electronically | ✓ | |
| **Credit and Collections** | | |
| Write-offs as Percent of Revenue | | ✓ |
| Days Sales Outstanding | ✓ | |
| Percent of Customers in 30/60/90 Days Arrears | ✓ | |
| % of Accounts Scheduled for Disconnect Actually Disconnected | ✓ | |
| **Field Service** | | |
| Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC) | ✓ | |
| **Overall Business- Reliability and Customer Satisfaction** | | |
| Customer Satisfaction - J.D. Power - Residential | ✓ | |
| Customer Satisfaction - J.D. Power - Business | ✓ | |
| Reliability | | ✓ |

#### *2.4.1.1 Contact/Call Center*

LADWP reported on 2 of the 5 selected metrics, Abandonment Rate and % IVR Self Service Completed. Of the 3 that could not be reported, 2 -- Service Level and Abandonment Rate -- should be derived and available from ACD (the call routing system) or Call Management System (CMS) reports.

#### *2.4.1.2 Meter Reading*

2 of the 3 selected metrics -- Annual Read Rate and Meters with Chronic No Read---were reported. The third, Meter Reading Error Rate, should be available through the Meter Reading software (for manual reads) and the Billing System when identifying exceptions, or in the Pre-Bill Audit Process.

#### *2.4.1.3 Customer Billing*

3 of 4 selected metrics -- % of Bills Issued Electronically, % of Bills Mailed in the Billing Window, and % of Bills Estimated -- were reported. % of Bills with Post-Bill Adjustments Due to Errors should be tracked in the Billing Group via available reporting, and individual tracking if necessary.

#### *2.4.1.4 Customer Payments*

The selected metric, % of Payments Received from Customers Electronically, was reported.

#### *2.4.1.5 Credit and Collections*

3 of 4 selected metrics -- Days Sales Outstanding, % of Customers in 30/60/90 Days Arrears, and % of Accounts Scheduled for Disconnect Actually Disconnected -- were reported. Write-offs as Percent of Revenue should be derived from financial statements and write-off tracking.

#### *2.4.1.6 Field Service*

The selected metric, Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC), was reported.

#### *2.4.1.7 Overall Business- Reliability and Customer Satisfaction*

Reliability metrics -- CAIDI, SAIDI, and SAIFI – were not reported. While not typically tracked in the Customer Service group, these metrics are standard reliability measures that should be tracked and easily available in the Distribution organization. Customer Satisfaction - J.D. Power – Business and J.D. Power Residential, were reported.

## *2.5 Results on the Reported Measures*

The results of performance for the metrics actually reported are shown in the table below. Most of the performance results fell in either the 3rd or 4th quartile of the comparison panel. A brief commentary follows the table.

**Figure 3: Performance Profile for LADWP Customer Service**

| | LADWP | Q | Mean | Q1 | Q2 | Q3 |
|---|---|---|---|---|---|---|
| **Contact/Call Center** | | | | | | |
| Service Level (Live Contacts) | NA | | 64.7% | 75.9% | 66.9% | 61.4% |
| Abandonment Rate (Live Calls) | NA | | 6.6% | 4.4% | 5.5% | 9.5% |
| Average Speed of Answer (Live Contacts) | 1362.0 | 4th | 100.9 | 46.0 | 90.0 | 111.5 |
| Percent of IVR Self-Service Contacts with a Completed Transaction | 41% | 3rd | 46% | 62% | 45% | 35% |
| First Contact Resolution Measure (Contact Center Process) | NA | | 78.0% | 85.0% | 78.0% | 72.0% |
| **Meter Reading** | | | | | | |
| Annual Meter Read Rate | 94.0% | 3rd | 92.3% | 98.4% | 96.5% | 93.1% |
| Meter Reading Error Rate | NA | | 0.13% | 0.04% | 0.10% | 0.19% |
| Meters with Chronic No Read (no bill 3-6-9 billing periods) | 0.84% | 2nd | 1.35% | 0.01% | 0.84% | 1.10% |
| **Customer Billing** | | | | | | |
| Percent of Bills Issued Electronically | 14.4% | 3rd | 18.5% | 22.6% | 16.1% | 14.4% |
| Percent of Bills with Post-Bill Adjustments Due to Errors | NA | | 0.240% | 0.098% | 0.159% | 0.309% |
| Percent of Bills Mailed Within Billing Window | 98.0% | 4th | 98.95% | 100.00% | 99.62% | 99.34% |
| Percent of Bills Estimated | 4.9% | 4th | 4.39% | 0.82% | 1.28% | 4.9% |
| **Customer Payments** | | | | | | |
| Percent of Payments Received from Customers Electronically | 35% | 4th | 53% | 50% | 54% | 58% |
| **Credit and Collections** | | | | | | |
| Write-offs as Percent of Revenue | NA | | 0.95% | 0.38% | 0.79% | 1.40% |
| Days Sales Outstanding | 36 | 2nd | 35 | 31 | 36 | 40 |
| Percent of Customers in 30/60/90 Days Arrears | 56% | 4th | 28% | 15% | 27% | 37% |
| % of Accounts Scheduled for Disconnect Actually Disconnected | 2.6% | 4th | 44% | 42% | 44% | 49% |
| **Field Service** | | | | | | |
| Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC) | 66.9% | 4th | 18.83% | 3.70% | 10.83% | 20.61% |
| **Overall Business – Customer Satisfaction** | | | | | | |
| Customer Satisfaction - J.D. Power - Business | 646 | 3rd | 657 | 670 | 659 | 645 |
| Customer Satisfaction - J.D. Power - residential | 641 | 4th | 651 | 661 | 647 | 643 |

### 2.5.1 Contact/Call Center

The reported Average Speed of Answer was in the 4th quartile. At close to 23 *minutes*, customer wait time before a call is answered, the Service Level (not provided) could be derived as close to or at 0% of calls answered in 30 seconds. These metrics indicate significant customer access challenges when compared to Mean ASA of 100 *seconds* as a benchmark. Factors to further investigate would be high call volume levels and causes of high volumes, staffing issues, staff to volume scheduling gaps, and drivers of repeat calls from customers. % IVR Self Service Completed falls in the 3rd quartile at 41%, less than the mean of 46%.

### 2.5.2 Meter Reading

The Annual Meter Read Rate falls in the 3rd quartile at 94%, meaning that on average 6% of the active meters are not being read. Factors to further investigate would be route reading efficiency, effectiveness, and staff productivity. While the % of Bills Estimated was not provided, this Read Rate metric would indicate a similar performance level in Estimated Bills.

### 2.5.3 Customer Billing

While 98% of bills were mailed within the billing window, this represents 4th quartile performance when compared to the benchmark panel. 2nd quartile performers achieve 99.62%. Factors to further investigate would be drivers of delay in both the Billing (processing backlogs or exception handling delays causing pre-bill adjustments) and Meter Reading (delays in reading on-cycle or missed reads) processes.

The % of Bills Issued Electronically was 14.4%, 3rd quartile performance. Mean performance was at 18.5%. The % of Bills Estimated was 4.9%, which is in the 4th quartile. Factors to investigate here include missed meter reads and/or problems in the pre-bill edit process.

### 2.5.4 Customer Payments

% of Payments Received from Customers Electronically, was reported at 35%, 4th quartile. The Mean performance was 53%. Factors to further investigate are success of approaches aimed at promoting both e-bill and e-pay to the appropriate customer demographic, both of which increase customer satisfaction and can serve to reduce postage and bill preparation/payment processing costs.

### 2.5.5 Credit and Collections

% of Customers in 30/60/90 Days Arrears was in 4th quartile and the highest in the benchmark panel at 56%. The Mean was 28%. Factors to investigate are collections policies and approaches, field activities and effectiveness of actions to be taken. % of Accounts Eligible for Disconnect Actually Disconnected was also 4th quartile and the lowest in the comparison group at 2.6%. The Mean was 44%. Factors to investigate are field collections policies, effectiveness, staffing availability, and $ amount and days delinquent minimum to send to the field.

### 2.5.6 Field Service

Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC) was reported at 66.9%, meaning that 2 of 3 fielded orders are not completed, an extremely high level and the second highest in the comparison group, placing LADWP in 4th quartile for this metric. Factors to investigate are order quality, field force effectiveness, scheduling, route management and productivity, and field training.

### 2.5.7 Overall Business -- Reliability and Customer Satisfaction

Reliability metrics---CAIDI, SAIDI, and SAIFI – were not reported. In other circumstances where these metrics are reported, LADWP typically compares favorably with the industry.

Customer Satisfaction - J.D. Power – Business and J.D. Power Residential, were reported at 646 and 641, respectively, which places LADWP in the 3rd and 4th quartiles of customer satisfaction performance. When viewed in concert with the performance on the operational metrics described above, the relatively low satisfaction results are just what would be expected.

## 3. Review of Customer Service Technology

Leading practices in customer service are increasingly defined by the advanced use of technology. In general, delivering customer service involves a set of technologies that fall into three main software categories: queuing and routing, CRM customer service, and workforce optimization.[2] These forms of technology are generally adopted to better address customer challenges, provide an increasing number of service delivery choices, improve staff efficiency and effectiveness, and provide meaningful insights to improve customer care. The main focus of enhanced technologies is typically in the following areas:

- Self-service optimization. Finding ways for customers to interact with the business when they want.
- Data management and analytics. Using data collected from customers to analyze their preferences.
- Insight-driven marketing. Using of data to conduct more effective target marketing.
- Marketing automation. Streamlining and automating business processes to improve efficiency.
- Workforce effectiveness. Encouraging staff to improve customer treatment through tools and training. [3]

While the immediate focus of these efforts is to enhance the "customer experience" and deliver operational improvements, inevitably the goal of deploying enhanced technologies is increased customer loyalty. Loyalty is relevant to the Department, inasmuch as inefficient or ineffective methods of customer service can lead to reputational risk and directly impact the relationship between the utility and its various stakeholders.

A 2015 Forrester report cites the following as some of the leading trends in Customer Service:

- "Pain Free": Customers want to feel empowered to get a question answered or an issue resolved at any point during their engagement journey with a company, and expect their service interactions to be painless.
- Proactive: Companies are embracing a new type of customer service engagement that relies on customer context, connected device information, and predictive intelligence to generate proactive or at best, preemptive experiences.
- Personalized: Organizations have long personalized their customer service interactions by providing differentiated experiences for broad customer segments. Now they need to go further, first by delivering the right service experience — either via self-service or agent assisted — to the right user at the right time.
- Productive: Customer service organizations strive to deliver a differentiated service experience for their customers that adds value to commoditized products and services and achieves customer loyalty. Yet they must provide these differentiated experiences at a cost that makes sense to the business — making efficiency a central concern.[4]

[2] Kate Leggett, "Trends 2015: The Future of Customer Service", Forrester Research, March 2015.
[3] Inc.com, "How to Use Technology to Improve Customer Service",
[4] Kate Leggett, "Trends 2015: The Future of Customer Service", Forrester Research, March 2015.

In short, current thinking on leading standards in customer service suggests that the best service should be straightforward, proactive, personalized, and delivered efficiently. For many companies, this level of service is a cornerstone of their customer engagement strategy. As a result, technology has topped the list in investment priorities for the last several years in customer service organizations.[5]

## *3.1 Technology in the Customer Service Division*

Technology strategies and objectives are defined and executed through the Customer Information, Communication and Technology (CICT) group in the Customer Service Division (CSD). As currently organized, the CICT is directly accountable for managing several applications for the Department, including the corporate website, the Customer Relationship Management (CRM) system, the customer service analytics database, and the e-marketing platform. CICT works closely with the Information Technology Services Division (ITSD) to manage other critical applications, including the Customer Information System (CIS), Mobile Workforce Management (MWM), Meter Data Management (MDM), meter reading systems (Automatic Meter Reading (AMR), Advanced Metering Infrastructure (AMI)), and Interactive Voice Response (IVR).

The following is an overview of the CICT in several key areas, including Strategy, Governance, Roles and Responsibilities, and Major Initiatives. Recommendations are highlighted at the conclusion of this report. This report should be read in conjunction with the *Technology Infrastructure* report to comprehensively understand the challenges and opportunities related to technology.

### 3.1.1 Strategy

The technology-related strategy of CSD is a primary topic of our review. To prepare this report, we reviewed a number of independent studies and benchmarking initiatives commissioned by the Department that focus on the requirements associated with moving toward greater customer focused operations. Many of the analyses assess the Department's overall customer experience ("Voice of the Customer") and customer service technology management. In addition, we reviewed the CSD Strategic Objectives document, which describes the Division's five (5) principal goal areas, all of which touch on the importance of technology in service delivery and workflow.

One of the strategic objectives in particular – "*Innovate*" – describes system stabilization and integration as important goals. The following are the specific "*Innovate*" goals:

1. Stabilize CIS (CCB) & other platforms
2. Integrate MDM with CCB
3. Integrate Unit Meters with CCB
4. Implement new ladwp.com framework
5. Implement RFP strategies for CCB & IVR Support
6. Increase billing & payment options for customers

The ability to address all of these goals depends on progress made specifically in Goal #1; CIS stabilization and leading day-to-day work consume a great deal of organizational resources.

[5] Forrester Research, "Forrsights Software Survey, Q4 2013".

Each major group in the CSD provided more detailed goals and objectives in five (5) areas: Improve Customer Experience; Operational Excellence; Customer Programs & Outreach; Strengthen People, Values & Culture; and Technology & Innovation. Within these areas, CICT identified specific objectives to improve the use of technologies used by customers, eliminate defects in key systems, and implement Request for Proposal (RFP) strategies for additional customer service systems (among others).
At present, CIS remediation and on-going operations are the two primary Division priorities, with the CIS program appearing to consume the greatest amount of time and resource in the CICT. The reasons for this are clear, as a properly-functioning CIS is critical for the Department. However, it is important to note that interviewees stated that both on-going operations and other strategic programs may suffer when competing with CIS program objectives. This finding is explored further in the *Organization & Staffing* and *Training* sections of our review, included below.

### 3.1.2 Governance

Customer Service technology strategies are formulated in the CSD, and executed by CICT with delivery support provided by ITSD. Special oversight committees are formed to provide additional governance over major initiatives. For example, the Technical Review Committee (Committee) provides governance over a variety of system-related issues, including the on-going CIS project. Members of the Committee include the AGM of Customer Service, the CIO, and members of CSD and IT management. The Committee reviews and approves program workplans, evaluates progress to-date versus major targets and milestones, and confirms program priorities. CICT then leads meetings with project managers, contractors, and ITSD to evaluate deadlines and overall project requirements.

While we believe this additional governance is appropriate, interviews suggest that the Committee can override the concerns of CICT staff, shift priorities, and commit to aggressive remediation schedules. In our experience, continuously shifting priorities can reduce overall staff productivity and impact morale. In addition, when implementing a program to resolve defects, adhering to aggressive "go-live" deadlines in the absence of comprehensive testing can have lingering impacts on system stability in the long term. CSD staff also noted that if project workplans are rejected by the Committee, alternatives or explanations are not provided and the review process has to start over, which elongates timelines to complete critical projects.

### 3.1.3 Organization & Staffing

At present, there are approximately 50 staff in CICT, organized around three (3) main functional areas – Customer Information, Customer Communications, and Customer Technology. Some number of these positions are ITSD matrixed staff positions, further indicating the close relationship between the groups. Interviews confirm that staffing levels need to increase, given the effort dedicated to day-to-day operations, remediation of the CIS, and other strategic objectives. Recent retirements exacerbate this need: There have been a large number of retirements in the last two years. Given recent and future changes in the technology and business process landscape in CSD, the type of skills required for this workload also need to be addressed. It is believed that staffing efforts to meet immediate needs could take up to three (3) months, after which training on both the technical and business facets of CSD activities would need to take place. Although progress has been made to improve the efficiency of the hiring process, delays in staffing would immediately impact the CIS remediation project, as CICT's immediate need is for additional analysts to develop business requirements and conduct software

testing. In the near-term, remediating the CIS defects – while also leading operations and preparing for additional technology initiatives – will require a combination of CICT staff and third-party consultants. Staffing plans need to be linked to a clear understanding of the functions, roles and responsibilities in CICT, and how CICT works with ITSD.

Generally, staffing levels in any organization are determined by an understanding of the number of services or products the organization provides, the demand for those service or products, the level of effort required, and the complexity of the work (among other factors). Navigant recommends that CSD conduct a detailed workload analysis to better understand the resource needs across all of the various tasks and activities conducted by CICT and CSD staff. Gaining a clearer understanding of workload and resourcing is particularly important, given that staff are balancing day-to-day operations and "special projects" around system deployments.

### 3.1.4 Roles & Responsibilities

CICT and ITSD work together on a variety of activities, from system selection to deployment and remediation. In general, clarity around roles and responsibilities, accountabilities, and ownership of tasks is a key determinant of organizational effectiveness. Interview results suggest a lack of clarity around roles and responsibilities and decision-making accountability around some key tasks that involve both groups. More specifically, confusion exists around the role of each group in the area of system "fixes". In addition, interviews suggest that CICT is unclear how business requirements are used in system selection processes.

The functionality of any complex system is determined through: 1) the configuration of standard settings, and 2) specific coding that yields more client-specific, tailored results. It is generally understood that CICT is accountable for identifying and remediating configuration-related system fixes, while ITSD is accountable for coding-related fixes. However, interviews suggest confusion around ITSD's role in configuration activities.

Additionally, CICT is accountable for ensuring the development of business requirements. Business requirements are used in efforts to address system defects, and also to identify new system selection criteria. Currently, accountability around developing business requirements is a significant determinant of CICT's staffing needs. However, interviews suggest that how business requirements inform or drive system selection is unclear among some CICT staff. Clarity around how outputs are used (in this case, business requirements) in an overall business process helps drive organizational and business process effectiveness.

Navigant recommends that CICT and ITSD more clearly delineate their roles and responsibilities, inputs and outputs, and interfaces, in all areas related to customer service technology management.

### 3.1.5 Training

Training is a critical aspect of successful system implementation. Business processes often change significantly with the adoption of any new system. This is particularly relevant in situations where legacy and proprietary systems are replaced with largely "off the shelf" solutions that reflect best practice processes and workflows.

One of the challenges of the CIS deployment was related to the lack of training. It was found that both existing and new employees did not understand the workflows associated with the new CIS or how

those workflows related to an overall business process. In 2014, CSD established a training academy for customer service in order to facilitate successful transition to new systems (including specifically the CIS). While initial efforts focused on ensuring an adequate level of both technology and business training among the new hires, CSD also focused training efforts on existing employees, with a particular emphasis on skill-enhancement.

These programs are a critical aspect of embedding new processes into CSD "ways of working", and helping new and existing employees understand why they are doing what they are doing in the CIS and other key work activities. Training extends from new technologies to call center, billing, and other key processes. Training programs will include additional facets of the CSD (field training) in the near term.

Navigant believes that comprehensive training not only improves operational performance, but also is an important form of change management: Morale will improve as new and existing employees understand their roles in the context of the overall CSD business process. Interviews suggest that the CSD will be more fully trained by Q3 2016. We believe that the training program is a success story, as CSD aims to ensure adoption of the CIS, build a more flexible and resilient workforce, and develop a "template" for future system and business process transformations.

### 3.1.6 Major Initiatives

The CICT has a number of major initiatives related to the customer service systems it supports. The following is an overview of several of the more prominent system-related initiatives currently underway.

#### *3.1.6.1 Customer Information System (CIS)*

One of the most critical CICT activities is related to the CIS remediation. A significant amount of work has been done to address a large number of system issues: This is a clear commitment of the CICT and ITSD organizations. Despite this progress, CICT and ITSD are still identifying critical tasks and remediating defects. According to interviews with staff, there are more than 600 CIS-related tasks and defects in the queue that need to be addressed. CICT places high-priority on two primary types of defects: 1) billing accuracy, and 2) arrears and collections. Once identified, CICT works closely with ITSD to remediate the issues. While CICT "owns" the prioritized list of tasks and defects (and schedule for remediation), ultimate governance around prioritization and pace of remediation is exercised by the Committee.

Importantly, interviews suggest a disconnect between those who desire a more rapid pace of issue-resolution, and those who strongly believe that both business requirements and testing need to be improved before defects are closed. Furthermore, additional staff are required to meet the schedule expectations for defect remediation. Continuing the pace of remediation while also conducting day-to-day business is contingent on efficient staffing in specific skill areas related to system testing, documenting business requirements, and executing the program of work to address remaining defects.

Finally, on-going training will continue to be important, as more CIS functionality is activated. Interviews with staff suggested that CSD is still working on establishing the core functionality of CIS and that the system offers significantly more capabilities than those being used. Accordingly, it is essential that staff are trained on these additional system components before they are activated and

incorporated into day to day operations. This, plus the desire to create system "superusers", are additional requirements associated with the CIS effort.

#### *3.1.6.2 Mobile Workforce Management (MWM)*

Mobile Workforce Management (MWM) systems provide decision-makers real-time information that enables active control and performance of field resources. Stability has improved in the Department's MWM system (RouteSmart), but CICT is still in the process of integrating RouteSmart and the Department's legacy proprietary system. CICT is also evaluating handheld field products to determine which products to integrate with the system. As with CIS, the system has many capabilities, but CSD and CICT continue to work to optimize core functionality.

#### *3.1.6.3 Interactive Voice Response (IVR)*

Interactive Voice Response (IVR) is an automated system that interacts with callers, gathers information and routes calls to the appropriate recipient. An IVR system and related business processes are central to effective customer service, insofar as they provide self-service options to customers that help deliver first call resolution. Several reports have specified IVR-related challenges at the Department. For example, a JD Power study (2015) found that IVR processing and routing is too complex, and that the organizational staffing / structure is not in place to adequately support the technology. In addition, a 2015 benchmarking study found:

- Total call time longest of any peer.
- Significant number of menu levels.
- More spoken than direct dial options.
- Confusion over prompts; multiple similar prompts.
- Non-recognition of number.
- Direct transfer not an option for a significant percentage of calls.
- Significantly longer wait time from answer to completion of menu.
- Extraordinary wait times for a Customer Service Representative (CSR).

As noted above, addressing these and other challenges has been identified as a priority in the CSD.

ITSD is currently accountable for managing the IVR system. However, according to interviews, no internal person in ITSD or CSD knows how to change the IVR messages. As a result, all system changes have to go through an external consultant. While there is a project plan to upgrade the system, the ownership of this upgrade is unclear. Moving forward, the CSD would like to actively and more directly manage the IVR system, particularly in the area of configuration (messages and routing), with ITSD providing technical support. There is an understanding that cooperation is required between the groups to make the IVR successful, but there is also the belief that CSD needs to own more of the management responsibility.

As mentioned above, an IVR project plan has been defined to upgrade the system, which contemplates a five-year RFP cycle defined by a number of tasks. Importantly, the JD Power identifies several paths – or preconditions – to IVR success. These typically include:

- Significant financial resources

- Long history with the technology
- Very loyal customer base

The JD Power study further identifies several strategic issues with the Department's IVR program, including (among others): availability of informative data; ownership of IVR performance; support structure; ownership and role definition, and design and direction to future state. These foundational aspects of the program need to be addressed for the IVR program to be successfully turned around.

## *3.2 Conclusions & Recommendations*

Technology plays a central role in moving customer service organizations toward leading practices, and delivering core operations in a more optimal manner. The current and proposed future state of the Department's technology infrastructure is a key determinant of how customer service will be delivered and how work will be conducted. As noted, the Department has commissioned a number of studies that provide specific guidance on how technology can be further optimized to meet strategic objectives (including how to move the company toward more customer-focused service). According to one of these studies, the Department has an opportunity to deploy technology more effectively to meet their goals: The CEB Study (2014) found that *Technology Management*[6] was the fourth highest opportunity area ranking, behind *Live Phone Experience*, *Quality Assurance*, and *Service Organization Culture*.

Focusing on technological change in concert with business process improvement and enhanced staffing, we believe the Department has an opportunity to make significant progress on customer service objectives. Pursuing excellence in customer service should be a continuous goal of the Department. We reiterate many of the goals recommendations described in the CSD strategic planning documents and findings from other assessments, and offer several additional recommendations below.

[6] The CEB defined the Technology Management assessment area as follows: "We make technology investments to better enable our existing processes—technology does not define process. We methodically approach vendor-fit evaluations, technology investment priorities, and implementation plans."

High Priority Recommendations

- Evaluate and more clearly define functional accountabilities for key activities between CICT and IT – confirm and draw "brighter lines" between functional responsibilities.
- Create an overarching strategic plan for customer service technology for the next 5-years (including prioritized technology requirements (remediation and new systems), high-level deployment schedules, and estimates of required resourcing (staff and capital) requirements).
- Strengthen the system selection process, and confirm business requirements as a central driver for system selection.
- Continue to develop the training program for CSD, focusing on both technical and business-focused modules. Also continue focus on staff cross-training and staff rotation to enhance flexibility and resiliency in workforce.
- Address staffing and hiring concerns as best as possible, with particular emphasis on specific subject matter expertise and program management acumen.
- Pursue documentation and training on key business processes that align to use of new technologies.
- Measure and evaluate key business activities, processes and personnel; specify Key Performance Indicators (KPI) and define performance targets; incorporate benchmarking as a normal aspect of performance evaluation.
- Conduct workload / workforce balancing analysis to more precisely understand the number of staff and types of skills required

## Appendix A. Lists of Interviews

| Name | Title/Topic | Interview Date |
|---|---|---|
| Estela Tieman | CICT Manager | August 13th/18th |
| George Rofail | Director of Customer Operations | August 25th |
| Greg Hornsby | Key Account Manager | August 12th |
| Michelle Moore | Field Operations and Call Center Manager | August 12th |
| Miki Yonamine | Credit and Collections Manager | August 12th |
| Latrice Williams | Revenue Management Manager | August 12th |
| Wanda Barnett | Customer Service Center Manager | August 12th |
| Nance Walker-Bonnelli | Billing Manager | August 13th |
| Sharon Grove | Assistant General Manager of Customer Experience | August 25th |
| Victoria Black | Training Manager | August 12th |

## Appendix B. List of Documents

Navigant submitted a series of document data requests to LADWP which were provided via a secure file sharing site. The primary documents are listed in detail below.

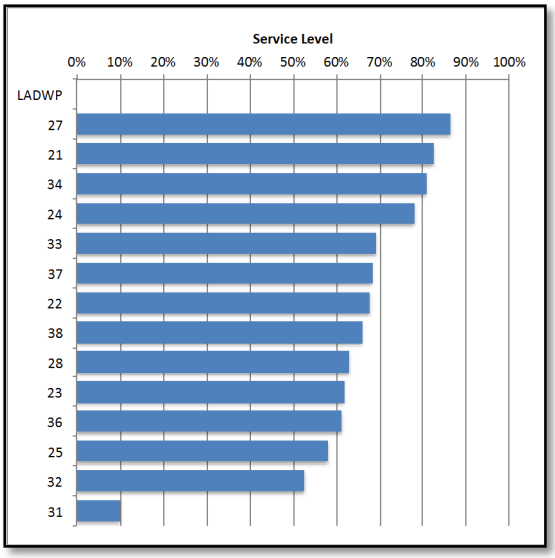
| Documents Provided by LADWP | |
|---|---|
| 1 | Customer Accounts Receivable Continued Reduction Plan |
| 2 | 2015 Utility Website Evaluation Study – J.D. Power |
| 3 | 2010 Electric Utility Business Customer Satisfaction Study |
| 4 | 2010 REU Study |
| 5 | 2013 Service One |
| 6 | 2014 MSI Cogent Energy Management Readout |
| 7 | Quality Assurance Planning and Procedures |
| 8 | 4110 4111_FinalData |
| 9 | Active Passive Relationship Presentation April 2013 |
| 10 | Amendment No. 4 to Software Maintenance and Support with eLoyalty, LLC |
| 11 | Chartwell Customer Care Survey Results |
| 12 | CIS Remediation Progress Report |
| 13 | LADWP 2012 Survey of Residential Customers |
| 14 | Change Order 53 |
| 15 | Customer Accounts Receivable Reduction Plan |
| 16 | CSD Organization Charts |
| 17 | Customer Service / Transaction Presentation |
| 18 | CS Department Goals and Vision |
| 19 | Final Data Analysis_20150518_NS |
| 20 | IVR Business Requirements |
| 21 | JD Power Business Customer Satisfaction Survey |
| 22 | JD Power Residential Customer Satisfaction Survey |
| 23 | JD Power 2010 and 2011 REU Study |
| 24 | LADWP Customer Experience Improvement Advisory Engagement |
| 25 | LADWP CS Analysis Board Presentation |
| 26 | JD Power Customer Experience Improvement Advisory Final Recommendations Report |
| 27 | LADWP IVR Assessment Final Report |
| 28 | LADWP Intranet Status |
| 29 | LADWP CS Project Plan |
| 30 | Link to all CSD Weekly KPI Metrics |
| 31 | LADWP CEB Customer Contact Anatomy Survey |
| 32 | Mayor Monthly Customer Service Metrics |
| 33 | Overall Results 10-28-13 |
| 34 | Payment Options Presentation Jan 2015 |
| 35 | 2013 Customer Service Policies Survey |
| 36 | Segmentation Update Presentation |
| 37 | Segmentation Full Report April 2013 |

| | |
|---|---|
| 38 | Services Implementation Kick-off |
| 39 | LADWP Customer Service Results from April 2015 |

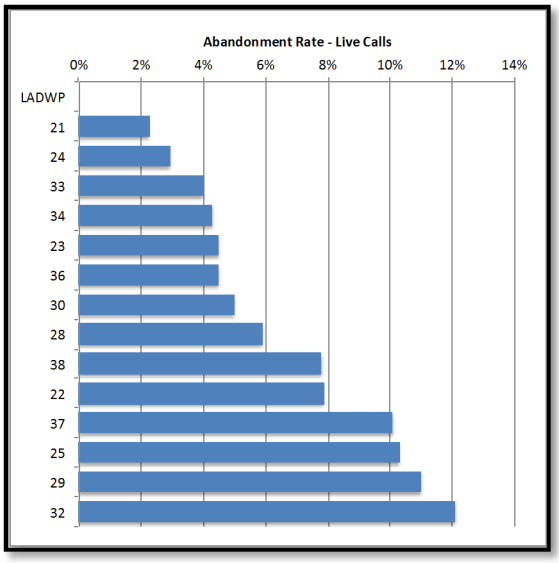
# Appendix C. Benchmark Exhibits

The results of each benchmarked metric can be found below. For confidentiality purposes, each peer utility is referenced by a random number rather than by name.

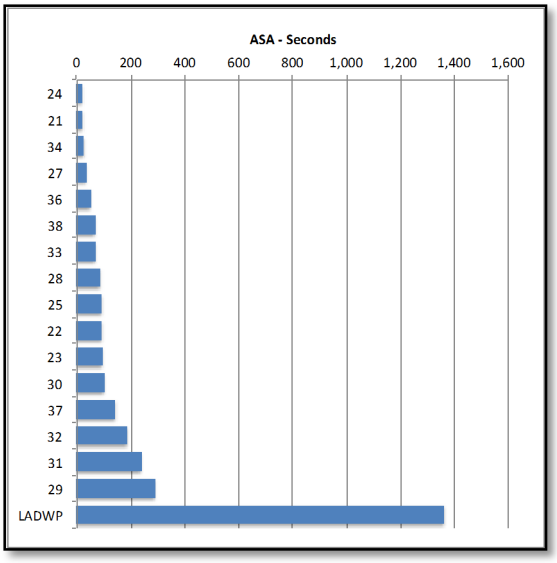
## *C.1 Service Level (Live Contacts)*



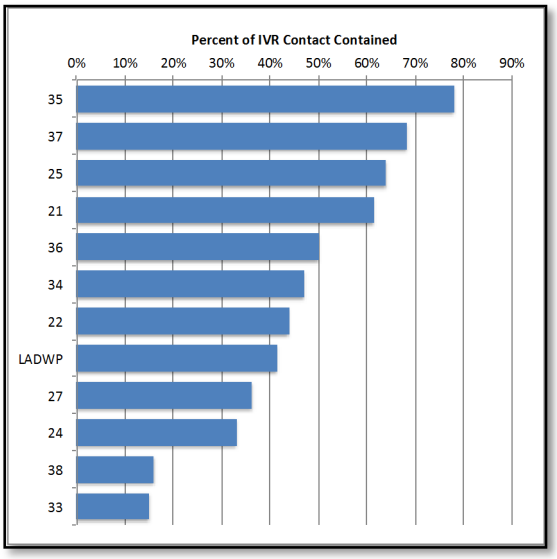

## *C.2 Abandonment Rate (Live Calls)*



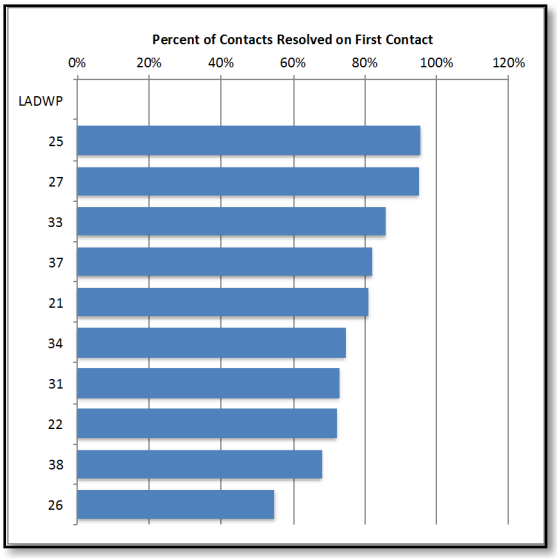
## *C.3 Average Speed of Answer (Live Contacts)*



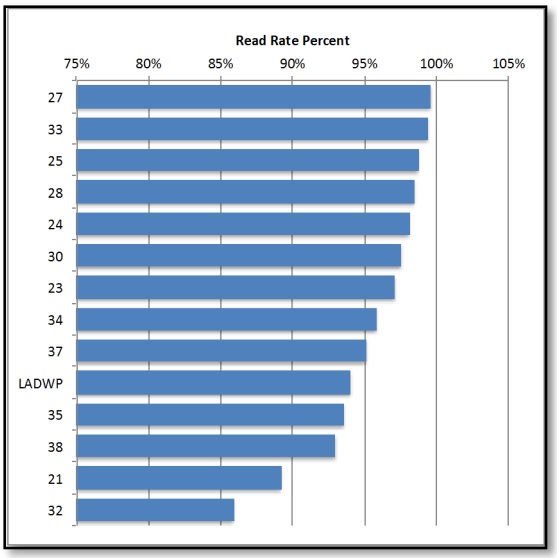

## *C.4 Percent of IVR Self-Service Contacts with a Completed Transaction*



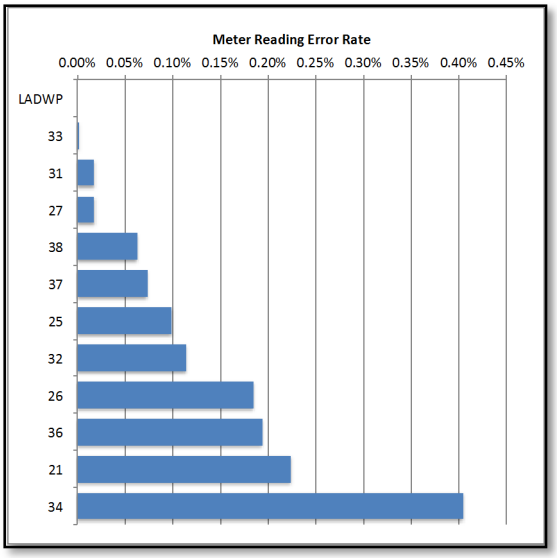
## *C.5 First Contact Resolution Measure (Contact Center Process)*



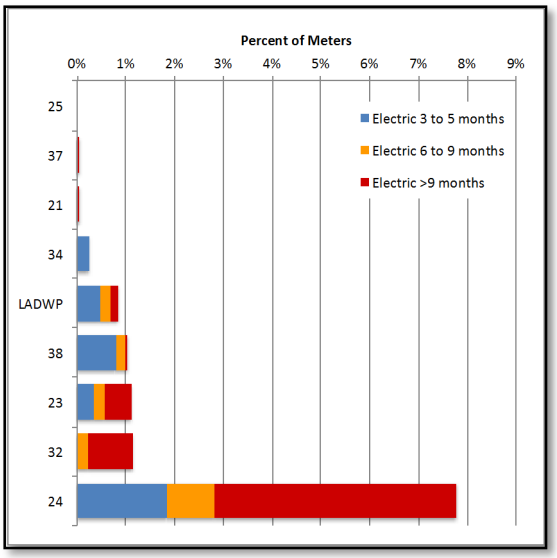

## *C.6 Annual Meter Read Rate*



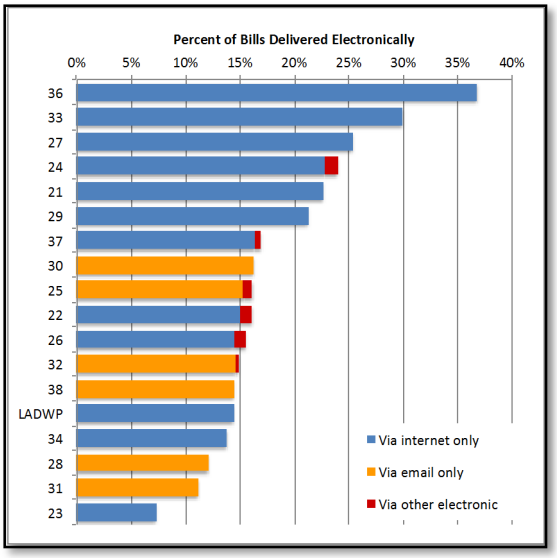
## *C.7 Meter Reading Error Rate*



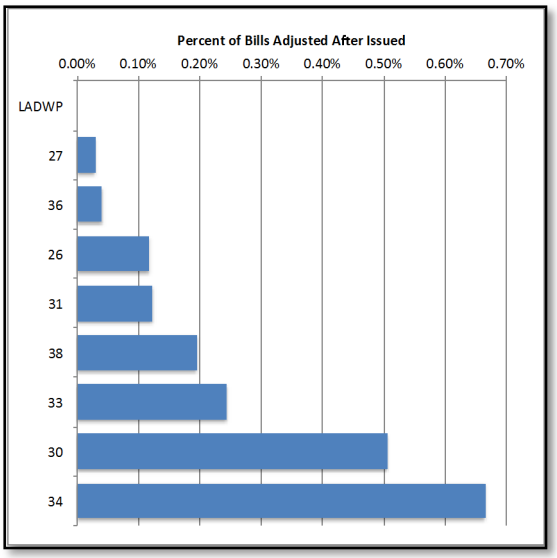

## *C.8 Meters with Chronic No Read (no bill 3-6-9 billing periods)*



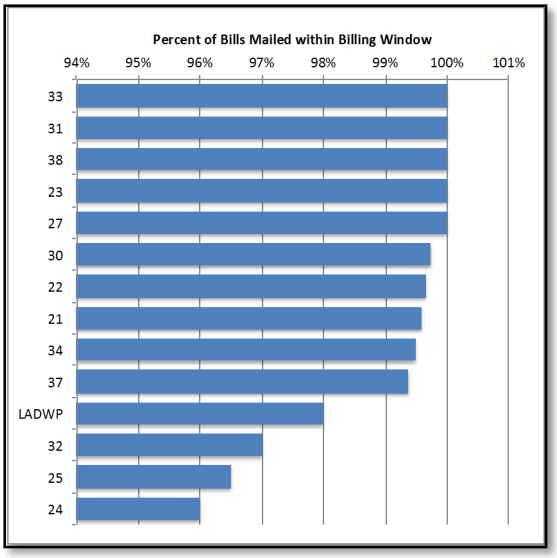
## *C.9 Percent of Bills Issued Electronically*



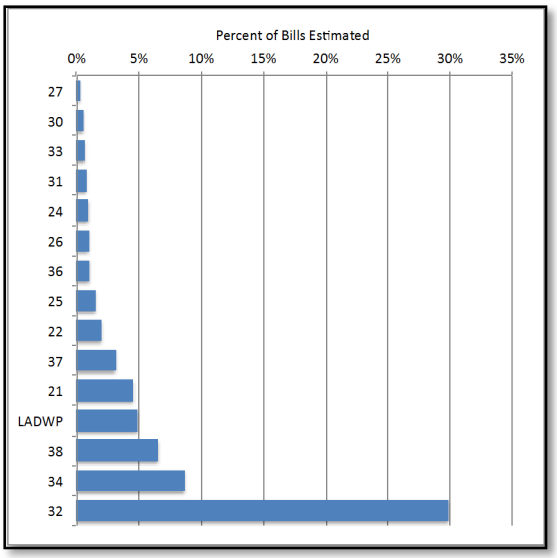

## *C.10 Percent of Bills with Post-Bill Adjustments Due to Errors*



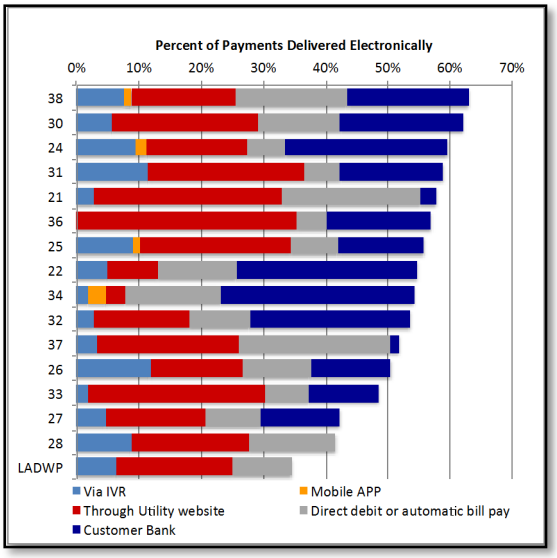
## *C.11 Percent of Bills Mailed Within Billing Window*



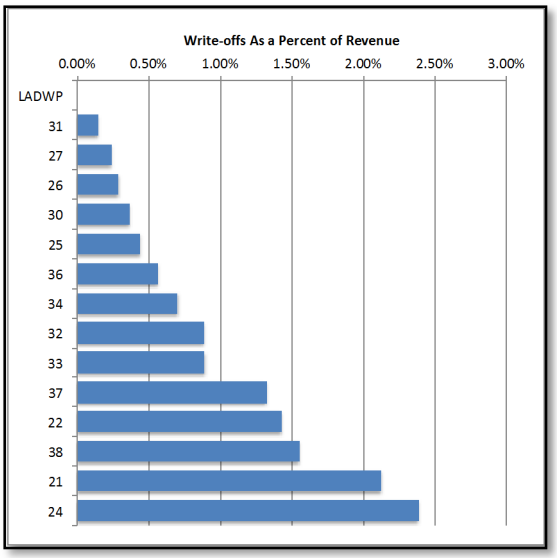

## *C.12 Percent of Bills Estimated*



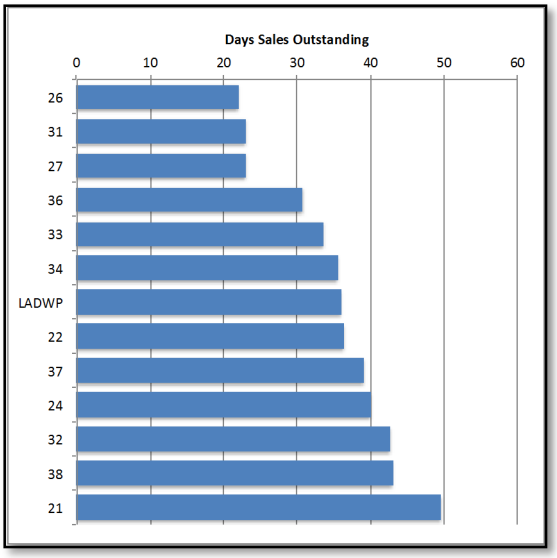
## *C.13 Percent of Payments Received from Customers Electronically*



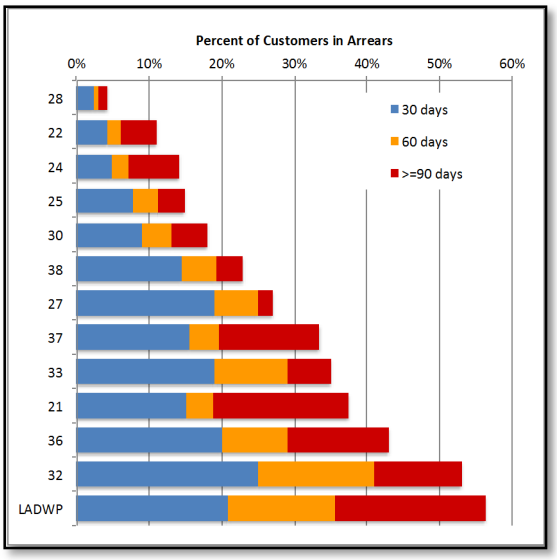

## *C.14 Write-offs as Percent of Revenue*



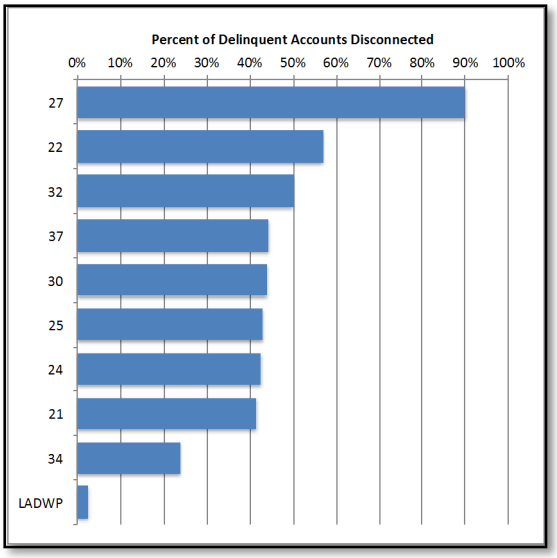
## *C.15 Days Sales Outstanding*



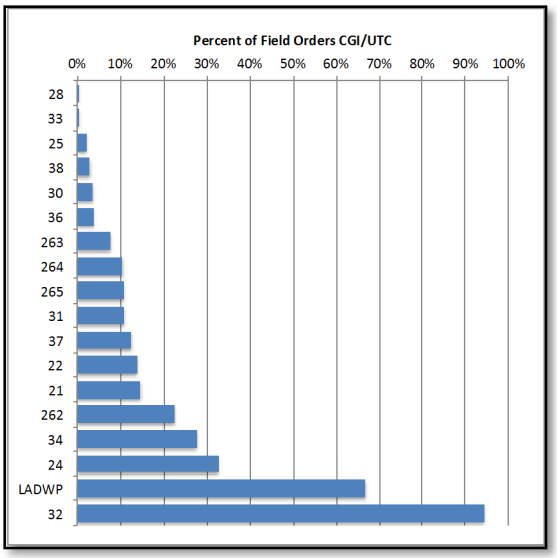

## *C.16 Percent of Customers in 30/60/90 Days Arrears*



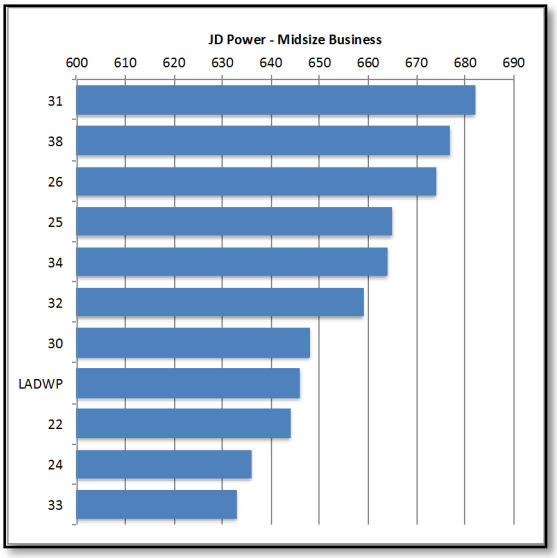
## *C.17 % of Accounts Scheduled for Disconnect Actually Disconnected*



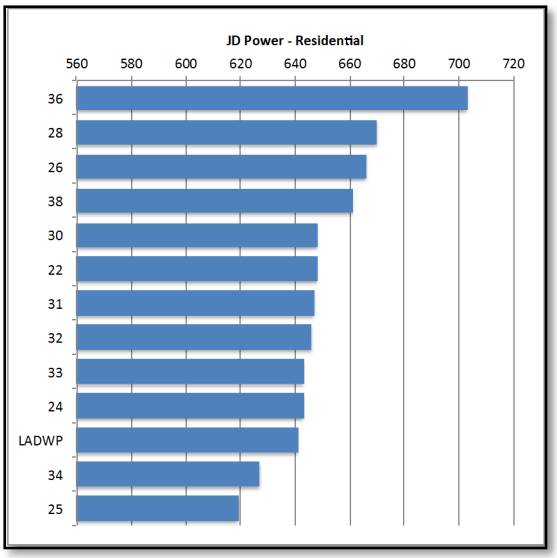

## *C.18 Percent of Field Service Orders Can't Get In (CGI) or Unable to Complete (UTC)*



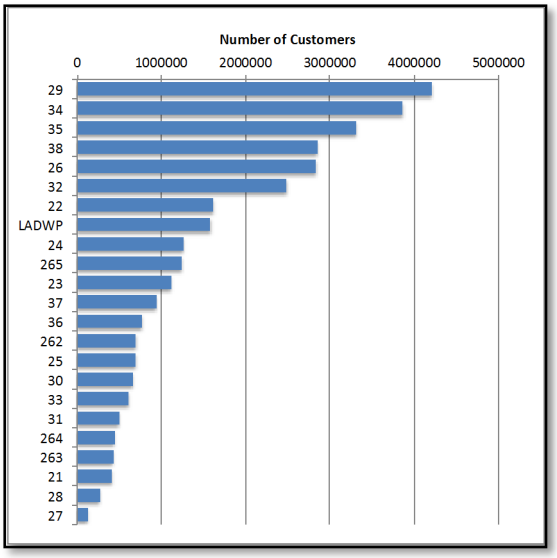
## *C.19 Customer Satisfaction - J.D. Power – Business*




## *C.20 Customer Satisfaction - J.D. Power – Residential*



## *C.21 Utility Size (Customer Count)*



# Volume IX

# Economic Development and Community Outreach

NAVIGANT

# 2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

## Economic Development and Community Outreach Report
## Volume IX

**Prepared for:**
**The City of Los Angeles**

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## Executive Summary

**Objectives & Approach**

This report presents Navigant's findings on Economic Development and Community Outreach for the IEA Survey. Economic Development and Community Outreach are separate, but related, program areas, each playing a central role in helping the Department achieve its Mission to be a vital and active member of the communities it serves, and supporter of the continued growth of the local and regional economy. Further, these functions help connect the Department to broader City goals and objectives, as forwarded by the Mayor's Office of Economic & Workforce Development and other departments.

Navigant reviewed the organizational structures, accountabilities, policies, and business practices adopted by the Department to complete this report. We also conducted interviews with Department staff to gain further insight into current and proposed economic development and community outreach practices. The goal of this assessment is to identify and recommend opportunities for improving the Economic Development and Community Outreach disciplines at the Department. A summary of findings and recommendations is provided at the conclusion of this report. Insights from interviews and document review complement these assessments. For the IEA Survey, we present our findings on Economic Development and Community Outreach in separate chapters. Each of these chapters includes a discussion on the following:

- Common program features: An overview of the common features of Economic Development and Community Outreach in areas such as planning, operations, performance management, goal-setting, and analytics.
- Economic Development and Community Outreach in utilities: How utilities typically design and implement these programs (with particular attention given to municipal utility peers).
- A review of these programs at the Department: Assessment of the Department's programs in each area, followed by recommendations for improvement.

A summary of findings and recommendations is provided at the conclusion of this report.

**Economic Development and Community Outreach Overview**

The roles of each of the groups can broadly be defined as follows:

- Economic Development: Design, execute, and monitor plans and programs that leverage Department resources to help attract, retain, and expand businesses in the City of Los Angeles.
- Community Outreach: Design, execute, and monitor plans and programs to provide information to – and gather feedback from – the communities the Department serves on key matters.

These groups design and execute plans and programs that help align with – and advance and build support for – the Department's broader strategies in areas such as energy efficiency, water conservation, among others. Importantly, Economic Development and Community Outreach are supported by the Department's Communications Department, which is charged with formulating and executing communication strategies.

**Economic Development Overview**

Economic Development is defined as the allocation of limited resources (including land, labor, capital and entrepreneurship) to create a positive effect on the level of business activity, employment, income distribution patterns, and fiscal solvency.[1] It is a process of deliberate intervention in the normal growth cycle, aimed at accelerating the process and optimizing overall economic impact. In any community, Economic Development activities typically involve a number of stakeholders, including elected officials, Chambers of Commerce, venture capitalists, banks, colleges & universities, and utilities.

A review of public power and water utilities and related agencies confirms the importance of economic development in strategic planning and on-going operations. The country's largest municipal and cooperative utilities have focused programs in economic development, while the American Public Power Association (APPA), Large Public Power Council (LPPC), and American Water Works Association (AWWA) each promote the role of public power and water utilities in fostering Economic Development.

**Utilities and Economic Development**

Public power and water utilities are seen as central to local and regional Economic Development efforts. Economic Development is typically featured prominently in the vision and mission statements of municipal, cooperative and other public utility agencies. Business attraction, retention, and the facilitation of urban renewal are just some of the goals of municipal utility development programs.

**Features of an Economic Development Program**

Economic Development programs are defined by several key features, including:

- A clear Vision and Mission, which reflect the guiding principles of the program
    - The Vision supporting an organizations' Economic Development plan is directly aligned to organizational and local and regional government objectives.
- Strategic plans for each major program area that tie to the Vision
    - Municipal organizations adopt Economic Development Strategic Plans that reflect overall corporate objectives and tie-in to local economic and political objectives.
- Programs for each major strategy that are designed to meet organizational and City objectives
    - Utilities give focus and priority to programs with significant and direct business benefit, which also align to a broader vision (e.g., leadership in renewable resources).
- An organization and budget aligned to program delivery and strategic goals
    - Economic Development groups are staffed by experts in the discipline, with the number of FTE positions commensurate with the vision and objectives of development activities.
- On-going analytics and reporting to support decision-making and performance
    - Programs are defined by the use of continuous monitoring and evaluation, which provide a basis for accountability and transparency in the use of resources.

These facets are closely aligned and adjusted as needs, resources, and performance change over-time.

**Peer Practices in Economic Development**

Economic development at utilities can encompass a wide range of initiatives, programs, and events that spur small business growth and create job opportunities for customer/ratepayers. While the direct comparison of budgets and staffing across peer organizations can be difficult and unclear, the Department generally pursues comparable types of programs as those that are adopted by peer organizations, including:

- Energy Efficiency and Conservation Programs
- Small Business Assistance Programs
- Commercial and Other Loan Programs
- Solar Initiative Programs
- Business Attraction and Retention Incentive Rates

**Economic Development at the Department**

The Vision of Economic Development at the Department is driven significantly by the broader objectives of the City, the county, and other regional organizations. Department statements explicitly recognize the role of LADWP in Economic Development: *As the nation's largest municipal utility, the LADWP believes in investing in the future success of Los Angeles. The mission of the LADWP Economic Development Division (EDD) is to attract, retain, and expand businesses in the City of Los Angeles.* This mission is supported by a strategic plan, and variety of specific programs.

*Strategic Planning*

In response to our document request, the Department provided strategic planning documentation from 2010-2011 that outlines Economic Development programs pursued by the LADWP. We believe that program vision, objectives, strategies, and tactical plans should be revised and formalized.

*Programs and Operations*

Economic Development plans and programs (and outcomes) are distinct, based on the goals and objectives of each locality. Current strategic imperatives include an emphasis on sustaining small businesses, strengthening the business environment – while encouraging uptake in the Department's programs. As noted above, the types of programs pursued by the Department appear to align to those adopted by peer organizations. However, the total budget available for these programs appears to be smaller than that for other POUs. In addition, the Department's ability to measure direct and indirect impact of the programs appears to be limited.

*Organization and Budget*

Research suggests that staffing plays a significant role in the performance expectations – and actual performance – of Economic Development organizations. In general, the larger the staff size, the greater the results. To this end, the EDD should assess current staffing levels, and align the program targets to staff required to meet development goals. Our analysis reflects that the EDD has been unable to spend its annual budget over the last several years, due in large part to challenges with contracting. Specifically, the EDD spent less than half of its budget in 2009, 2010, 2011 and 2013. While spending has improved in 2014 and 2015, the EDD has not been able to spend its budget.

*Analytics*

Analytics and reporting – and the process of delivering insight to stakeholders, decision-makers, and program owners – are key aspects of an Economic Development program. This includes establishing targets for programs, assessing performance versus those targets, and broadly engaging in performance management. We believe the measurement, reporting, and analysis activities within the EDD should be formalized and strengthened to include additional metrics, targets, benchmarks, and routine reporting versus clear goals. Consistent reporting against these targets (and also benchmarking of performance) should also be adopted.

**Community Outreach Overview**

Community Outreach is a multifaceted approach to consistently engage stakeholders on an organization's strategies, policies, or solutions. Through a variety of methods, outreach programs deliver and receive information to: 1) inform or influence behavior, and/or 2) gather and assess feedback. Community Outreach is often considered a subset of Public Relations, which is conducted to solicit support, shape public opinion, and/or request community participation (e.g., involve the community).

**Utilities and Community Outreach**

In today's environment, utilities are confronted by significant strategic challenges and opportunities that require a clear and consistent dialogue with ratepayers, community groups, business leaders, and other stakeholders. Community Outreach is a central aspect of a utility's overall approach to engaging the public in a two-way dialogue on a variety of topics. In a utility setting, community outreach efforts are often organized around significant projects and programs including rate increase proposals, design and execution of resource plans, roll-out of significant conservation and efficiency initiatives, and emergency restoration efforts (among many others).

**Features of a Community Outreach Program**

Outreach programs are typically comprised of the following components:

1) Goals: Clear articulation of the goals of outreach, which are closely aligned to strategic vision of the programs that the outreach supports.
2) Target Audiences: A comprehensive understanding of the various stakeholders for each outreach effort.
3) Messages: The key themes associated with each of the outreach efforts, which are intended to inspire and drive support.
4) Format and Distribution: Coordination of the key messages, how they will be catered to be most effectively delivered to the Target Audiences.
5) Evaluation: Continuous feedback between the delivery of the messages and the effectiveness versus goals and objectives.

**Peer Practices in Community Outreach**

Given their role in the communities in which they serve, municipal utilities conduct routine outreach efforts, with significant focus on providing various stakeholders insight into – and gathering feedback on – major programs and significant events. There are a large number of outreach methods, which are used optimally to meet the specific communication need. Examples include direct mail campaigns, corporate and "special topic" websites, social media, among many others.

**Community Outreach at the Department**

*Strategic Planning*

The Department has not established a formal strategic plan for its community outreach activities. However, the Department's community outreach efforts can be categorized in five main areas:

- ***Stakeholder Engagement*:** This is done primarily through the Los Angeles Neighborhood Councils (LANC) and other forums for information sharing.
- ***Energy Efficiency and Water Conservation:*** Reduce and optimize water and electrical use, both through water conservation measures, and increased reliance and adoption of renewable energy sources and solutions to generate power.
- ***Rates & Water and Power Infrastructure:*** Increase water and power rates to enable the Department to fund and pursue capital projects to improve and update its aging water and power infrastructure.
- ***Safety:*** Increase awareness related to electric safety tips, emergency and earthquake preparedness, and the health effects of electric and magnetic fields.
- ***Educational Programs***: Help secure a knowledgeable base of residential and business customers to better understand and appreciate water, energy, and environmental issues.

The lack of a formal and centralized plan may be due to several factors, including the decentralization of responsibility for certain outreach initiatives to the Power and Water Systems.

*Program and Operations*

The Department utilizes a variety of outreach communication methods, which are in large part driven by the Communications Department. These include traditional methods (e.g., newsletters, websites, press releases) and emerging methods (e.g., social media), which are used in targeted fashion to address specific constituents or needs. Close interaction with the Los Angeles Neighborhood Councils (LANC) is one of the most critical functions of the Department's Community Relations function; workshops on discrete matters such as the Integrated Resource Plan or rate action are additional focus areas. The Department should continue to pursue and adopt methods of engaging with stakeholders on a routine and consistent basis, outside of special events such as rate actions or resource planning reviews.

*Organization and Budget*

One of the most significant roles of the Community Outreach function and its staff is related to routine and on-going engagement with the neighborhood councils. In consideration of the scope of the mandates of the Department and number of customers which it serves, Navigant believes that the size of the IACO staff should be revisited. For example, only two (2) of the Intergovernmental Affairs and Community Outreach (IACO) staff are dedicated to representing the Department across the ninety-five (95) Neighborhood Councils in the City. The limited staff resources may result in inconsistent engagement across the set of councils (with the potential for smaller, and less influential Neighborhood Councils receiving less attention than larger Neighborhood Councils). Further, given the significant size and potential impact of the capital programs in both the Power and Water Systems, additional staff should be considered to actively manage the outreach efforts around these programs.

*Analytics*

At present, Community Relations programs do not appear to be consistently assessed and managed in relation to a set of cost, effort, or performance metrics. Through our document request, we did not receive reports that reflect a consistent analysis of the impact from Community Outreach efforts in relation to goals and objectives. As with Economic Development, Navigant believes that specific goals and targets should be established for Community Outreach programs.

**Conclusions**

Economic development and community outreach are key activities for municipal utilities. This is particularly true as MOU's are seen as contributors to the goals and objectives of local government and the communities they serve. Further, we believe that attention on these activities has increased in recent years in line with the recovery of the economy after the Great Recession of 2008 and in response to the nature of current and future challenges in the largest municipalities in the US – including Los Angeles.

Our recommendations in each of these areas focus on strengthening the foundational aspects of program strategy, design, implementation, and monitoring. This would include a dedicated strategic planning effort (which would dovetail with the Department's and City's overall goal-setting activities). It would also include design and clear specification of programs on an annual basis (which would include targets for program performance), and the consistent reporting of program performance to Department, City, and customer stakeholders. We further recommend greater focus and diligence on budgeting and budget monitoring in these areas. Transparency and financial rigor in these areas is important in relation to the Department's overall goals of exhibiting greater focus on the customer, as well as dedication to financial controls (reflected in consistent reporting of performance versus goals and targets).

In addition, we also believe that additional focus in these areas will clarify the number and type of staff required to deliver target programs. From a clear inventory of programs and desired timing to meet objectives, the Department can identify the resources required to deliver. Further, given that some level of decentralization has occurred in each of these areas, we recommend that the Department clearly determine accountability for development and outreach activities. While the "ways of working" between these functional groups and the Power and Water Systems may be known informally, a thorough review of business processes will improve service delivery and clarify roles and responsibilities.

At the highest level, we encourage the Department to reassess these areas in terms of their current and potential role in meeting the goals of the utility and the City.

High Priority Recommendations

- Develop a Strategic Plan for Economic Development and Community Outreach at the Department.
- Confirm goals and objectives for all programs in each area.
- Define and launch foundational aspects of a performance management program for each functional area and each program, including:
    - A set of rigorous Key Performance Indicators and targets that focus on benefits-derived for each program given a level of cost.
    - Recurring performance reports (including distribution lists).
- Improve budget monitoring and assessment practices in coordination with defined targets and metrics.

Medium Priority Recommendations

- Complete a thorough staffing assessment to determine the appropriate level and skill set of staff required to execute the strategic plan and programs identified above.

Low Priority Recommendations

- Engage in a benchmarking effort for these areas, working closely with Corporate Performance.

# 1. Introduction

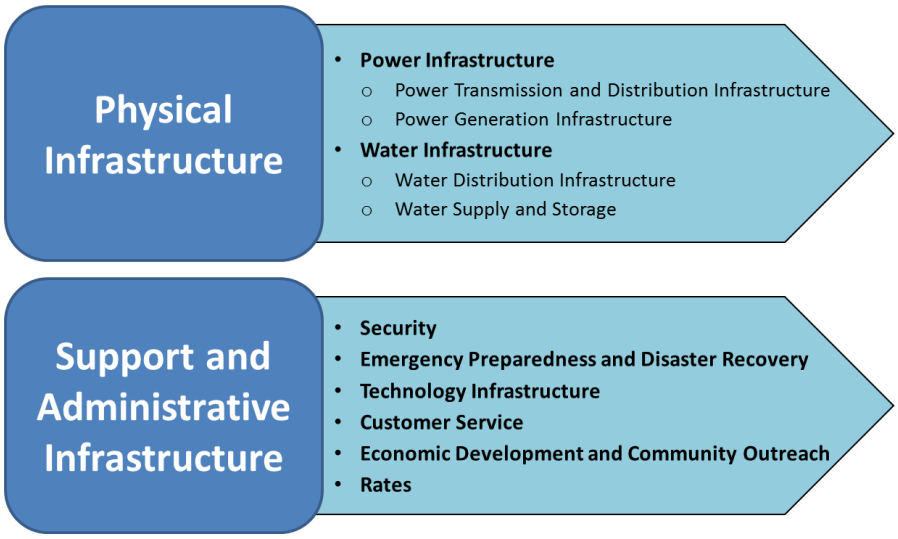
## *1.1 Study Objectives*

The City of Los Angeles, by virtue of Section 266 of the Los Angeles City Charter, requires that the City Controller conduct an Industrial, Economic and Administrative Survey (IEA Survey) of the Los Angeles Department of Water and Power (the Department, LADWP). For the 2015 edition, the City Controller has retained Navigant Consulting, Inc. (Navigant) to conduct this study.

The primary objective of the IEA Survey is to assess how well-prepared LADWP is to address current and future challenges, while providing safe and reliable water and power to its ratepayers at reasonable costs.

For the LADWP, the most critical challenges currently revolve around power and water physical infrastructure and certain areas of administrative infrastructure. To address these, the Joint Administrators included the following focus areas in the scope of the 2015 IEA Survey:

**Figure 1-1. Focus Areas of the 2015 IEA Survey**




This report presents Navigant's findings on the Department's programs and organizations in Economic Development and Community Outreach, with particular attention paid to measures of program effectiveness and cost-benefit. Finally, the appropriateness of LADWP's business outreach and business development programs is evaluated in relation to the Department's Mission, the City's Vision, and the priorities of similarly situated utilities.

## *1.2 Approach*

Information for the Economic Development and Community Outreach report was derived from several primary sources:

- Documents uploaded to Navigant's secure portal;

- Interviews with Department personnel, including the Director of Communications, the Chief of Staff, the Director of Local Government and Community Relations, and the Director of Economic Development; and
- Best practices with regards to economic development and community outreach programs.

Navigant conducted interviews with leadership and subject matter experts that manage many of the economic development and community outreach programs. See Appendix A for a complete list of interviewees. The materials reviewed for this engagement are listed in Appendix B.

### *1.3 Report Organization*

The report comprises the following chapters:

- Economic Development and Community Outreach Overview: An introduction to the disciplines of Economic Development and Community Outreach.
- Economic Development: A description of the common features of economic development programs, the role and implementation of economic development in utilities, and economic development at the Department.
- Community Outreach: A description of the common features of community outreach programs, the role and implementation of community outreach in utilities, and community outreach at the Department.

While the remainder of this report considers these programs separately, we also note key areas of program overlap, where appropriate.

## 2. Economic Development and Community Outreach Overview

Economic Development is defined as the allocation of limited resources (including land, labor, capital and entrepreneurship) to create a positive effect on the level of business activity, employment, income distribution patterns, and fiscal solvency.[1] Meanwhile, Community Outreach is a subset of Public Relations involving specific programs, projects or events to further enhance an organization's ability to meet its objectives. Generally, Community Outreach is conducted to solicit support, shape public opinion, and/or request community participation (e.g., involve the community).

Economic Development and Community Outreach each play a central role in helping the Department achieve its Mission to be a vital and active member of the communities it serves, and supporter of the continued growth of the local and regional economy. Further, these functions help connect the Department to broader City goals and objectives, as forwarded by the Mayor's Office of Economic & Workforce Development and other departments.

The roles of each of the groups can broadly be defined as follows:

- Economic Development: Design, execute, and monitor plans and programs that leverage Department resources to help attract, retain, and expand businesses in the City of Los Angeles.
- Community Outreach: Design, execute, and monitor plans and programs to provide information to – and gather feedback from – the communities the Department serves on key matters.

In advancing development and engagement objectives, these groups design and execute plans and programs that help align with – and advance and build support for – the Department's broader strategies in areas such as energy efficiency, water conservation, among others. Importantly, Economic Development and Community Outreach are supported by the Department's Communications Department, which is charged with formulating and executing communication strategies, and also responding to communication requirements on an "as-needed basis". Specific areas include: corporate communications; customer communications; program-specific communication strategies; graphic, creative, and photography services; and media relations.

[1] California Association for Local Economic Development, *Economic Development Handbook* (2014).

# 3. Economic Development

Economic Development is a process of deliberate intervention in the normal economic growth cycle, aimed at accelerating the process and optimizing overall impact. The California Association for Local Economic Development (CALED) defines Economic Development as "a concerted effort in cities and counties to influence the direction of private sector investment toward opportunities that can lead to sustained economic growth." To this end, a number of stakeholders are typically involved in Economic Development efforts, including elected officials, Chambers of Commerce, venture capitalists, banks, colleges & universities, and utilities.

A review of public power and water utilities and related agencies confirms the importance of economic development in strategic planning and on-going operations. The country's largest municipal and cooperative utilities dedicate some level of resources to Economic Development programs. To exemplify this point, the American Public Power Association (APPA), Large Public Power Council (LPPC), and American Water Works Association (AWWA) each promote the role of public power and water utilities in fostering Economic Development.[2] In short, strategies and programs that facilitate the local and regional economic growth are a core aspect of any municipal utility.

## *3.1 Utilities and Economic Development*

Given their role in the communities that they serve, public power and water utilities are seen as central to local and regional Economic Development efforts. In fact, Economic Development is typically featured prominently in the vision and mission statements of municipal, cooperative and other public utility agencies. Specifically, through their efforts, utilities can help facilitate growth by:

- Attracting, retaining, and creating new businesses, which helps maintain and improve local and regional employment.
- Helping broaden a community's tax base, offsetting the need for increased local taxes and improving the local economy.
- Reducing utility costs through development tariff rates, thereby allowing businesses to spend more on other goods and services.
- Facilitating urban renovation, business development, industrial parks and other significant public works projects.[3]

Utilities also directly benefit from the expansion of commercial and industrial businesses through adoption of specific utility programs and the extension of utility infrastructure. Therefore, in addition to being a key stakeholder in fostering growth, utilities have an innate incentive to support commercial and industrial growth within their service territories.

[2] Examples include: AWWA, *Beyond the Tap: City Water Service as a Catalyst for Regional Economic Development* (2007); APPA, Economic Development & Utility Marketing Workshop (Multiple Documents, Multiple Dates); LPPC, General guidance on economic development and related energy programs.

[3] https://austintexas.gov/faq/economic-development-important-utility

### *3.2 Features of an Economic Development Program*

The discipline of Economic Development is generally defined by several common program features, as reflected in the exhibit below.

**Figure 2.1. Economic Development Program Features**




Well-functioning programs begin with a clear Vision, from which a clear set of strategic plans are derived. The Vision and strategic plans then determine the organizational structure (and related budget), followed by specific development programs required to achieve objectives. Finally, analytics are critical (including targets) to clearly assess performance and determine the cost/benefit of specific programs. However, while these features are common across Economic Development programs, the definition of what an economic development entity is supposed to accomplish varies widely from community to community. Therefore, although outcomes cannot generally be compared, the framework that defines a program can be assessed in terms of the above features and the following high-level principles:

- *Align* the organization's Economic Development Vision, Mission and strategic plans to the City, County, and/or region's Vision and plans.
- *Communicate* consistently with local elected officials and government agencies to efficiently and effectively carry out the Economic Development Vision and Mission.
- *Design* programs to align closely with and integrate into local and regional programs, and to contribute materially on core city objectives.
- *Partner* closely with a wide variety of entities to design and carry out the Economic Development Vision and programs.
- *Implement* an expert-led organization to deliver the identified plans and programs; work closely with Community Outreach professionals across jurisdictions.
- *Specify* performance targets for each major program; design reporting protocols and "look-back" assessments to alter course or direction, as necessary.

The following are additional findings from our research and experience, which in combination with the principles identified above directly guided our evaluation of the Department.

### 3.2.1 Vision and Mission

Organizations recognize that the goals and methods of driving Economic Development are determined by regulatory (oversight), social, and political dynamics. Therefore, the Vision and Mission supporting an organizations' Economic Development plan is directly aligned with the broader goals and objectives of local and regional governments, and the local and regional government's overall plan for Economic Development.

### 3.2.2 Strategic Planning

As noted above, Economic Development is both an economic as well as a political activity. As large and prominent players in local and regional politics and economics – with significant assets at its disposal – utilities are central players in Economic Development efforts. Thus, municipal organizations design and adopt comprehensive Economic Development Strategic Plans that reflect and integrate closely with overall corporate objectives, strategic goals, and financial forecasts – as well as specific local and regional economic and political objectives.

At the highest level, high-performing Economic Development organizations design program activities around a strategic vision, and generally engage in the following planning and management activities:

1. Document a strategic plan annually
2. Outline each staff person's role in reaching that plan
3. Set activities and outcomes for each staff person, and for the organization
4. Report quarterly, using a pre-defined dashboard, to the board and other stakeholders
5. Benchmark annually[4]

### 3.2.3 Programs and Operations

Utility organizations give focus and priority to programs with significant and direct business benefit, which also align to a broader vision (e.g., leadership in renewable resources). Program areas emphasized by utilities include efficiency programs, incentive rates for new businesses, and loans for new construction (among many others). Forward-thinking organizations adopt programs that embrace and accelerate commercialization, entrepreneurship, and other aspects of innovation-based economic development—evolving from traditional economic development organizations focused solely on marketing and recruitment to venture development organizations that reflect today's economic environment.

Importantly, partnering with external groups is a critical aspect of successful Economic Development; organizations typically partner with a broad spectrum of public and private entities (including project funders, legal professionals, financial managers, marketing specialists, colleges and universities, and

[4] "Putting High Performance Economic Development into Practice: A Guide for Economic Development Leaders and Their Boards", International Economic Development Council, 2014.

many others), and maintain close communication with those entities when designing strategic plans and executing tactical plans.[5]

### 3.2.4 Organization and Budget

Evidence confirms that one of the most important factors driving successful Economic Development program design, execution, and evaluation is adequate staffing with significant expertise. Budgets are structured to fund specific programs, which are determined through the planning effort; budgets also include allocations for third party experts to assist with detailed forecasting, system expansion, economic impact, and other analyses related to development plans. Evidence reflects that high-performing economic development organizations establish a clear connection between: 1) staffing and budgets and, 2) outcomes.[6] Economic Development organizations are staffed by experts in the discipline, and grow with an increasing number of FTE positions commensurate with the objectives of development activities and number of programs supported.

### 3.2.5 Analytics

Programs are defined by the use of analytics to assess and report on progress versus clear targets. Analytics in this context refers to both continuous monitoring and periodic evaluation, and the tools and techniques required to conduct both. Program assessment provides a basis for accountability and transparency in the use of resources (an important factor for public institutions).

The Government Finance Officers Association (GFOA) states that providing a thorough and rigorous analysis of each economic development project is critical for the purposes of government accountability and long-term revenue impacts. Responsible use of public funding requires that projects funded provide a suitable return for the jurisdiction, are consistent with overall community goals and priorities, and require that investments are made in a transparent manner with full understanding of all short- and long-term costs and benefits. As a municipal entity, this principal applies to the Department.[7]

The GFOA confirms that an analysis of each project should, at a minimum, include:

- A clear understanding between financial and non-financial costs and benefits
- Consideration of the timing of costs and benefits
- Scope of the analysis
- Identification of all cost and benefits
- Assessment of the chance that each cost and benefit will occur
- Communication of results

Organizations focus on delivering standard reports on the condition of programs, with particular insight into performance versus targets and prior period benchmarks. Economic Development cannot just focus

[5] National Best Practices Scan: Economic Development, State Chamber of Oklahoma Research Foundation, Oklahoma Business Roundtable, October 2012.
[6] "Putting High Performance Economic Development into Practice: A Guide for Economic Development Leaders and Their Boards", International Economic Development Council, 2014.
[7] Evaluating and Managing Economic Development Incentives, February 2014, Government Finance Officers Association (GFOA).

on activities, it must focus on outcomes. Outcomes are reported in balanced scorecards on a recurring basis.

## *3.3 Peer Practices in Economic Development*

The above principles were derived from strategies recommended by a variety of leading associations and oversight organizations. In addition to the common features and principles identified above, we reviewed the programs in place in other utilities (public and investor-owned) and in non-utility organizations. Organizations assessed as an aspect of this assessment are referenced in Appendix C. From these sources, we derived an indication of common practices and programs that define Economic Development.

### 3.3.1 Peer Utility Comparison

Economic development at utilities can encompass a wide range of initiatives, programs, and events that spur small business growth and create job opportunities for customer/ratepayers. Accordingly, a utility's return on investment in economic development can vary significantly depending on the programs included in the group's function. A summary of the economic development programs at peer municipal utilities in California is provided in the table below.

**Table 1: Peer Company Economic Development Programs**

| Utility | Economic Development Programs |
|---|---|
| SMUD | • **Economic Development Rate:** To help companies that choose to open in the Sacramento area, or expand their current operation, SMUD offers new and expanding customers a discount rate over their first three years of service.<br>• **SEED Program** (Supplier Education and Economic Development): Program offers incentives for small businesses to participate in the SMUD's competitive bid process.<br>• **Energy Services and Programs**: **(1) Energy Delivery -** Design and construction for new electric service as well as existing connection set-up; (2) **Savings by Design –** Integrate innovative energy efficiency technologies into new construction, as well as provide incentives, and free analysis tools.<br>• **SMUD Commercial Loan Program** - SMUD provides commercial customers loans for energy efficiency buildings and equipment, including lighting, heating and air conditioning systems, refrigeration systems and process equipment.<br>• **Grow Sacramento Fund** - Grow Sacramento Fund (GSF) is a loan program for businesses in Sacramento city and county. Funded jointly by SMUD and the Sacramento Housing and Redevelopment Agency, GSF is designed to create or retain jobs and to help energy-related businesses.<br>• **State Loan Guarantee Program** - SMUD partners with the California Capital Financial Development Corporation to participate in the State Loan Guarantee Program, providing funds to guarantee loans to small businesses within our service area. |

| Utility | Economic Development Programs |
|---|---|
| City of Pasadena, Water & Power | • **me Rewards Program:** Rebates on appliances, home heating/cooling, shade trees and pool pumps<br>• **LED Webshop:** Pasadena residential electric customers can purchase LED light bulbs at nearly half the cost.<br>• **Refrigerator Recycling Rebate**<br>• **Pasadena Solar Initiative:** *Install a solar system at your home and get up to $0.85 per watt*<br>• **Green Power Program:** Reduce your companies' carbon footprint by signing up for 100% renewable power from PWP<br>• **Electric Vehicle (EV) Program:** Reduce fuel costs and emissions by switching to plug-in electric vehicles<br>• **Under One Roof:** Provides money-saving programs and low or no interest loans that help Pasadena residents buy, keep, and revitalize their homes<br>• **Energy Efficiency Partnering Program (EEP):** A flexible rebate program that rewards a broad range of efficiency retrofits<br>• **Pasadena Express Efficiency Rebate Program (PEER):** The PEER program provides Pasadena businesses straight-forward energy efficiency incentives based on type of equipment and the number of units installed<br>• **Water & Energy Direct Install Program (WeDIP):** Provides audits and installation water and energy saving equipment at NO COST to qualifying PWP small business customers<br>• **Pool Pump Rebate:** Provides rebates for replacing older pool pumps with new efficient models<br>• **Cool Trees Rebate:** PWP offers rebates for planting any one of 37 species of shade trees |
| City of Glendale, Water & Power | • **Large Business Incentives Program:** Incentives for large businesses to complete pre-approved energy savings project<br>• **SoCal Water Smart Program:** Rebates for several water-efficient technologies to help businesses lower bills<br>• **Smart Business Energy Savings Update Program**: Up to $2,000 in free energy and water saving upgrades<br>• **Smart Business AC Tune-Up:** AC system tune-ups for small business customers save energy by ensuring their AC systems are functioning at the optimal level<br>• **Fiber Optic Solutions Program:** Provides both large and small commercial customers optical fiber lease services |

| Utility | Economic Development Programs |
|---|---|
| City of Anaheim | • **Economic Development/Business Retention Incentive Rate**<br>• **Green Building Program**<br>• **New Construction Incentives**<br>• **Dusk to Dawn Lighting:** Free high pressure sodium (HPS) or fluorescent lights with photo sensors that automatically turn lights on at dusk and off at dawn.<br>• **EV Charger Rebates:** Rebate to customers who install a Level 2 (240-Volt) plug-in electric vehicle charger. Through this program, the utility reimburses customers for out of pocket expenses up to $1,000 per charger. Eligible expenses include the charger purchase price and installation costs. In addition to the $1,000 rebate, we will waive the City's permit application fees related to the installation of the EV charger.<br>• **Green Power Program:** Customers contribute 25, 50, or 100% of electric usage – and an additional 2 cents per kilo-watt hour (kWh) used will be billed to that percentage of customer accounts.<br>• **Home Incentives Rebates:** Rebates when customers switch to water and energy-efficient appliances and cooling equipment, or install approved high-efficiency household conservation measures. |

Despite the limited publicly available data associated with economic development at utilities, there are a number of peer utilities that appear to have expansive economic development groups. For example, Austin Energy supports an Economic Growth and Redevelopment Services Office (EGRSO) in conjunction with the City of Austin. In FY 2011-12, the group had 46 full time equivalent positions and a budget of approximately $9.8 million.[8] The EGRSO funds small business development, cultural arts initiatives, business retention and recruitment programs, music events, and redevelopment programs. These findings should be considered in the context of various organizational alternatives, in which Economic Development staff may be centralized or significantly decentralized across a number of functional areas.

## *3.4 Economic Development at the Department*

The following section outlines our analysis of Economic Development activities at the Department. Observations were derived from document review and interviews conducted with LADWP staff.

### 3.4.1 Vision and Mission

The Vision of Economic Development at the Department is driven significantly by the broader objectives of the City, the county, and other regional organizations. The Mayor's Office of Economic & Workforce Development directs a variety of programs that provide services to businesses in the City, with the specific goal of improving "…the economic climate of Los Angeles through the provision of financing, technical assistance, training, business tax incentives, and workforce programs. These services help local

[8] "Austin Energy's Investment in Economic Development," Austin Energy, March 2012.

businesses grow, provide living wage jobs for local workers, as well as high quality goods and services to under-served communities."[9]

Statements and resources from Los Angeles County also affirm the role of Economic Development. For example, Goal Two of the Los Angeles County Economic Development Corporation (LAEDC) Strategic Plan for Development focuses on creating a more business friendly environment.[10] These and other sources emphasize the role of the Department in Economic Development activities in the local and regional economy. With these Mission and objective statements as context, Department statements explicitly recognize the role of LADWP in Economic Development:

> *As the nation's largest municipal utility, the LADWP believes in investing in the future success of Los Angeles. The mission of the LADWP Economic Development Division (EDD) is to attract, retain, and expand businesses in the City of Los Angeles.*

This mission is supported by a strategic plan, and variety of specific programs.

### 3.4.2 Strategic Planning

An organization's Vision and Mission should be closely integrated with the strategic plan, which should then drive tactics to achieve those strategic plans. Several Department documents establish the strategic plan for the Department in terms of Economic Development. Below are the FY2015-2016 goals and objectives for the Department's Office of Sustainability and Economic Development.

The Office of Sustainability and Economic Development works directly with the Power and Water Systems and handles matters involving energy efficiency, water conservation, economic development, distributed generation outreach, the electrification of the transportation network and environmental compliance responsibilities. In addition to working with internal LADWP groups, the Office also works to create innovative partnerships with communities and collaborates with government agencies to advance conservation and sustainability both at a grass roots and policy level. For FY 2015-2016, this Office will continue to make Los Angeles a more environmentally minded and prosperous city by:

- Establishing a path forward to meet the Board of Water and Power's mandate of 15% energy efficiency savings by 2020.
- Aggressively promoting the water conservation goals outlined in Mayor Garcetti's Executive Directive which include increasing water conservation measures for City facilities, business and residential customers.
- Expanding the electric vehicle infrastructure that provides convenient and easy vehicle charging options in Los Angeles.
- Continue expanding economic development with a strong focus in cleantech and STEM careers for youth in the City of Los Angeles.

[9] From the City of Los Angeles, Economic & Workforce Development Department website: http://ewddlacity.com/index.php/local-business.
[10] http://laedc.org/wtc/chooselacounty/

- Ensuring that LADWP remains in compliance with state environmental mandates and goals that incorporate a transparent and rigorous data performance analysis on GHG emissions and sustainable metrics into the day to day operations of LADWP.

In response to our document request, the Department provided strategic planning documentation from 2010-2011 that outlines detailed Economic Development programs. The program documentation proposes focus in nine areas, including (among others): Incentives; Reduced Power Rates; Loans & Grants; and Green Jobs. The documentation also includes the justification for each program, peer utilities with comparable programs, requirements for success, and challenges (or inhibitors) to program implementation. In several cases, lack of funding, inadequate staffing, and the need for close coordination with various local government and business entities are cited as significant challenges.

### 3.4.3 Programs and Operations

As noted in Section 3.2.1, Economic Development plans and programs (and outcomes) are distinct, based on the goals and objectives of each locality. The following section assesses the Department's programs in relation to the broader goals of the City, and also examines the relative performance of the programs in terms of cost/benefit and record of achievement.

Interviews confirm that the current strategic imperatives in Economic Development include an emphasis on sustaining small businesses and generally strengthening the business environment – while encouraging uptake in the Department's programs. The following is a brief description of the main programs administered by the EDD.[11]

**Table 2: Economic Development Programs Administered by the Department**

| Program | Description |
|---|---|
| Industrial Incentive Program | Assist the manufacturing sector to develop industrial property, improve to a lean and sustainable manufacturing process and identify energy and water efficiency opportunities. |
| Business Development Programs | Promotes the attraction of new businesses and the development of existing businesses and job creation in state and federally designated economically depressed areas (Enterprise/Empowerment Zones); provides project case management assistance, such as procurement of permits and clearances; facilitates construction of utility facilities and infrastructure improvement. |
| Case Management | Provides new businesses that are unfamiliar with the City of Los Angeles' technical processes with information on the following: Electric service planning; Water service planning; Engineering requirements; Meter service; and City and utility programs and incentives. |

[11] https://www.ladwp.com/ladwp/faces/ladwp/commercial/c-savemoney/c-sm-economicdevelopment?_adf.ctrl-state=ttxmga4yj_4&_afrLoop=18779611023820

| Program | Description |
|---|---|
| Energy and Water Efficiency Programs | A range of energy and water efficiency programs administered in collaboration with the Power and Water System. |
| Utility Infrastructure Loan | Available to new and existing commercial/industrial LADWP customers. Loans will only be extended to qualifying prospective projects. [12] |
| The La Kretz Innovation Campus (LKIC) | Project is envisioned to serve as a clean industry hub – a place where entrepreneurs, engineers, scientists, and policymakers can interact to promote and support the development of clean technologies and Los Angeles' green economy.[13][14] |
| Hosting Economic Development events | Participated in and hosted international economic development events such as the International Trade Conference of the Economic Alliance of the San Fernando Valley and events with the World Trade Organization.[15] |
| Locate LA | Provides customers with an innovative, web-based economic development tool (LocateLA) to assist prospective businesses in identifying opportunity sites within the City of Los Angeles.[16] |

To facilitate adoption of high-priority programs and resources, the EDD has designed a "Train the Trainer" program that helps guide businesses toward programs such as demand response and energy efficiency, which benefit the business community and that also align closely to the development and sustainability goals of the City.

#### *3.4.3.1 Event Sponsorship*

One of the primary vehicles through which utilities drive economic development goals and objectives and engage with the community is by sponsoring and attending local community events. The EDD has an established history of sponsoring and attending community events to support the mission and goals of the Department and the City of Los Angeles.

As illustrated in Table 3, the EDD spent approximately $118,000 to sponsor eleven (11) community events in FY 2014-2015, including business award ceremonies and women technology conferences. Approximately 2,700 people attended these events.

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[12] https://www.ladwp.com/ladwp/faces/ladwp/partners/p-economicdevelopment/p-ed-utilityinfrastructureloanprogram?_adf.ctrl-state=1cxzmrfdu8_4&_afrLoop=424145156341142

[13] https://www.ladwp.com/ladwp/faces/ladwp/partners/p-economicdevelopment/p-ed-lakretz?_adf.ctrl-state=1cxzmrfdu8_4&_afrLoop=424254485244779

[14] Managed directly by the Mayor's Office.

[15] https://www.ladwp.com/ladwp/faces/ladwp/partners/p-economicdevelopment/p-ed-nationalandinternationalbusinessresources?_adf.ctrl-state=1cxzmrfdu8_4&_afrLoop=425162759139984

[16] https://www.ladwp.com/ladwp/faces/ladwp/partners/p-economicdevelopment/p-ed-locatela?_adf.ctrl-state=1cxzmrfdu8_4&_afrLoop=425313401964707

**Table 3. LADWP Sponsored Events (FY2014-2015)**

| | Event | Attendees | Cost |
|---|---|---|---|
| 1 | Wet Cleaning Demo Workshop for Dry Cleaners | 45 | $471.00 |
| 2 | Train the Trainers Workshops | 60 | $2,134.56 |
| 3 | Los Angeles County Economic Development Corporation (LAEDC) 19th Annual Eddy Awards | 200 | $5,000.00 |
| 4 | CoolCalifornia Small Business Awards (Organized by ARB) | 100 | $1,000.00 |
| 5 | Weingart YMCA Wellness and Aquatic Center's Fifth Annual Luncheon | 150 | $2,500.00 |
| 6 | Annual sponsorship of The Valley Economic Alliance (TVEA) Events | 300 | $25,000.00 |
| 7 | Glendale Narrows Recreational Zone Program | 50 | $50,000.00 |
| 8 | Global Stage-Global Opportunity (Glo-Sho14) | 800 | $10,000.00 |
| 9 | Southern Cal Minority Business Development Council (SCMBDC) MBOD | 100 | $7,500.00 |
| 10 | "California Greenworks, Inc. - Maya Angelou Native Butterfly Garden Dedication Ceremony | 400 | $5,000.00 |
| 11 | Wonder Woman Tech Conference | 500 | $10,000.00 |
| | TOTAL | 2,705 | $118,605.56 |

Navigant found that the Department sponsored events are generally in line with the types of events sponsored by investor-owned and municipal utilities. However, the EDD appears to spend less per customer on event sponsorship than peer utilities. For example, the EDD allocated approximately $0.12 cents per (electric) customer to sponsoring events, while Burbank Water and Power allocated approximately $.65 cents per customer. On the upper-bound of this comparison, Austin Energy allocated an $500,000 annually to event sponsorships, which represents approximately $1.12 per customer. It should be noted that the costs incurred by the EDD to sponsor events may not be fully reflective of the Department's sponsorship expenditures because it only reflects those events funded directly by EDD as provided to Navigant by the Department.

### 3.4.4 Organization and Budget

The following section provides an assessment of the organizational structure and collaboration arrangements of the Department's Economic Development functions, with specific attention given to:

- How the Department's functional groups are organized to efficiently and effectively execute Economic Development plans and tactics.
- The staffing levels of each of the Economic Development functional teams.
- Evidence of effective collaboration between the Department and other City Departments.
- Recent Economic Development-related budgets and the focus of those budgets.

#### *3.4.4.1 Organizational Structure and Staffing Levels*

The Office of Sustainability and Economic Development is organized around four main functional areas: Environmental Affairs; Efficient Solutions; Electrification of Transportation Systems; and Economic

Development. The EDD has an organization comprised of ten (10) positions. Documents provided by the Department reflect five (5) of these positions as either new or vacant.

Research suggests that staffing plays a significant role in the performance expectations – and actual performance – of Economic Development organizations. In general, the larger the staff size, the greater the results.[17] To this end, the EDD should assess current staffing levels, and align the program targets to staff required to definitively meet and exceed development goals.

#### *3.4.4.2 Communication and Collaboration*

Active collaboration between the EDD and LADWP divisions is critical for advancing the Department's development goals; collaboration with City departments is also important to ensure alignment between the LADWP and the City on development-related matters. Internally, the EDD works closely with Community Relations, with particular attention paid to the small business component of the outreach effort. Economic Development also work closely with internal Power and Water System "customers", who partner with the EDD to help design and roll out programs. Externally, the EDD works closely with a wide variety of entities to design and implement economic development programs, including the Mayor's Office, the Business Improvement Districts, the City Economic & Workforce Development Department (EWDD), the Los Angeles Chamber of Commerce (and ethnic Chambers of Commerce), among many others. Further, the EDD partners with regional utilities and other organizations to design and facilitate workforce development programs. The EDD appears to work closely and communicate consistently with potential program partners (internal and external).

#### *3.4.4.3 Budget Analysis*

In addition to the programs identified in Table 2, the EDD continues to make progress to design new programs to address specific and emerging issues. For example, the Construction Impact Mitigation (CIM) program is ramping up to support businesses that may be impacted by the aggressive Capital Improvement Program (CIP) for the Water System. EDD is also networking with Business Improvement Districts to increase participation in economic development programs. Accordingly, EDD has a number of expanding programs that require additional resources. While the EDD has a budget that provides adequate funding to these projects given current objectives, interviews confirm that challenges in contracting are the main driver of the EDD's inability to fully execute programs. As a result, the EDD has been unable to spend its annual budget. Specifically, the EDD spent less than half of its budget in 2009, 2010, 2011 and 2013. While spending has improved in 2014 and 2015, the EDD has still not been able to spend its budget.

According to interviews with Department personnel, the EDD has four analysts that manage multiple programs, including one analyst to track and manage the budget. Navigant also found that EDD fields business-related customer service calls, which is a resource intensive effort. Accordingly, the limited resources in EDD have prevented the group from actively monitoring and reporting on the budget and performance of its programs. According to documents provided to Navigant, the EDD has developed a methodology to track program performance monthly, quarterly, and annually. This methodology

[17] "Putting High Performance Economic Development into Practice: A Guide for Economic Development Leaders and Their Boards", International Economic Development Council, 2014.

includes tracking certain performance indicators such as jobs retained, jobs created, businesses assisted, and businesses opened. The EDD has also set minimum performance goals for each major EDD program. While this methodology provides the framework to frequently track program performance and EDD personnel have expressed interest in developing formal reports, Navigant found that the EDD has not implemented this methodology on a continuous basis. Accordingly, Navigant recommends that the EDD formalize these tracking methodologies and develop processes to capture this information in a standardized reporting structure. These reports should also include spending by program to track budget against performance. Navigant further recommends that the Department increase EDD staff and fill vacancies to support these processes while also managing programs and customer-service related tasks.

Navigant also found that the EDD's ability to capture data and report on budget and performance is limited by its IT resources. EDD has an Economic Development Information System (EDIS) that tracks program participation, relevant customer complaints, and certain performance metrics. However, EDIS lacks automation and self-service. For example, EDD would like to develop a standardized form for businesses to fill out to promptly collect relevant information and address concerns. According to interviews with staff, the EDIS improvements are not a priority for ITSD. Given the criticality of EDIS for proper tracking and reporting in EDD, Navigant recommends that the Department prioritize these system improvements or identify alternative measures, such as additional staff, to improve program monitoring, data collection, and response times to business concerns.

Furthermore, the development and expansion of EDD programs are restricted by contracting limitations. This issue has been identified in many of the IEA Survey reports. According to interviews, the EDD is trying to hire external consultants to help develop its programs, but the lengthy RFP process and the finality of rejected contracts creates lags and extends project timelines. As a result, budgets are underspent and rolled over to the next year. As discussed throughout the IEA Survey, Navigant recommends that the Department develop a stated contracting strategy to support program implementation and optimization.

### 3.4.5 Analytics

Analytics and reporting – and the process of delivering insight to stakeholders, decision-makers, and program owners – are key aspects of an Economic Development program. This includes establishing targets for programs, assessing performance versus those targets, and broadly engaging in performance management. The following have been identified as target metrics for key economic development programs at the Department:

| Programs | Performance Tracking | Minimum Goal | Reporting |
|---|---|---|---|
| Regional Economic Development (RED) Team | Job Retained | 5 | Monthly |
| Green Technology | Job Created | 10 | Monthly |
| Business Concierge Services | Businesses Assisted | 10 | Monthly |
| Business Promotion Rider | Businesses Opened | 3 | Quarterly |
| General Outreach | Businesses Assisted | 25 | Monthly |

| | | | |
|---|---|---|---|
| Utility Infrastructure Loan | Application Received | 5 | Monthly |
| Train the Trainers Workshops | Businesses Assisted | 50 | Quarterly |
| Targeted Industry Outreach | Businesses Assisted | 20 | Quarterly |
| Construction Impact Mitigation | Businesses Assisted | 100 | Monthly |
| Business Improvement District | Businesses Assisted | 20 | Monthly |
| Impact Analysis Studies | Businesses Assisted | 2 | Annually |

As noted above, our analysis or Department operations reflects that the EDD does not consistently conduct performance management and evaluation of development programs. It is unclear that these measures are routinely produced, to whom they are reported, or how these measures drive decision-making. Efforts should be dedicated to identifying additional, more robust and comprehensive performance targets in areas such as revenue generation, business attraction, and business retention. Further, EDD program costs should be actively evaluated in relation to realized benefits. These types of analyses – if conducted on a routine basis – will enable the Department to assess program effectiveness versus targets, and reallocate funds if and as appropriate.

As an example of mature practices, organizations such as the Tennessee Valley Authority (TVA) have designed and implemented rigorous measurement and reporting capabilities that allow the organization to measure and report on the impact of economic development programs. Specific examples include:

- In 2012, economic development programs sponsored by TVA – including technical services, research and financial assistance – helped stimulate nearly $6 billion in business investments in the TVA service area.
- Also in 2012, TVA attracted or retained 48,000 jobs, bringing TVA's economic development contributions to more than 300,000 new or retained jobs and $32 billion in business investment for the period 2005-2012.[18]

The Division is currently designing an Annual Report, which when implemented, will provide insight into program performance versus goals and targets. The ability to measure and report on program results is central to demonstrating the Department's commitment to the community and the City's goals. Clearly reporting on development performance can also help influence public perception and build support for the Department's goals.

## *3.5 Findings and Recommendations*

Municipal utilities play a central and unique role in the communities they serve. In addition to providing safe, reliable, and cost effective service to customers, public power agencies are seen as having a role in facilitating regional and local economic growth. Further, economic development groups within

[18] Public Power Weekly, "TVA economic development efforts spur $5.9 billion in investments in fiscal year 2012", November 26, 2012.

municipal utilities are expected to work closely with a large array of government and other stakeholders to facilitate economic growth.

The EDD was established in 2001 by the Board of Water and Power Commissioners. Two of the more prominent goals of the group are:

- Growing the local economy through partnering with other entities to retain, expand, and attract businesses to LA
- Making LADWP's customers aware of money-saving incentives and programs.

Evidence from our review confirms that the EDD is engaged in comparable economic development activities as similarly situated peer public power agencies. Further, interviews and document review reflects support for economic development activities and a positive energy for moving the Department forward in this area. Despite these strengths, our analysis also confirms that several foundational characteristics of strong economic development programs are missing in the EDD, including:

- Current strategic plan
- Detailed operational plans
- Program metrics and reporting
- Budget tracking
- Benchmarking
- Routine plan reviews

As noted in the sections above, we believe the EDD should comprehensively design and implement these structures and business processes to advance the maturity of the organization. With highly formalized strategic and tactical plans in place (including program targets and reporting capabilities), the EDD will be better positioned to reflect the true contribution of program efforts to the Department leadership and City stakeholders. The strategic plans and program targets would be best determined in a series of facilitated working sessions with Department leadership.

We further recommend completion of an analysis to determine the optimal organization size to meet the economic development and facilitation goals of the City and Department. We believe that the EDD should be staffed with the appropriate number of economic development professionals to meet program targets, and build sufficient resiliency into the organization. We believe that the Department can demonstrate support for economic development activities through a commitment to provide appropriate staffing levels (and staff skill sets) in EDD.

# 4. Community Outreach

Community Outreach is a multifaceted approach to consistently engage stakeholders on an organization's strategies, policies, or solutions. Through a variety of methods, outreach programs deliver and receive information to: 1) inform or influence behavior, and/or 2) gather and assess feedback. Rather than a public information or public relations campaign (which may focus on one-way communication), an effective outreach program is defined by consistent two-way communication that promotes public feedback and uses that feedback to influence decision-making processes and outcomes.[19]

## *4.1 Utilities and Community Outreach*

In today's environment, utilities are confronted by significant strategic challenges and opportunities that require a clear and consistent dialogue with ratepayers, community groups, business leaders, and other stakeholders. Community Outreach is a central aspect of a utility's overall approach to engaging the public in a two-way dialogue on a variety of topics. At the highest level, organizations committed to effective outreach maintain a high level of transparency, cultivate relationships with the surrounding communities, and increase support for their projects and programs by incorporating public involvement early in the planning process and continuing with public outreach over-time.

In a utility setting, community outreach efforts are often organized around significant projects and programs including rate increase proposals, design and execution of resource plans, roll-out of significant conservation and efficiency initiatives, and emergency restoration efforts (among many others). In this context, the most effective outreach programs embody several characteristics, including:

- Organizations that pursue iterative and continuing public outreach strategies tend to generate greater public support.
- Beginning outreach early in the planning phase and continuing throughout the life of a project will likely contribute to the ease with which a project is carried out in subsequent phases.
- Public outreach helps develop a public that is informed about the specifics of the project as well as the tradeoffs associated with different options.
- Involving the public in the planning process, asking for and then making use of input, and answering questions early and often can help appropriately and proactively address concerns.
- Engaging multiple segments of the community results in a more collaborative process, which inevitably leads to decision-making that is more reflective of community values.

Importantly, organizations must accept the costs (time and capital) associated with conducting community outreach programs properly.[20] [21]

Community Outreach is driven by regulatory, social, and political dynamics and requirements. Due to their prominence in the communities they serve, municipal utilities and other public power agencies typically focus significant attention on outreach. These entities work to earn and continuously strengthen

[19] 4 *State of the Practice: White Paper on Public Involvement*. Committee on Public Involvement in Transportation. June 2000.

[20] Best Practices *for* Sustainable Wind Energy Development *in the* Great Lakes Region, Community Support through Public Engagement and Outreach, *Great Lakes Wind Collaborative,* July 2011

[21] How Transit Agencies Can Improve the Public Involvement Process to Deliver Better Transportation Solutions

the public's trust; consistent focus on stakeholder relationships through Community Outreach is essential to building civic "capital".

The American Public Power Association (APPA), Large Public Power Council (LPPC), and American Water Works Association (AWWA) each promote Community Outreach as an important method of communicating with various utility stakeholders, and notifying customers of the benefits of public utilities. For example, APPA has a number of tools that help communicate value to community stakeholders including document templates, customer information flyers, and fact sheets about the benefits of public power.[22]

## *4.2 Features of a Community Outreach Program*

There are several guiding principles when designing and executing a Community Outreach program. Outreach activities should be:

- *Aligned*, coordinating closely with the execution of strategic programs.
- *Planned*, reflecting rigorous management across the entire lifecycle of the outreach effort.
- *Inclusive*, involving of as many groups and individuals in the community as practicable.
- *Proactive*, assessing performance continuously throughout the relevant period.
- *Clear*, communicating the entire outreach plan to the public.
- *Innovative*, utilizing multiple forms of outreach and communication channels.
- *Integrative*, incorporating the public's ideas into the decision making process.

Given these principles, programs are comprised of several primary components:[23]

1) Goals: Clear articulation of the goals of outreach, which are closely aligned to strategic vision of the programs that the outreach supports.
2) Target Audiences: A comprehensive understanding of the various stakeholders for each outreach effort.
3) Messages: The key themes associated with each of the outreach efforts, which are intended to inspire and drive support.
4) Format and Distribution: Coordination of the key messages, how they will be catered to be most effectively delivered to the Target Audiences.
5) Evaluation: Continuous feedback between the delivery of the messages and the effectiveness versus goals and objectives.

These principles have been derived through a review of the community outreach strategies designed and recommended by standard-setting associations and leading organizations. This review has provided one frame of reference against which the Department's current practices can be compared. Organizations reviewed to inform best practices in the area include Non-Governmental Organizations (NGO), government agencies, For-Profit and Non-Profit organizations (Non-Utility), and academic research.

[22] APPA website (http://www.publicpower.org/Programs/interiordetail2col.cfm?ItemNumber=37836&navItemNumber=38739).
[23] United States Environmental Protection Agency, Water: Best Management Practices, Development an Outreach Strategy (http://water.epa.gov/polwaste/npdes/swbmp/Developing-an-Outreach-Strategy.cfm)

## *4.3 Peer Practices in Community Outreach*

Given their role in the communities in which they serve, municipal utilities conduct routine outreach efforts, with significant focus on providing various stakeholders insight into – and gathering feedback on – major programs and significant events. There are a large number of outreach methods, which are used optimally to meet the specific communication need. As above, we reviewed the outreach programs in place in other utilities (public and investor-owned) and in non-utility organizations to supplement the common features and principles specified above. From these sources, we derived an indication of common practices and programs that define Community Outreach. See Appendix C for a list of peer companies reviewed.

## *4.4 Community Outreach at the Department*

Community Outreach at the Department is organized under the General Manager's Chief of Staff, within the Intergovernmental Affairs & Community Relations group. This small organization leads intergovernmental and community relations to groups (not at a customer-level), with a goal of creating and strengthening touch points with all the communities the Department serves. Community Relations works with the Systems and Divisions to design and execute outreach programs; information and outreach may be program-specific (e.g., Power or Water System major construction programs) or more broadly, provide insights into the strategic goals or operational performance of the LADWP. All communication is crafted by the Communications Department (also organized under the Chief of Staff).

In addition to specific outreach efforts, Community Relations participates in and sponsors events, which focus on specific themes (e.g., water conservation). The group also conducts tours to Department facilities to educate customers on utility operations.

### 4.4.1 Strategic Planning

Community outreach activities are central to the promotion of the Department's strategic plans, operational objectives in areas such as rate proposals, resource plans, and major capital programs (among others). The Department has not established a formal strategic plan for its community outreach activities. However, the Department's community outreach efforts can be categorized in five main areas:

- ***Stakeholder Engagement*:** This is done primarily through the Los Angeles Neighborhood Councils (LANC) and other forums for information sharing.
- ***Energy Efficiency and Water Conservation:*** Reduce and optimize water and electrical use, both through water conservation measures, and increased reliance and adoption of renewable energy sources and solutions to generate power.
- ***Rates & Water and Power Infrastructure:*** Increase water and power rates to enable the Department to fund and pursue capital projects to improve and update its aging water and power infrastructure.
- ***Safety:*** Increase awareness related to electric safety tips, emergency and earthquake preparedness, and the health effects of electric and magnetic fields.
- ***Educational Programs***: Help secure a knowledgeable base of residential and business customers to better understand and appreciate water, energy, and environmental issues.

The Department drives community outreach efforts in the above areas through sponsorship and participation in community events as well as communications through print and electronic media and websites.

### 4.4.2 Program and Operations

As noted above, stakeholder engagement is one of the most critical outreach efforts provided by the Community Relations group. The Department utilizes a variety of outreach communication methods, including:

- Newsletters
- Corporate website(s)
- Press releases
- Emailed notifications
- Brochures
- Utility bill inserts
- Fact sheets
- News articles
- Mailed notifications
- Public service announcements
- Community group newsletters
- Social media / on-line advertisements

Methods of soliciting in-person participation include:

- Public meetings
- Advisory committee meetings
- Hearings (formal comments)
- Working groups/task forces
- Formal presentations
- Workshops
- Open houses
- Tours

The messages crafted by the Department are derived by the Communications Department, working closely with the Systems and other stakeholders.

Within the broad category of stakeholder engagement, planned and unplanned interactions with the LANC are one of the most critical activities of Community Relations. The following are descriptions of the Neighborhood Council and other outreach efforts.

#### *4.4.2.1 Neighborhood Councils*

Community Outreach is in part defined through a Memorandum of Understanding (MOU) between certified Neighborhood Councils and the Department. Article IX of the City Charter requires that information be provided to Neighborhood Councils "as soon as practical" to provide sufficient time for review and comment before critical decisions are made. Information provided by the Department to Neighborhood Councils is one aspect of a two-way communication; Neighborhood Councils provide commentary on major decisions, and also "monitor the delivery of City services."

In accordance with the MOU, the Department has established points of contact (liaisons) for each Neighborhood Council. These liaisons attend council meetings and coordinate information and requests. Through this framework, the Department provides each council with information on key programs and initiatives. Plans and programs specifically referenced in the MOU include the Department's Ten-Year

Capital Improvement Program, the Urban Water Management Plan, the Power System Integrated Resource Plan (IRP), and the Power System Operations Business Plan. In addition, rate actions and the Department's budget setting process are also a significant focus of enhanced communication and outreach through this framework. Additional information can be requested by councils on a variety of local issues and other planned and unplanned major projects. LADWP has also created a website that provides information to Neighborhood Councils such as the liaison contact, events, proposals, reports and DWP business.[24]

#### *4.4.2.2 Educational Programs*

The Department provides a variety of educational programs for the community. Educational programs provide community members, in particular individuals at younger ages, with an opportunity to engage with the Department, which is an important influence on community perception. Such programs are common amongst peer and best practices, and should continue accordingly. A sample of the educational programs provided by the Department, include:

- LADWP Science Bowl
- Adopt-A-School
- Math and Science Lessons
- Theatre Plays
- Times in Education
- Electric Safety Activities
- Plant Tours
- LAUSD Partnerships

Interviews with Department officials indicated the Plant Tours have played an important role in raising awareness amongst the community relative to utility operations and the complex nature of providing water and power electric services. These tours and site visits are also a common practice among municipal utility peers.

#### *4.4.2.3 Integrated Resource Planning*

The Department has designed and incorporated a Community Outreach program into its Integrated Resource Planning (IRP) process. The program includes recurring public outreach to both provide information to – and also gather input from – stakeholders. Public Outreach Workshops are conducted on a recurring basis during the IRP process. During these workshops, overviews and results from IRP planning are presented for public feedback. In general, these workshops serve as an opportunity for public stakeholders to learn about the IRP and provide input on the future of LADWP resource planning. An IRP website and online forms further define the approach to outreach.

In addition to conveying information and gathering feedback on a set of discussion themes, the Community Outreach effort also provides information to customers on key Department programs in which customers may participate (including Environmental Efficiency, Local Solar, and Electric Vehicle Rebates). Stakeholder engagement and the public comment period are central to strengthening public

[24] Reference: http://empowerla.org/neighborhood-councils-and-the-dwp/

support for the IRP. Similarly, the Department should make similar outreach efforts in relation to the pending update to the Urban Water Management Plan.

#### *4.4.2.4 Other Community Outreach Efforts: Emergency, Customer Service, and Rate Cases*

The Department' community outreach activities tend to be more re-active, rather than pro-active in nature, and appear to be most visible with regard to responses to emergencies (e.g. UCLA water main break), significant issues that impacts customers (e.g. CIS Implementation), or other major public relations issues (e.g. Audit of Joint Safety Institute and Joint Training Institutes).

While the Department did communicate with individual customers and stakeholders with regard to the problems with implementation of its CIS, particularly via press releases and through its website, Navigant's interviews identified that the Department did not allocate any staff members from its own community outreach team to pursue a pro-active communication approach.

An exception to the reactive nature of community outreach activities at the Department are most evident with regard to years when water and power rates cases are presented. The Department leads a series of public meetings regarding the power and water rate proposals, and also reflects the rate proposals, infrastructure plans, budgets, and rate proposals on MyLADWP. However, Navigant recommends that public support for increases to water and power rates (and more specifically, the substantial programs that provide the basis for rate increases) should be addressed on an on-going basis rather than shortly before a rate case. This can be accomplished through a communication strategy that routinely updates target constituencies on progress versus key capital program goals and targets. Linking rate increases with the tangible benefits of those increases over-time is a common community outreach and communication strategy.

### 4.4.3 Organization and Budget

The Intergovernmental Affairs and Community Outreach Group (IACO) has eight (8) employees dedicated to leading and managing local government and community outreach activities. In addition to the Director of the IACO, the Group has four (4) employees dedicated to local government functions, two of whom are dedicated to leading the LADWP's engagement with the LANC, and three (3) to other facets of community outreach.

In the execution of its related functions and responsibilities, the Group leverages the employees and related expertise from across the Department. For example, as noted, the Communications Group provides support relative to graphic design (e.g. brochures, event stands, etc.) and press release (e.g. electronic, print, and mail) needs. In additional, IACO is also supported my members of all other Systems and Divisions relative to providing experts and speakers to discuss LADWP programs and initiatives with key stakeholders across the community.

Considering the scope of the mandates of the Department and number of customers which it serves, Navigant believes that the number of IACO staff should be revisited. For example, only two (2) of the IACO staff are dedicated to representing the Department across the ninety-five (95) Neighborhood Councils in the City. This staffing may at times compromise the coverage of IACO staff across all of the LANC. Further, given the significant size and potential impact on various stakeholders of the capital programs in both the Power and Water Systems, additional staff should be considered to actively

manage the outreach efforts around these programs. The size and specific accountabilities of these additional staff would be determined in conjunction with a formal strategic planning effort.

#### *4.4.3.1 Processes*

As described earlier, the Department conducts day-to-day community outreach activities primarily through the Office of the Chief Staff and related groups (i.e. Communications, Federal and State Legislative, and Intergovernmental and Community Relations) and also involves virtually all other LADWP divisions.

Navigant's research into common and best practices for community outreach finds that the participation of multiple divisions and engagement of Department employees on community outreach activities is in itself a positive practice. At the Department, for example, the Chief Sustainability and Economic Development Office promotes the energy efficiency, water conservation, and economic development programs and initiatives. Similarly, the Financial Service Office (FSO) leads the Department's efforts around its water and power rate cases, which includes activities such as presenting to the community groups and other key stakeholders. All Department divisions, from its water, power, and joint system, as well as safety and administrative offices, have a stake in and participate in activities which either engage directly with the community or influence community outreach efforts and performance. In the context of the Department, increased engagement of divisions outside the Office of the Chief of Staff is also necessary one in light of limited staffing and financial resources provided to the Intergovernmental and Community Relations Group.

We also found, however, that the Department's decentralized approach has occasionally resulted in a lack of coordination around the various activities being carried out by the Department in the broad area of outreach. The most effective community outreach strategies are those that are supported by a single point of accountability, and defined by clear and cohesive business processes. The benefits of a lean organizational approach to outreach should be weighed against the possibility for communication and control breakdowns.

### 4.4.4 Analytics

As described in Section 3.4.5 above, measuring and reporting performance in relation to clearly defined goals and targets is an important facet of program management. Measuring performance can:

- Strengthen program strategy and project design, and lead to improvements in implementation.
- Help direct investments toward programs and activities that have the greatest impact on productivity, job growth or investment.
- Build trust with businesses, customers, and other stakeholders by openly sharing results.
- Transparency can further stimulate partnerships, improve stakeholder relations and strengthen the Department's presence in the wider community
- Help ensure and demonstrate that the agreed activities have the desired and intended impact on stakeholders
- Inform practitioners whether they are doing the right things, and doing them well.

- Allow for the benchmarking of programs against leading good practice
- Provide early warning of problems and allow actions to be taken on timely basis

At present, Community Relations programs do not appear to be consistently assessed and managed in relation to a set of cost, effort, or performance metrics. Through our document request, we did not receive reports that reflect a consistent analysis of the impact from Community Outreach efforts in relation to goals and objectives.

### *4.5 Findings and Recommendations*

As noted above in the section on development, outreach programs are typically defined by a common set of strategic plans, operating protocols, processes, and reporting capabilities. In combination, these facets of a mature outreach program enable an organization to more formally prioritize, measure, and monitor the effectiveness of efforts in relation to a clearly articulated plan.

Given the Department's need to consistently engage the public on a variety of key matters (for example, given the significant capital programs and associated rates in both the Power and Water Systems), well-organized and more extensive outreach will become more critical over the next several years. To this end, we recommend that the Department focus on strengthening the foundational aspects of program design and monitoring – from creation of a strategic plan, to specification and documentation of programs, to goal-setting, and finally to enhanced analysis and reporting. As above, these efforts to increase the maturity of the outreach function should extend into clearly identifying the staffing required to deliver on the programs clearly specified in planning activities.

In addition, while great efforts are made to work and coordinate closely with the Power and Water Systems on outreach efforts, decentralization can lead to a lack of understanding of where functional responsibility and accountability ultimately resides for community outreach. As with other studies conducted as part of the IEA Survey, Navigant recommends greater centralized control be exercised by Community Relations over outreach activities. Through this focused accountability, Community Relations would be responsible for designing and adopting a comprehensive public relations strategy to assess, plan, and define tools, tactics, and resources to guide the Department's community outreach activities in alignment with its strategic, operational, and regulatory mandates.

## Appendix A. List of Interviews

| Name | Title/Topic | Interview Date |
|---|---|---|
| Guy Lipa | Chief of Staff | September 17th |
| Joseph Ramallo | Director of Communications | September 15th |
| Winifred Yancy | Director of Intergovernmental and Community Relations | September 15th |
| Kecia Washington | Director of Economic Development | September 29th |

## Appendix B. List of Documents

Navigant submitted document data requests to LADWP which were provided via a secure file sharing site. The primary documents are listed in detail below.

| Documents Provided by LADWP | |
|---|---|
| 1 | Construction Mitigation Program – WETS |
| 2 | ED Strategy Report |
| 3 | EDD Annual Budget 2009-2015 |
| 4 | EDD Annual Budget vs. Actuals 2009-2015 |
| 5 | EDD Outreach Events REVISED |
| 6 | EDD Outreach Events |
| 7 | EDD Performance Tracking Methodology |
| 8 | EDG Summary Position and Duties |
| 9 | General Service Rider Business Promotion |
| 10 | LocateLA Marketing Outline |
| 11 | Mayor's Briefing |
| 12 | Proposed ED 2015-2016 Organization Chart by Function |
| 13 | Proposed ED 2015-2016 Organization Chart |
| 14 | SED Organization Chart Detail |
| 15 | Train the Trainers Presentation |
| 16 | UIL Board Presentation |

## Appendix C. Peer Companies

| Reference | Description |
|---|---|
| Public and Municipal Power and Water Utilities | Regional Municipal Utilities: Sacramento Municipal Utility District (SMUD) (Power); City of Pasadena (Water & Power); City of Glendale (Water & Power); City of Burbank (Water & Power); City of Anaheim (Water & Power); and the City of Riverside (Water & Power).<br><br>Public Power Agencies: Tri-State Generation & Transmission Association, Inc.; Lower Colorado River Authority (LCRA); CPS Energy; Austin Energy; and Omaha Public Power District (OPPD). |
| Investor-Owned Utilities | Regional peer IOUs, including Southern California Edison (SCE), Pacific Gas & Electric (PG&E), and Sand Diego Gas & Electric (SDG&E). |
| Non-Utility Entities | Examples include the Port Authority of NY/NJ, Port of Los Angeles, and Port of Long Beach. |

# Volume X

# Water and Power Rates Benchmarking

NAVIGANT

# 2015 Industrial, Economic and Administrative Survey of the Los Angeles Department of Water and Power

## Water and Power Rates Benchmarking Report
## Volume X

**Prepared for:**
**The City of Los Angeles**

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# 1. Executive Summary

The City of Los Angeles ("the City"), by virtue of Section 266 of the Los Angeles City Charter, requires that the City Controller conduct an Industrial, Economic and Administrative (IEA) Survey ("the Survey") of the Los Angeles Water and Power Department ("the Department" or "LADWP"). For the 2015 edition, the City Controller has retained Navigant Consulting, Inc. ("Navigant") to conduct this study.

The primary objective of the Survey is to assess how well-prepared LADWP is to address current and future challenges, while providing safe and reliable water and power to its ratepayers at an appropriate cost. This section of the IEA Survey report is focused on the latter and presents the findings of a water and power rates benchmarking study ("the Study") conducted by Navigant. In particular, the Study includes:

- A comparison of LADWP's monthly bill for power and water services, for the residential, commercial and industrial customer classes against selected comparable utilities ("the peer panel"). Monthly bills were computed for the Fiscal Year 2015/2016[1].
- A comparison of the Department's electric and water rate structures against the peer panel companies.
- An assessment of electric and power rate drivers in order to provide context for the rate levels of the peer panel companies as compared to LADWP.
- A review of the incentives for water and power conservation provided by the rate structures of the peer panel.

Navigant's proposal for the development of the peer panel explicitly envisioned the selection of utilities operating in the Los Angeles area, as well as utilities with similar water and power supply constraints operating in Northern California, San Diego and neighboring states. Another key metric considered for the development of the peer panel was the similarity in rate setting mechanisms and cost structures. Rate setting mechanisms and cost structures can differ significantly across the utility industry, especially between Municipality Owned Utilities (MOUs) like LADWP and Investor Owned Utilities (IOUs). Further, the cost structure associated with running a private enterprise usually results in higher rates for IOUs. Finally, a major difference between California MOUs and IOUs is their generation mix. The three California power IOUs, Southern California Edison (SCE), San Diego Gas & Electric (SDG&E) and Pacific Gas & Electric (PG&E), have largely or fully eliminated coal from their generation mix while many Southern California MOUs, including LADWP, still heavily rely on electricity generated by cost competitive coal power plants. Coal has been, and is still one of the most cost competitive energy source for power generation and constitutes one of the key drivers behind the competiveness of many MOUs electric rates.

[1] Starts July 1, 2015 and ends June 30, 2016.

These differences in rate setting mechanisms, cost structures and generation mix can result in large rate level disparities between California MOUs and IOUs, and justify the creation of a peer panel composed exclusively of MOUs.

However, comparing the Department against SCE, SDG&E and PG&E can be valuable since:

- All 4 utilities are all large size utilities supplying power to some of the largest California metropolitan areas.
- LADWP is making the same transition away from coal that the IOUs have now completed, as well as strong investments in infrastructure and reliability. Therefore, comparing their rates is instructive in illuminating future cost drivers LADWP ratepayers will face as the Department moves toward even cleaner and more reliable systems.
- LADWP and SCE are operating in neighboring service areas.
- It provides a point of reference to the public since most electric rate benchmarking studies involving California utilities published to date have included the three California IOUs.

To address these intricacies, Navigant created three peer panels: one water peer panel and one power peer panel composed exclusively of MOUs, and one power peer panel including MOUs as well as SCE, SDG&E and PG&E.

The Department has managed to maintain a strong and stable revenue stream over the last decade despite a limited number of rate increases. However, LADWP – and the vast majority of water and power utilities operating in California and across the Southwest of the United States - is currently facing a number of challenges on both the water and power sides that require significant Capital and Operations and Maintenance ("O&M") expenditures related to the maintenance and replacement of its aging infrastructure, and the compliance with stringent regulatory mandates. Further, the Department faces a unique set of challenges related to:

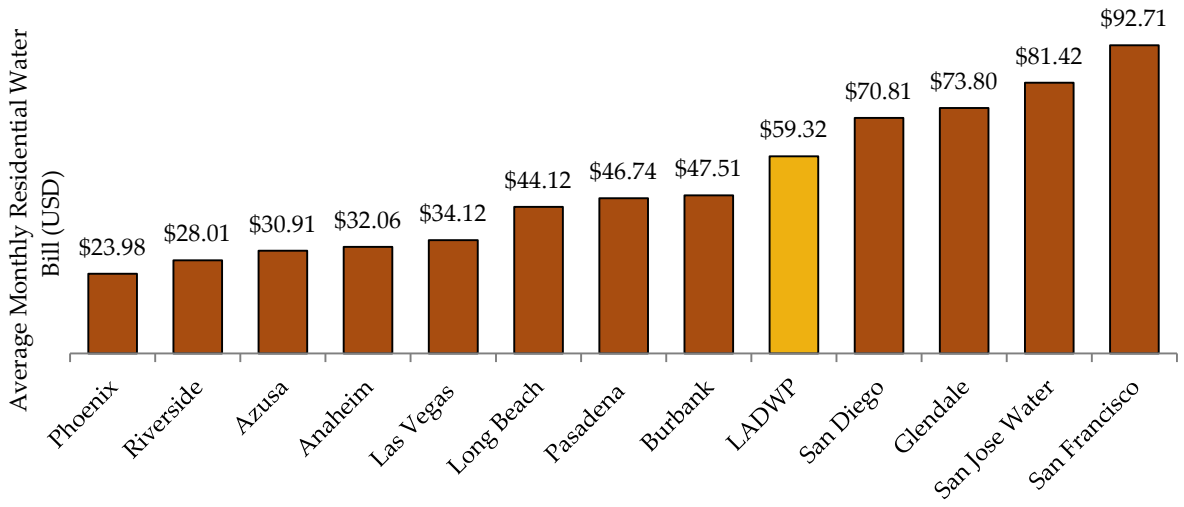
- Its age. Los Angeles is one of the oldest metropolitan areas in the Southwest and faces specific aging infrastructure replacement needs, such as the renewal of a large number of above ground power lines.
- Its diverse service area. The diversity of LADWP's geographic area demands specific operational requirements such as the maintenance of power transmission lines in mountain areas and greater water pumping needs in hilly areas.
- Its vertically integrated structure. LADWP owns and operate its own generation, transmission and distribution systems, and is therefore responsible for the maintenance, repair and replacement of these assets.

The comparison of LADWP's monthly bills for residential water services shows that LADWP's water rates are on the high end of the peer panel overall but the lowest for residential customers among California major metropolitan providers. As stated above, one of the primary drivers for LADWP's higher rates, is the age of its infrastructure. Some utilities in the peer panel, such as Phoenix, Riverside and Las Vegas benefit from a newer infrastructure with flatter terrains and likely have fewer leaks and breaks per mile, lower overall O&M cost due to fewer pumping needs and fewer pressure zones. In

addition, they currently are not confronted with the significant capital expenditures the Department faces to replace its aging infrastructure.

Another key rate driver is LADWP's reliance on water purchases from the Metropolitan Water District (MWD) for most of its water supply. According to Navigant's findings, MWD purchases represent the second most expensive water source in California, behind ocean water desalination. While MWD pricing is outside the direct control of the Department, LADWP is addressing this cost driver by making large investments in its local water supply which will reduce its reliance on MWD over time. The Department is planning on cutting in half its MWD water purchases by 2024 through increased conservation, recycled water, and stormwater capture, and is actively working on the rehabilitation of the San Fernando groundwater basin.

**Figure E-1. Average Monthly Residential Water Bill - Medium Usage Scenario (12 HCF/mo – ¾ meter)**




LADWP's power rates compare positively against those of the peer panel companies. However, nearly half of the Department's generation mix is currently sourced from the Navajo and Intermountain Power Project (IPP) coal power plants, which represent a very cost competitive source of energy. To meet environmental goals and regulations, LADWP will be replacing coal through a combination of energy efficiency, renewable energy, and natural gas within the next 10 years[2] and will significantly increase its share of energy generated through utility scale solar PV. While this strategy is in line with LADWP's and the City's environmental goals and supported by the relatively low levelized cost of energy (LCOE) associated with these two generating technologies, the transition from coal to natural gas will come at a cost to LADWP's ratepayers since the new gas-fired capacity replacing the Navajo and IPP coal power plants will not be as economical.

[2] LADWP has finalized the sale of the Navajo Generating Station but is entitled to power from the plant until July 1, 2016, and is planning on divesting from IPP by 2025 according to the Department's 2014 Integrated Resource Plan.

**Figure E-2. Average Monthly Residential Power Bill - Medium Usage Scenario (500 kWh/mo) – Power Peer Panel A**

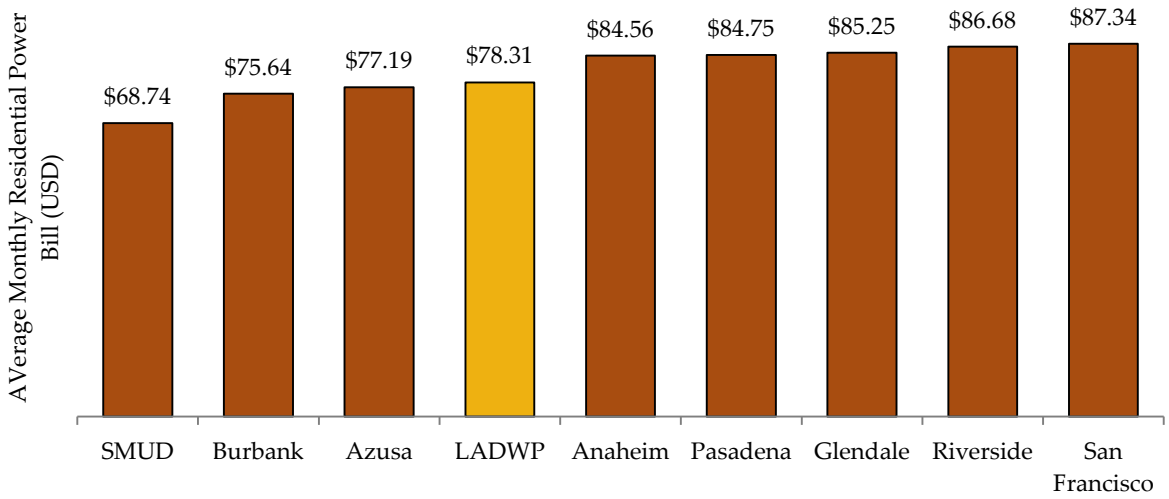
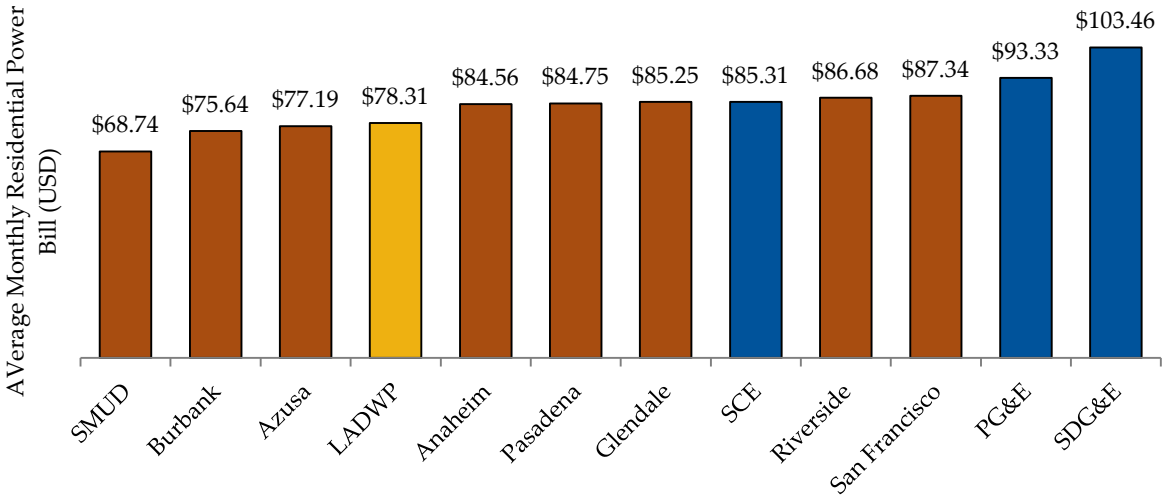



**Figure E-3. Average Monthly Residential Power Bill - Medium Usage Scenario (500 kWh/mo) – Power Peer Panel B**




Finally, Navigant assessed LADWP's rate structures against those of the peer panel companies. LADWP's water and electric rate structures appear to be more complex than those of its peers. Both the power and electric rate ordinances can be quite challenging to interpret without a certain degree of familiarity with utilities' rate structures, primarily due to the use of a large number of rate adjustment factors. As a result, it can be challenging for LADWP's ratepayers to understand how their water and power utility bills have been developed. However, each rate adjustment factor is tied to specific water and power programs which can help ratepayers bridge the gap between their monthly bill components and these specific programs.

While LADWP's rate structures appear quite complex, they appropriately support the City's and Department's water and power conservation goals. LADWP uses seasonal rates for both water and power, and implemented shortage year water rates in order to incentivize their customers to limit their water and power usage.

Overall, this Study shows that the Department's rate levels are reasonable when compared to the peer panel, especially given LADWP's unique set of challenges related to its size and the characteristics of its service area. However, it is likely that the Department's rates will increase as it seeks additional funding to address current and new challenges, including the maintenance, repair and replacement of its aging infrastructure, the transition from coal to natural gas and the development of its local water resources. In the future, the Department's rates should be examined against the challenges and regulatory requirements it faces, while ensuring that they accurately reflect the costs of providing water and power supply services to its customers. Low rates are not a desirable goal if they are inadequate to provide the level of service required to meet the policy goals of the City of Los Angeles.

## 2. Introduction

Utilities meet the requirements of day-to-day operations and large scale capital programs through the derivation and application of rates that are designed for specific customer classes. The manner in which the costs of "doing business" are allocated across the various customer classes is an explicit consideration of all utilities and their oversight bodies.

In general, LADWP has a long history of relatively low power and water rates, few rate increases, and strong financial ratios exemplified by high credit ratings. However, significant capital improvement and other programs are impacting the Department's rate structure over the recent period.

The City included in the scope of the 2015 IEA Survey a "competitive analysis of electric and water rates with neighboring comparable utilities in various customer classes and usage levels". This report presents the findings of the rates benchmarking study conducted by Navigant, including:

- A comparison of LADWP's monthly bill for power and water services, for the residential, commercial and industrial customer classes against the peer panel. Monthly bills were computed for the Fiscal Year 2015/2016[3].
- A comparison of the Department's electric and water rate structures against the peer panel companies.
- An assessment of electric and water rate drivers in order to provide context for the rate levels of the peer panel companies as compared to LADWP.
- A review of the incentives for water and power conservation provided by the rate structures of the peer panel.

This report is organized as follows:

- Presentation of Navigant's approach and methodology in conducting the Study.
- An assessment of LADWP's water and electric rate structures against those of the peer panel companies.
- Water rates benchmarking findings.
- Power rates benchmarking findings.
- An assessment of rate structure designs as they relate to water and power conservation.
- Conclusion.

[3] Starts July 1, 2015 and ends June 30, 2016.

# 3. Approach and Methodology

## *3.1 The Peer Panels*

To conduct the Study, Navigant developed three peer panels: the Water Peer Panel, Power Peer Panel A and Power Peer Panel B. All three peer panels include utilities operating in the Los Angeles area, as well as utilities with similar water and power supply constraints operating in Northern California, San Diego and neighboring states.

One key metric used in selecting utilities for the Water Peer Panel and Power Peer Panel A was the similarity in rate setting mechanisms and cost structures. Rate setting mechanisms and cost structures can differ significantly across the utility industry, especially between MOUs like LADWP and IOUs. Rate setting mechanisms for California IOUs are based on cost of service studies[4] that define the true cost of providing water and power services to customers and allow a rate of return, while LADWP's rates are primarily designed to recover the cost of debt servicing, ensuring the appropriate level of reserves and paying the City Transfer[5]. In short, the IOUs revenue requirement is based on a rate of return rate base methodology and LADWP's revenue requirement is based on a cash revenue requirement methodology. Additionally, the cost structure associated with running a private enterprise usually results in higher rates for IOUs.

Another major difference between California MOUs and IOUs is their generation mix. The three California power IOUs, SCE, SDG&E and PG&E, have largely or fully eliminated coal from their generation mix while many Southern California MOUs, including LADWP, still heavily rely on electricity generated by cost competitive coal power plants. Coal has been, and is still one of the most cost competitive energy source for power generation and constitutes one of the key drivers behind the competiveness of many MOUs electric rates.

These differences in rate setting mechanisms, cost structures and generation mix can result in large rate level disparities between California MOUs and IOUs. This led Navigant to exclude IOUs from the Water Peer Panel and Power Peer Panel A.

Power Peer Panel B is similar to Power Peer Panel A with the exception that it does include the three California IOUs. While it is justified to compare LADWP's rates exclusively against other MOUs for the reasons outlined above, a comparison against SCE, SDG&E and PG&E is valuable since:

- All four utilities are all large size utilities supplying power to some of the largest California metropolitan areas.
- LADWP is making the same transition away from coal that the IOUs have now completed as well as strong investments in infrastructure and reliability. Therefore, comparing their rates is instructive in illuminating future cost drivers LADWP ratepayers will face as the Department moves toward even cleaner and more reliable systems.
- LADWP and SCE are operating in neighboring service areas.

[4] LADWP has recently completed a 2014 Power Cost of Service Study as part of their latest rate action. However, this cost of service study was not used to develop the rates reviewed in this Study.
[5] Represents 8% of LADWP's power revenues.

- It provides a point of reference to the public since most electric rate benchmarking studies involving California utilities published to date have included the three California IOUs.

This Study will therefore compare residential, commercial and industrial monthly bills across all three peer panels. The utilities included in the water and power peer panels are listed in the following table.

**Table 3-1. Water and Power Peer Panels**

| | Water Peer Panel | | Power Peer Panel A | | Power Peer Panel B |
|---|---|---|---|---|---|
| 1 | City of Pasadena | 1 | City of Pasadena | 1 | City of Pasadena |
| 2 | City of Glendale | 2 | City of Glendale | 2 | City of Glendale |
| 3 | City of Burbank | 3 | City of Burbank | 3 | City of Burbank |
| 4 | City of Anaheim | 4 | City of Anaheim | 4 | City of Anaheim |
| 5 | City of Riverside | 5 | City of Riverside | 5 | City of Riverside |
| 6 | City of Azusa | 6 | City of Azusa | 6 | City of Azusa |
| 7 | City of San Diego | 7 | City of San Francisco – San Francisco Public Utilities Commission (SFPUC)[6] | 7 | City of San Francisco – San Francisco Public Utilities Commission (SFPUC)[7] |
| 8 | City of San Francisco – San Francisco Public Utilities Commission (SFPUC) | 8 | Sacramento Municipal Utility District (SMUD) | 8 | Sacramento Municipal Utility District (SMUD) |
| 9 | City of Las Vegas | 9 | LADWP | 9 | SCE |
| 10 | City of Long Beach | | | 10 | SDG&E |
| 11 | City of Phoenix | | | 11 | PG&E |
| 12 | City of San Jose, San Jose Water | | | 12 | LADWP |
| 13 | LADWP | | | | |

## *3.2 Monthly Bill Computations*

With the objective of considering all charges related to power and water services, and considering that rates structures vary significantly across utilities, power and water monthly bills have been computed for each utility of the peer panel.

[6] The SFPUC provides power to only a very limited number of residential customers, as most of their electric customers are municipalities.

[7] The SFPUC provides power to only a very limited number of residential customers, as most of their electric customers are municipalities.

All charges considered in the monthly bills were derived from publicly available rate ordinances and the appropriate rate schedules. The bill computation process used for the Study considered:

- Charges directly related to providing water and power services - The computations only reflect fees directly related to providing water and power services, i.e. taxes and surcharges not related to such services were excluded from the computations.
- Current rate levels - In order to provide the most current rate levels representation, rates effective July 1, 2015 were considered for the Study and monthly bills were computed for the July 2015, June 2016 study period[8].
- Seasonality – When applicable, and according to each utility's rate ordinance, a distinction was made between months considered to be in the "high", "medium" or "low" season, and summer or winter months. The monthly bills presented in sections 5 and 6 were first calculated for each month and then averaged over the study period, and therefore reflect the seasonality impact on rates.
- Specific on-peak and off-peak electric rates, when applicable.
- Drought – Drought surcharges were included in the water bill computations and rate schedules addressing drought conditions were applied.
- Number of days per month – When applicable, daily charges were translated into monthly charges, considering the total number of days in each month over the study period[9].

Finally, in order to ensure the accuracy of the benchmarking results presented in this report the assumptions and approach used to compute the residential monthly bills were reviewed and validated in collaboration with each peer panel company. Additionally, the commercial and industrial bills were compared against the output of the utilities' bill estimators and/or bill samples, when available.

### *3.3 Customer Classes*

As mentioned previously, the Study provides monthly water and power bill levels for the residential, commercial and industrial classes.

The following is a description of the class definitions and assumptions used for the Study:

- Residential water customers - Considers water sold, supplied, distributed, or transported to customers in a single family accommodation and water sold for general domestic and household purposes, using a 3/4" size meter – this meter size is commonly found in single household accommodations. When a location distinction was necessary, it has been assumed that the residential customers were located "inside" the city.
- Commercial water customers – Considers water sold, supplied, distributed, or transported to customers in a non-residential setting for commercial purposes. It does not consider water for agricultural uses.

[8] Navigant assumed no rate increases over the study period for all utilities included in the peer panel, including LADWP.

[9] The computations account for the fact that 2016 will be a leap year.

- Industrial water customers – Similar to the commercial water customers, the industrial segment considers water sold, supplied, distributed, or transported to customers in a non-residential setting for industrial purposes, excluding agricultural activities.
- Residential power customers - Considers customers located in individually metered, single-family accommodations, where the power is used primarily for domestic and household purposes, including lighting, appliances, cooking and power consuming appliances. This service is typically supplied at one standard voltage through one meter. When a distinction with regards to water and space heating was necessary, it has been assumed that the power residential customers were not using electricity for water and space heating purposes.
- Commercial power customers – Considers customers such as businesses, enterprises, or equivalent in a non-residential setting and where power is used for purposes including lighting, power and heating or any combination thereof. It has been assumed that the power is delivered at a single phase alternating-current.
- Industrial power customers – Similar to a commercial power customer, an industrial power customer is considered a business, enterprises, or equivalent in a non-residential setting, where power is used for purposes including lighting, power and heating or any combination thereof.

## *3.4 Usage Scenarios*

In order to evaluate the impact of the peer panel companies' rate structure on both power and water usage, Navigant developed three usage scenarios for the residential, commercial and industrial customer classes. Comparing usage scenarios across the peer panel provided insights with regards to the utilities efforts in implementing pricing signals to promote energy and water conservation.

The following tables summarize the water and power usage scenarios per customer class.

**Table 3-2: Water Usage Scenario Summary (HCF/mo - Meter Size)**

| Scenario | Residential | Commercial | Industrial |
|---|---|---|---|
| Low Usage | 6 HCF – ¾" | 50 HCF – 1" | 500 HCF – 2" |
| Medium Usage | 12 HCF – ¾" | 200 HCF – 1.5" | 3,000 HCF – 3" |
| High Usage | 24 HCF – ¾" | 1,000 HCF – 2" | 15,000 HCF – 6" |

*1 HCF = 748 gallons*

**Table 3-3. Power Usage Scenario Summary (kW – kWh/mo)**

| Scenario | Residential | Commercial | Industrial |
|---|---|---|---|
| Low Usage | 250 kWh | 40 kW - 10,000 kWh | 350 kW - 250,000 kWh |
| Medium Usage | 500 kWh | 150 kW - 50,000 kWh | 1,000 kW - 300,000 kWh |
| High Usage | 750 kWh | 1,000 kW -300,000 kWh | 5,000 kW[10] – 2,000,000 kWh |

[10] Primary schedules were used for the high usage power industrial bills (demand of 5000 kW), as opposed to secondary schedules for the remaining scenarios.

# 4. Rate Structures

Water and power rate structures and the associated complexity can vary significantly across utilities. Differences in rate structures may be due to a number of factors, including:

- Funding mechanisms.
- Financial constraints.
- Regulatory and legal requirements.
- Incentives for water and power conservation.
- Water and power supply constraints.
- Water and power transmission and distribution constraints.
- Geography/Service Area.
- Climate.

It is critical for a rate structure to appropriately address all the factors listed above, while ensuring that revenue requirements are met through the application of rates that reflect the true cost of service and provide incentives for water and power conservation. In parallel, utilities ought to use clear and transparent rate structures for their ratepayers to get a clear understanding of how their water and power bills have been developed.

This section of the report provides a high level comparison of the peer panel companies' rate structures and evaluates the associated complexity.

## *4.1 Water Rate Structures*

Table 4-1 compares the residential water rate structures of the peer panel companies against the following metrics:

- Monthly Fee - Identifies if the rate structure includes a fixed monthly fee that is unrelated to water usage.
- Tiered Water Charges - Identifies the number of water usage tiers in each rate structure.
- Water Conservation Incentive – Identifies if the rate structure in effect at the time of the Study promotes water conservation through the use of drought surcharges or drought specific schedules/rates.
- Season Based - Identifies if rates are adjusted by season.

**Table 4-1: Residential Water Rate Structures**

| Charges | Pasadena | Glendale | Burbank | Anaheim | Riverside | Las Vegas | Long Beach | Phoenix | San Jose | Azusa | San Diego | San Francisco | LADWP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly Fee | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Tiered Water Charges | 4 | 4 | 3 | 1 | 4 | 4 | 3 | 2 | 3 | 3 | 4 | 2 | 2 |
| Water Conservation Incentive | | ✓ | | | ✓ | | | | ✓ | ✓ | | | ✓ |
| Season Based | ✓ | | | | ✓ | | | ✓ | ✓ | | | | ✓ |

Table 4-1 highlights that LADWP is the only utility of the peer panel to exclusively use volumetric rate components (rates based on water usage). All the other peer panel companies' rate structures include a fixed monthly fee that is unrelated to water usage.

The number of tiers across the rate structures reviewed varies from one to four. Anaheim is the only utility of the peer panel without a multi-tier rate structure. While LADWP is currently on the lower end of the spectrum with two tiers, the Department has submitted a water and power rate increase proposal to its Board of Commissioners on July 8, 2015 that includes a transition to a four tiers water rate structure. This is in line with the recommendation from the California Urban Water Conservation Council, who supports a tiered rate structure to encourage conservation.

Five utilities out of thirteen have implemented drought surcharges or drought specific schedules, including LADWP. The Department implemented shortage year rates in June 1, 2009 for all its customer classes, reducing the first tier water allotment by 15%. Shortage year rates were still in effect as of July 1, 2015. Additionally, LADWP has launched multiple water conservation programs including, among others, limiting outdoor watering to three days a week, the turf replacement program, and rebates for residential high efficiency washers, toilets, outdoor watering systems and residential drought resistant landscape.

The use of season based rates across the peer panel companies appears to be limited, as it is only implemented at five out of thirteen utilities, including LADWP. Seasonal pricing can serve to encourage additional conservation efforts during high demand months, particularly for outdoor use. In addition, such rates can be justified in part because they better reflect a user's share of system capacity through peak demand pricing. However, given the current stricter outdoor watering restrictions across California, the difference in seasonal water usage may not be as pronounced, as California residents may only be focused on complying with current watering restrictions without necessarily reducing their winter usage. Such behavior could limit the relevance of season based rate structures during temporary

water restrictions, but seasonal pricing will remain a powerful tool to limit outdoor water use over the long-term.

These observations generally apply to the commercial and industrial rate structure comparison shown in Table 4-2.

**Table 4-2: Commercial and Industrial Water Rate Structures**

| Charges | Pasadena | Glendale | Burbank | Anaheim | Riverside | Las Vegas | Long Beach | Phoenix | San Jose | Azusa | San Diego | San Francisco | LADWP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly fee | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Tiered Water Charges | 4 | 1 | 1 | 1 | 2 | 4 | 1 | 2 | 1 | 3 | 1 | 1 | 2 |
| Water Conservation Incentive | | ✓ | | | ✓ | | | | | ✓ | | | ✓ |
| Season Based | ✓ | | ✓ | | ✓ | | | ✓ | | | | | ✓ |

Navigant's review of the complexity of LADWP's rate structure shows that the Department is the only utility of the peer panel with different water usage tiers depending on the customer's zip code to address weather changes across the Department's large service area. In addition, LADWP uses adjustments to tiers based on lot size and family size. Having water usage tiers that vary depending on the customer's zip code, lot size and family size helps ensure that LADWP's customers are treated fairly across the Department's vast service area. However, it adds another layer of complexity to the rate structure.

## *4.2 Power Rate Structures*

Table 4-3 compares the residential electric rate structures of the peer panel companies against the following metrics:

- Monthly/Fixed Fee - Identifies if the rate structure includes a monthly or fixed fee that is unrelated to energy usage.
- Energy Usage Tiers - Identifies the number of energy usage tiers in each rate structure.
- Season Based - Identifies if the rates are adjusted by season.

**Table 4-3: Residential Power Rate Structures**

| Charges | Pasadena | Glendale | Burbank | Anaheim | Riverside | Azusa | San Francisco | SMUD | SCE | SDG&E | PG&E | LADWP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly / Fixed Fee | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Energy Usage Tiers | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 4 | 4 | 4 | **3** |
| Season Based | | ✓ | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

LADWP is among the three utilities of the peer panel that exclusively uses volumetric rate components. Note that the Department uses adjustment factors in the event it cannot recover enough revenue through the application of tis volumetric rates.

The number of energy usage tiers varies from two to four across the peer panel, with five out of twelve utilities using three tiers, including LADWP, and the IOUs using four tiers. The use of a larger number of tiers can be seen as an incentive for ratepayers to limit their energy usage to the lowest cost Tier one rate.

Finally, eight out of twelve utilities are using season based rates, including the Department. The use of season based rates is appropriate in areas such as Southern California, where electricity demand is larger in the summer due primarily to greater air conditioning needs.

The commercial and industrial rate structure comparison shown in Table 4-4 highlights a few differences from the observations made on the residential rate structure comparison. LADWP charges a fixed Service Charge to its commercial and industrial customers (only the City of Azusa does not apply such fixed fee) and most peer panel utilities do not use an energy usage tiered structure.

**Table 4-4: Commercial and Industrial Power Rate Structures**

| Charges | Pasadena | Glendale | Burbank | Anaheim | Riverside | Azusa | San Francisco[E] | SMUD | SCE | SDG&E | PG&E | LADWP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly / Fixed Fee | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Energy Usage Tiers | 1 | 1 | 1 | 1[B] | 1[C] | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| Season based | ✓ | ✓ | ✓[A] | | ✓[D] | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

*A - Only for customers with a demand greater than 250 kW.*
*B - Only applies to customers with a maximum demand of 200 kW. For customers with a demand greater than 200 kW, the City of Anaheim applies two energy usage tiers.*
*C – For customers with a demand between 20 and 150 kW, the City of Riverside applies two energy usage tiers.*
*D – Applies to customers with a demand greater than 150 kW.*
*E – The SFPUC does not have an electric rates schedule for customers with a demand greater than 200 kW.*

Overall, this high level review reveals that LADWP's power rate structure for residential, commercial and industrial customers is in line with the peer panel companies and can support the implementation of energy conservation incentive mechanisms.

However, a review of the complexity of LADWP's rate structure showed that the Department is using a larger number of rate adjustments and is the only MOU in the peer panel to have different residential power rate tiers depending on the customer's zip code (or geographical zone)[11] [12].

The large number of rate adjustment represents a good effort from the Department to bridge the gap between the Departments key capital and O&M programs and the components of the customer's bill. The downside is a rate ordinance that is complex for the public to interpret, since it requires a certain degree of familiarity with power rate structures.

Similar to the observations made on the water rate structure comparison, having power rate tiers that vary depending on the customer's zip code helps ensure that LADWP's customers are treated fairly across the Department's service area but adds another layer of complexity to the rate structure.

[11] The California IOUs also use differing tiers depending on the customer's zip code.

[12] Navigant used geographical Zone 1 tiers in order to compute LADWP's residential electric bills. This assumption was validated by the Department.

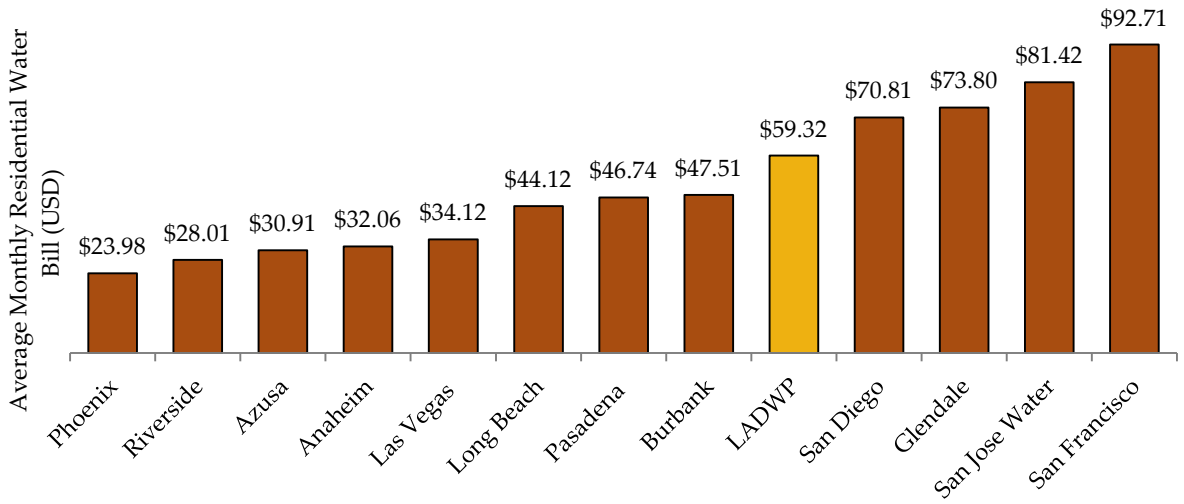
## 5. Water Rates Benchmarking

This section of the report presents the water rates benchmarking findings for the Water Peer Panel. It includes monthly water bill comparisons for residential, commercial and industrial customers, and provides insights with regards to key water rate drivers.

### *5.1 Residential Customers*

The results from the water rates residential benchmarking study are presented in the chart below. These results reflect the Medium Usage Scenario at a consumption of 12 HCF per month using a ¾" size meter.

**Figure 5-1: Average Monthly Residential Water Bill - Medium Usage Scenario (12 HCF/mo – ¾ meter)**




The peer panel average monthly bill for 12 HCF is $51.19, and monthly bills range from a low of $23.98 for Phoenix to a high of $92.71 for San Francisco. LADWP's monthly bill is estimated at $59.32, $8.12 or 15.9% higher than the peer panel average. The average monthly bill for the peer panel utilities operating in the Los Angeles area[13] is $45.31, with a low of $28.01 for Riverside and a high of $73.80 for Glendale. LADWP's monthly bill is the second highest, $14.01 or 30.9% higher than the average.

Water rates are composed of multiple cost parameters that reflect capital expenditures driven by such things as regulatory mandates, water purchases, external or self-driven goals and infrastructure related programs, as well as the company's own operations. Identifying the exact sources for the disparities in monthly bills shown in the figure above would require a detailed and complex review of each peer panel company's cost structure. However, there is one rate driver that can provide an indication for the variance in monthly bills: the utility's water supply sources portfolio.

The water supply sources can be categorized as follows:[14]

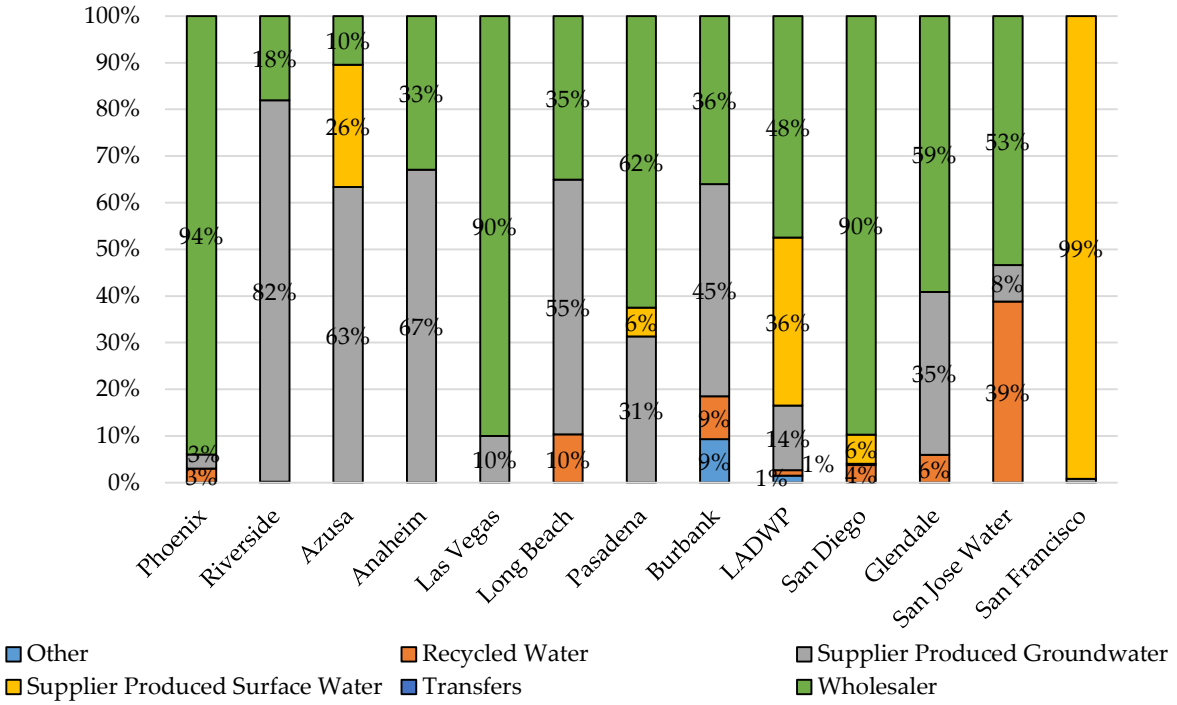
[13] Includes Riverside, Azusa, Anaheim, Long Beach, Pasadena, Burbank, LADWP and Glendale.

[14] The categories presented here reflect the categories used by the California Department of Water Resources (DWR) for the 2010 Urban Water Management Plan reports.

1. Wholesaler – Includes water purchased from a wholesaler. The largest water wholesaler operating in the California and supplying a large share of the water used in the State is MWD.
2. Supplier Produced Groundwater – Includes water directly pumped by the utility from underground water basins. This category excludes groundwater sold by another utility or agency.
3. Supplier Produced Surface Water – Includes water that is drawn from streams, lakes and reservoirs. Water from the Los Angeles Aqueduct (LAA) that is owned and operated by LADWP falls within this category.
4. Recycled Water – Includes water recycled by the utility.
5. Transfer – Includes water transferred from another utility or agency.
6. Other – Includes any other sources of water supply such as stormwater capture.

A summary of the peer panel companies' water sources portfolio is presented in Figure 5-2.

**Figure 5-2: Peer Panel Companies Water Sources Portfolio**




*Sources: California DWR website;[15] "2011 Water Resource Plan" – City of Phoenix Water Services Department; "Water Resource Plan 09 – Southern Nevada Water Authority."*
Note: The DWR has aggregated all relevant data from each California water agency 2010 Urban Water Management Plan, including their water supply sources.

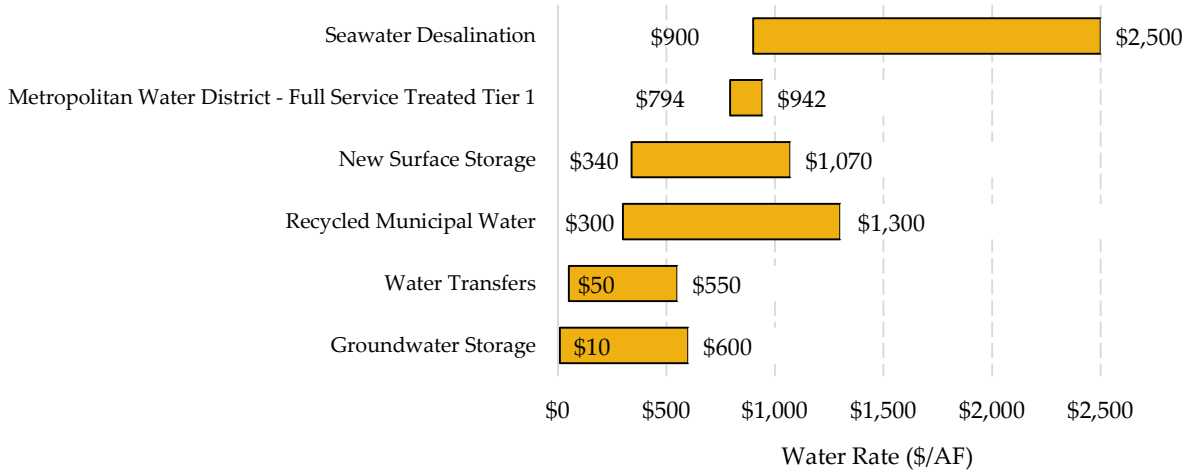
Figure 5-2 highlights that the two primary water sources for the peer panel companies are water purchased from a wholesaler and supplier produced groundwater.

[15] www.water.ca.gov/urbanwatermanagement/2010_Urban_Water_Management_Plan_Data.cfm

As shown in Figure 5-3, the cost difference between these two sources is significant, with groundwater representing a much more cost competitive option. The Public Policy Institute of California refers to groundwater storage as "one of the least expensive ways to make water available".[16] They estimate groundwater storage costs between $10/AF and $600/AF while MWD rates for Full Service Treated Water Tier 1 range from $794/AF in 2012 to $942/AF in 2016.

Therefore, water utilities with the largest share of groundwater in their supply portfolio should be expected to have the lowest monthly bills. This is confirmed by the findings of the Study as Riverside, Azusa, and Anaheim have the largest share of groundwater in their portfolio and the lowest residential bills, among the peer panel companies operating in Southern California.

**Figure 5-3: Rates by Water Sources in California**




*Sources: California's Water Market, By the Numbers: Update 2012; MWD website.*[17]
Note: The price range corresponds to the change in Tier 1 Full Service Treated Volumetric Cost between 2012 and 2016.

LADWP's share of groundwater is relatively small when compared to the other peer panel companies operating in the Los Angeles area, which is one of the reasons why the Department does not compare favorably for this Study. However, the primary factor influencing LADWP's water bill is its reliance on purchased water: MWD water purchases represent nearly half of the Department's water supply portfolio. Therefore, large and expensive water purchases lead to greater water rates for LADWP.

While MWD pricing is outside the direct control of the Department, LADWP is addressing this cost driver through large investments in its local water supply, which will reduce its reliance on MWD. The Department is planning on cutting in half its MWD water purchases by 2024 through increased conservation, recycled water, stormwater capture and is actively working on the rehabilitation of the San Fernando groundwater basin.

LADWP rates can fluctuate significantly from a dry year to a wet year due to the variation in water supply from the LAA. LADWP owns this water supply, and the associated costs are much lower than

[16] "California's Water Market, By the Numbers: Update 2012" by the Public Policy Institute of California.
[17] www.mwdh2o.com/WhoWeAre/Management/Financial-Information/Pages/default.aspx#tab2.

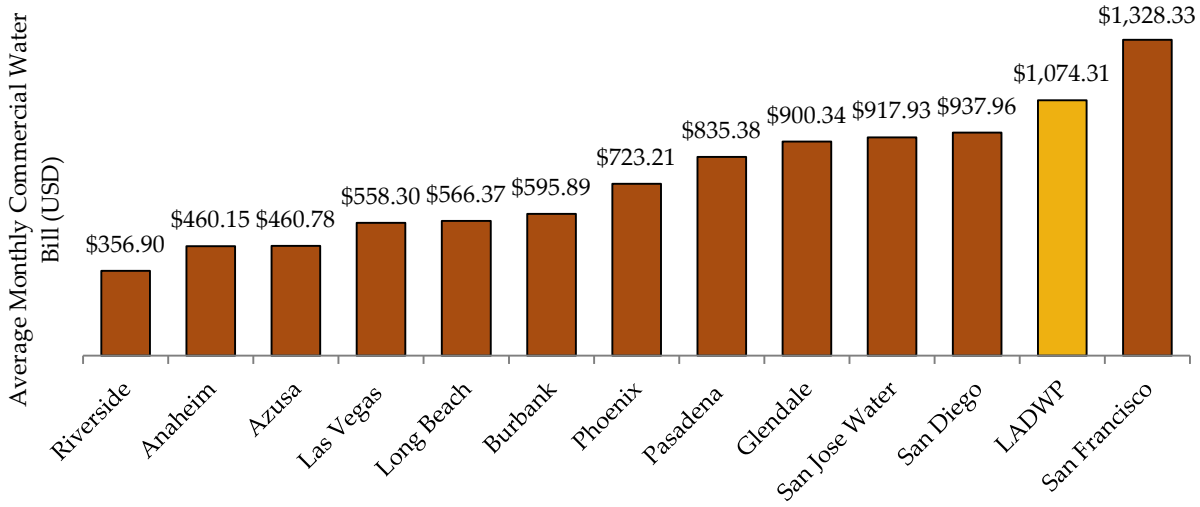
the costs of purchasing water from MWD. The data shown in Figure 5-2 reflect a year of normal precipitations when the Department should receive 36% of its water supply from the LAA. However, in drought years LADWP will rely for the most part on imports from MWD, which will trigger significant rate increases. LADWP ratepayers have experienced higher rates than usual since the beginning of the drought in California (Fiscal Year 2012/2013) for that particular reason. Note that this issue impacts all the utilities of the peer panel, as they need to address the rate impacts of varying weather-dependent water supplies.

Another key rate driver is the age of the infrastructure. Some utilities in the peer panel, such as Phoenix, Riverside and Las Vegas benefit from a newer infrastructure with flatter terrains and likely have fewer leaks and breaks per mile, lower overall O&M cost due to fewer pumping needs and fewer pressure zones. In addition, they currently are not confronted with the significant capital expenditures the Department faces to replace its aging infrastructure. Further, the City of Phoenix, which has the lowest bill, receives most of its water from the Salt River Project (SRP) and the Central Arizona Project (CAP), two wholesalers that have significantly lower rates than MWD. The combination of cost competitive purchased water and newer infrastructure yield much lower rates for Phoenix when compared to the peer panel companies, and LADWP in particular.

## *5.2 Commercial Customers*

The results from the water rates benchmarking study for commercial users are presented below. These results reflect the Medium Usage Scenario, which considers a water consumption of 200 HCF per month, using a 1.5" size meter.

**Figure 5-4: Average Monthly Commercial Water Bill - Medium Usage Scenario (200 HCF/mo – 1.5" meter)**



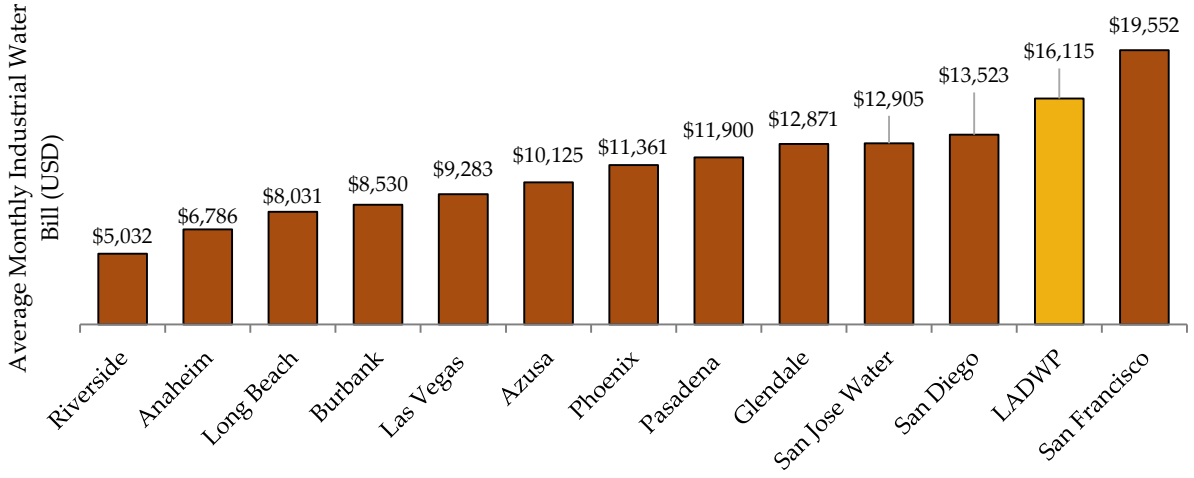

The peer panel average monthly bill is $747.47, and monthly bills range from a low of $356.90 for Riverside to a high of $1328.33 for San Francisco. Consistent with the findings for the residential rates benchmarking, San Francisco has the highest bill. However, Phoenix, who has the lowest residential rates, is now very close to the peer panel average at $723.21, $366.31 or 102.6% higher than Riverside.

LADWP's monthly bill is estimated at $1074.31, $326.94 or 43.7% higher than the peer panel average. LADWP commercial bill is the second highest of the peer panel and the highest of the utilities operating in the Los Angeles area. The average monthly bill for the peer panel utilities operating in the Los Angeles area[18] is $656.26 with LADWP's monthly bill $418.05 or 63.7% higher than the average.

## *5.3 Industrial Customers*

The water rates benchmarking study conducted for industrial customers is presented below. These results reflect the Medium Usage Scenario, which considers a monthly water consumption of 1,000 HCF, using a 4" size water meter.

**Figure 5-5: Average Monthly Industrial Water Bill - Medium Usage Scenario (3,000 HCF/mo – 3" meter)**




The utilities ranking shown in Figure 5-5 is pretty similar to the ranking for commercial customers, as most of the peer panel companies have very comparable commercial and industrial water rate structures. The peer panel average monthly bill is $11,231.78, and monthly bills range from a low of $5032.23 for Riverside to a high of $19,551.51 for San Francisco. Consistent with the findings for the commercial rates benchmarking study, Riverside and San Francisco have the lowest and highest bills, respectively.

LADWP's monthly bill is estimated at $16,114.65, $4,882.87 or 43.5% higher than the peer panel average. LADWP industrial bill is the second highest of the peer panel and the highest of the utilities operating in the Los Angeles area. The average monthly bill for the peer panel utilities operating in the Los Angeles area[19] is $9,923.68 with LADWP's monthly bill $6,190.98 or 62.4% higher than the average. LADWP's high industrial water bill could be considered by high water use industrial customers as an incentive to invest in water-saving technologies or to relocate their operations where water supplies are more abundant and less costly.

[18] Includes Riverside, Azusa, Anaheim, Long Beach, Pasadena, Burbank, LADWP and Glendale.
[19] Ibid.

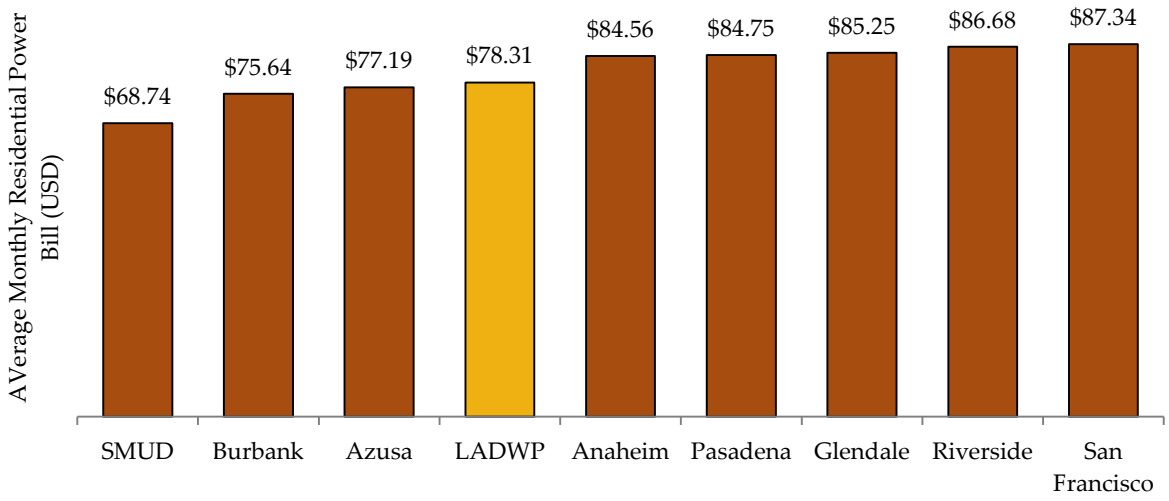
# 6. Electric Rates Benchmarking

This section of the report presents the electric rates benchmarking findings for Power Peer Panel A and Power Peer Panel B. It includes monthly power bill comparisons for residential, commercial and industrial customers for both power peer panels – findings related to Power Peer Panel A are presented first - and provides insights with regards to key electric rate drivers.

## *6.1 Residential Customers*

The results from the electric rate benchmarking study for residential customers are presented below. These results reflect the Medium Usage Scenario, where residential customers consume 500 kWh per month.

**Figure 6-1: Average Monthly Residential Power Bill - Medium Usage Scenario (500 kWh/mo) – Power Peer Panel A**

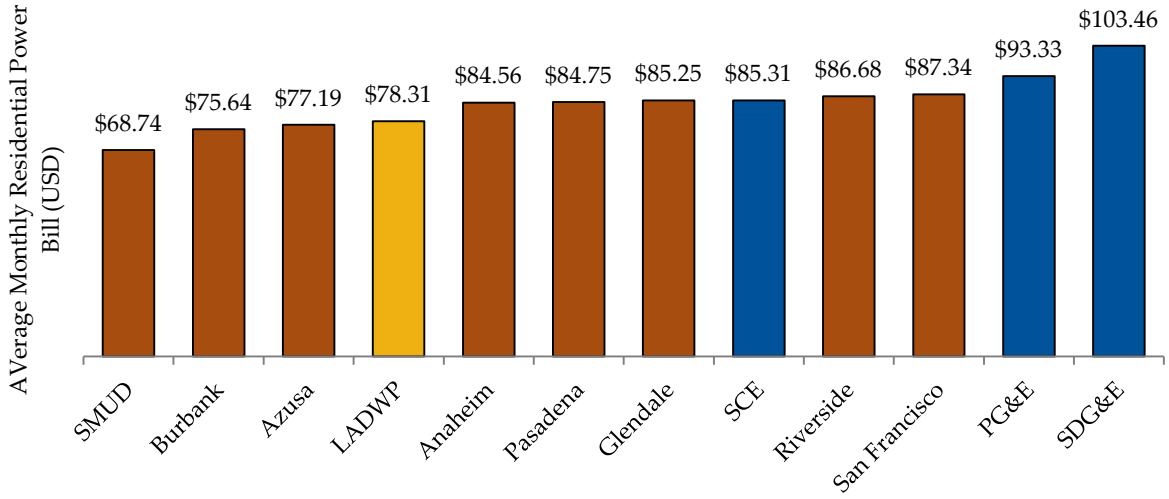



The Power Peer Panel A average monthly bill is $80.94, and monthly bills range from a low of $68.74 for SMUD to a high of $87.34 for San Francisco.

LADWP's monthly bill is estimated at $78.31, representing a $2.63 or 3.3% discount compared to the peer panel average. The average monthly bill for the peer panel utilities operating in the Los Angeles area[20] is $81.77, with a low of $75.64 for Burbank and a high of $86.68 for Riverside. LADWP's monthly bill represents a $3.46 or 4.2% discount relative to the Los Angeles area average.

[20] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside and Anaheim.

**Figure 6-2: Average Monthly Residential Power Bill - Medium Usage Scenario (500 kWh/mo) – Power Peer Panel B**



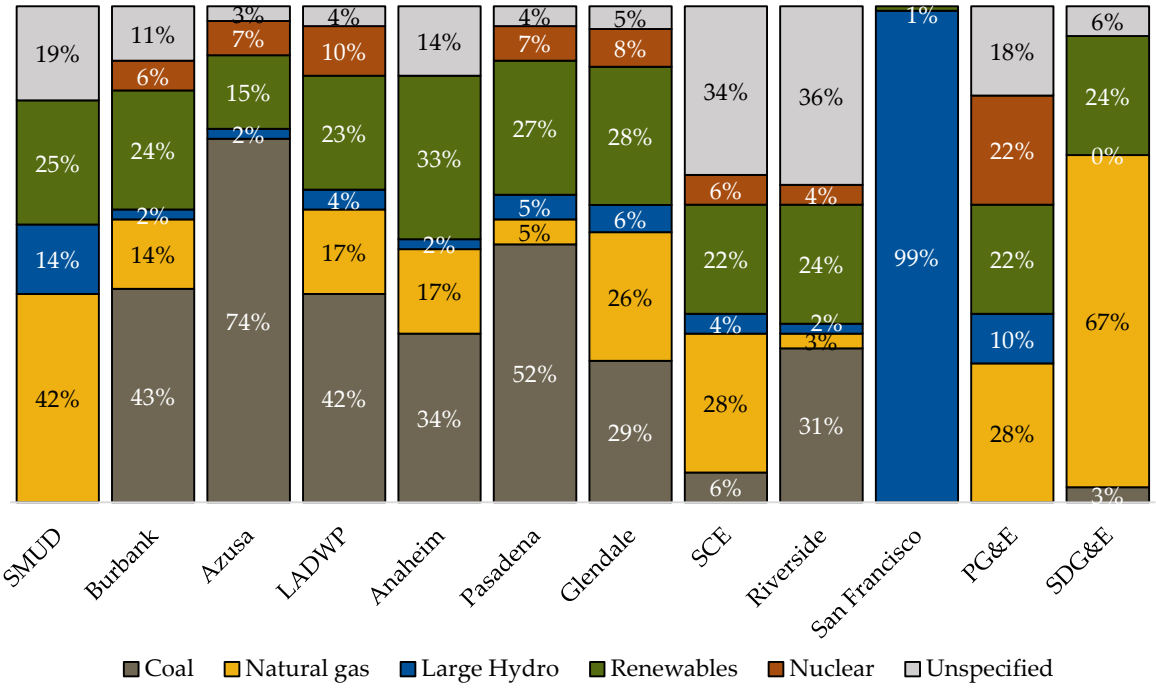

As anticipated, the California IOUs are among the most expensive utilities and raise the average monthly bill of the peer panel. The Power Peer Panel B average monthly bill is $84.21, and monthly bills range from a low of $68.74 for SMUD to a high of $103.46 for SDG&E. LADWP's monthly bill compares more positively than in Power Peer Panel A, representing a $5.91 or 7.0% discount compared to the average for Power Peer Panel B. The average monthly bill for the peer panel utilities operating in the Los Angeles area[21] is $82.21, with a low of $75.64 for Burbank and a high of $86.68 for Riverside. LADWP's monthly bill represents a $3.91 or 4.8% discount relative to the Los Angeles area average.

Similar to water rates, power rates are driven by a variety of cost parameters that are specific to each utility and identifying the exact sources of the disparities in monthly bills shown in Figure 6-1 would require a detailed and complex review of their cost structure. However, the utility's generation mix can provide a reasonable indication for the variance in monthly bill levels.

A utility's generation mix represents the share of energy generated by the company's generating technologies (or energy resources) used to meet its electricity demand in a given year. Figure 6-3 and Figure 6-4 below present the overall generation and renewable generation mix of the peer panel companies, respectively.

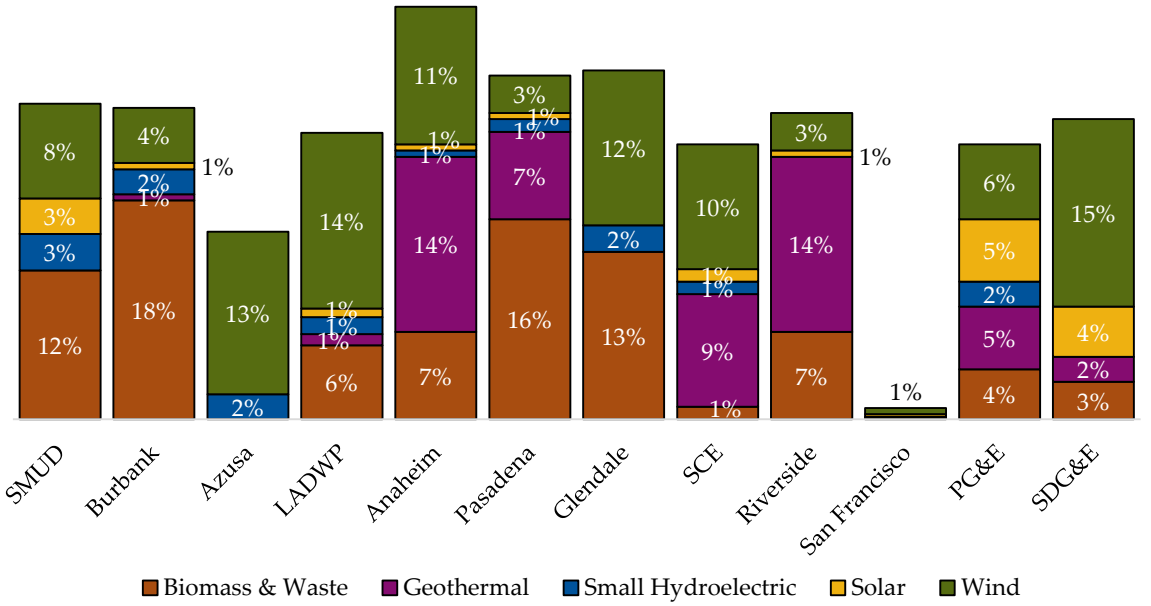
[21] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside, Anaheim and SCE.

**Figure 6-3: Peer Panel Generation Mixes (2013)**




*Source: California Energy Commission website (www.energy.ca.gov/sb1305/labels/index.html).*

**Figure 6-4: Peer Panel Renewables Generation Mixes (2013)**



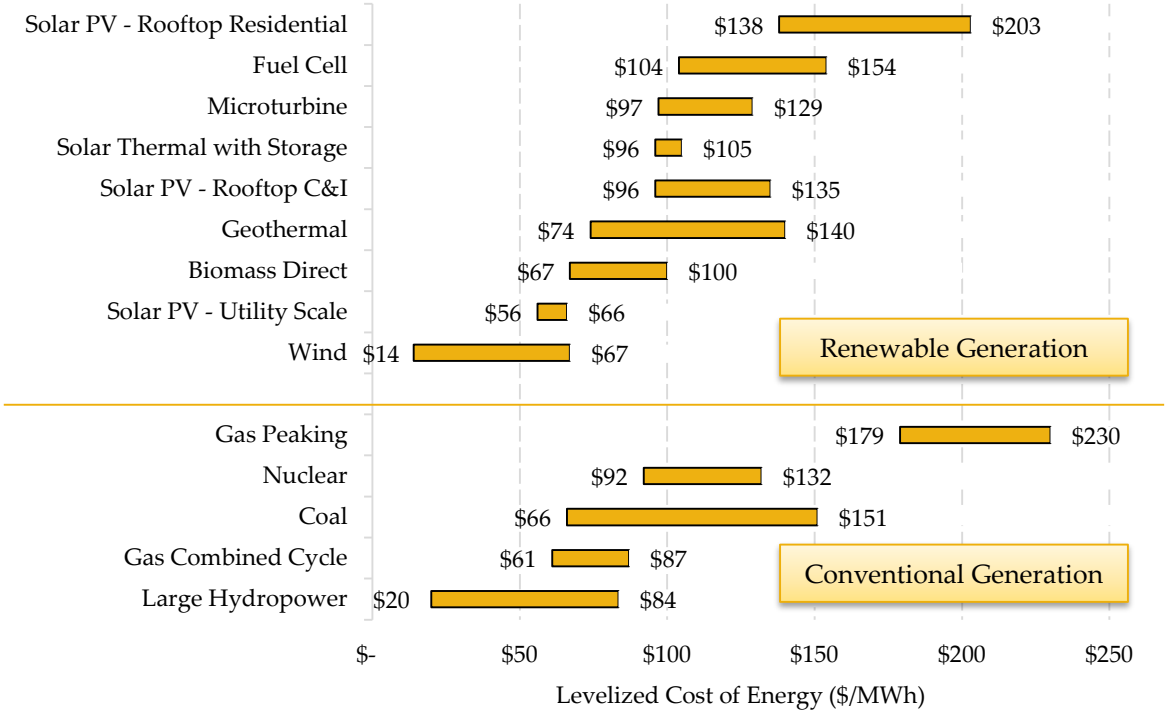

*Source: California Energy Commission website (www.energy.ca.gov/sb1305/labels/index.html).*

Figure 6-3 and Figure 6-4 highlight significant differences among the peer panel companies generation mix. These changes in generation mix combined with large generating technologies cost disparities can justify the differences in monthly bill levels observed in Figure 6-1.

The measure used to represent the life cycle cost of a particular generating technology is referred to as the levelized cost of energy (LCOE). The LCOE is often used to compare the competitiveness of different generating technologies and reflect the costs of building and operating a power plant over its life cycle.

Figure 6-5 presents LCOE ranges for typical generating technologies and shows that the three least expensive conventional generating technologies are hydropower, gas combined cycle and coal power plants, with wind, utility scale solar PV and biomass representing the most cost competitive renewable options. A utility using a significant share of one, or a combination of these lower cost generating technologies should be expected to have competitive rates.

**Figure 6-5: LCOE by Generating Technologies ($/MWh) [22] [23]**




The residential rates benchmarking study showed that SMUD has the lowest residential monthly bill of the peer panel. This finding could be explained by a large share of its energy being generated by hydropower plants (14%), natural gas fired plants (42%) and a large share of cost competitive renewable energy (12% biomass and waste, and 8% wind). On the other end, Riverside's relatively high residential

[22] Data Source: "Lazard's Levelized Cost of Energy Analysis – Version 8.0". The renewable generation LCOEs are inclusive of the U.S. Federal Investment Tax Credit and Production Tax Credit.

[23] The large hydropower LCOE estimate was derived from data included in a 2010 Navigant LCOE study and the U.S. Energy Information Administration "Levelized Cost and Levelized Avoided Cost of New Generation Resources" study included in the 2015 Annual Energy Outlook.

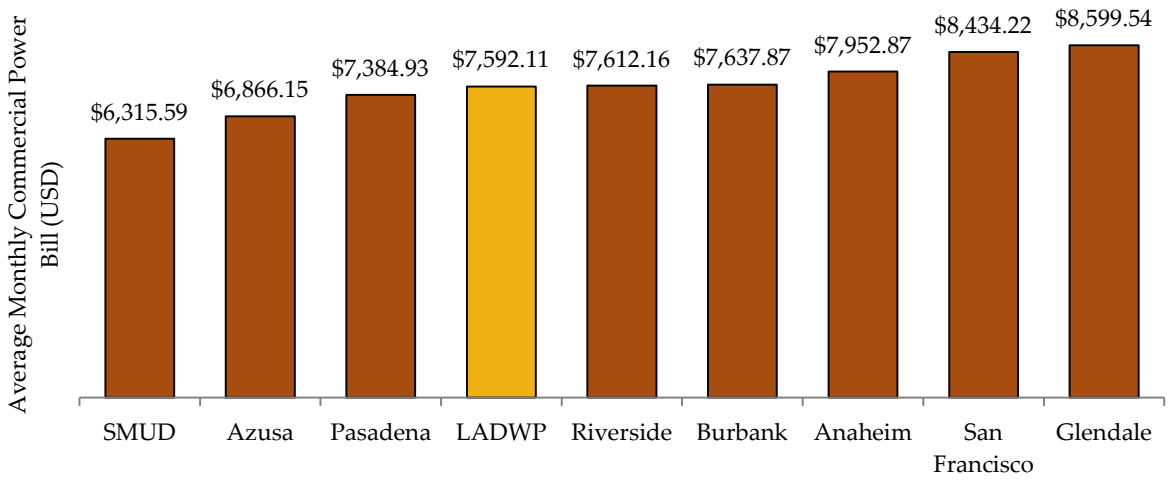
bill could be driven by the fact that it has the largest share of geothermal energy among the peer panel companies, which is the most costly utility scale renewable resource according to Figure 6-5.

Figure 6-3 highlights that utilities with a large share of coal in their generation mix tend to have the lowest monthly bills. This is especially true for the Department which currently benefits from low cost electricity generated by the Navajo and IPP coal power plants[24]. To meet environmental goals and regulation, LADWP will transition from coal to natural gas within the next 10 years and will significantly increase its share of energy generated through utility scale solar PV. While this strategy is in line with LADWP's and the City's environmental goals and supported by the relatively low LCOE associated with these two generating technologies, the transition from coal to natural gas will come at a cost to LADWP's ratepayers since the new gas-fired capacity replacing the Navajo and IPP coal power plants will not be as economical.

## *6.2 Commercial Customers*

The results from the electric rates benchmarking study for commercial customers is presented next. These results reflect the Medium Usage Scenario representing a 150 kW demand and 50,000 kWh monthly energy usage.

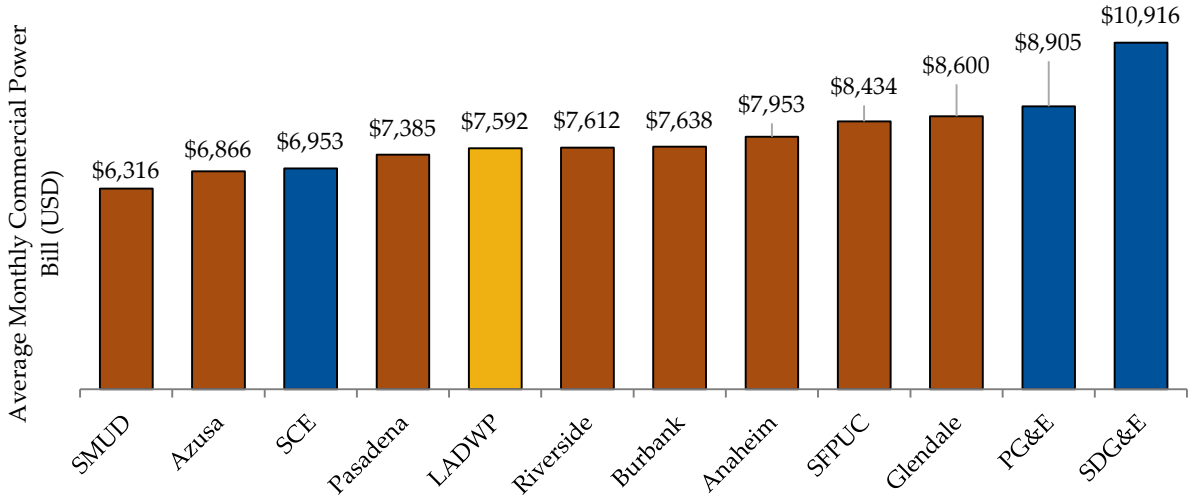
**Figure 6-6: Average Monthly Commercial Power Bill - Medium Usage Scenario (150 kW – 50,000 kWh/mo) – Power Peer Panel A**




The Power Peer Panel A average monthly bill is $7,599.49, and monthly bills range from a low of $6,315.59 for SMUD to a high of $8,599.54 for Glendale. Similar to the findings for the residential electric rates benchmarking, LADWP compares favorably against most of the peer panel companies. LADWP's monthly bill is estimated at $7,592.11, representing a $7.39 or 0.1% discount compared to the peer panel average. The average monthly bill for the peer panel utilities operating in the Los Angeles area[25] is $7,663.66. LADWP's monthly bill represents a $71.55 or 0.9% discount relative to the Los Angeles area average.

[24] LADWP has finalized the sale of the Navajo Generating Station but is entitled to power from the plant until July 1, 2016, and is planning on divesting from IPP by 2025 according to the Department's 2014 Integrated Resource Plan.
[25] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside and Anaheim.

**Figure 6-7: Average Monthly Commercial Power Bill - Medium Usage Scenario (150 kW – 50,000 kWh/mo) – Power Peer Panel B**

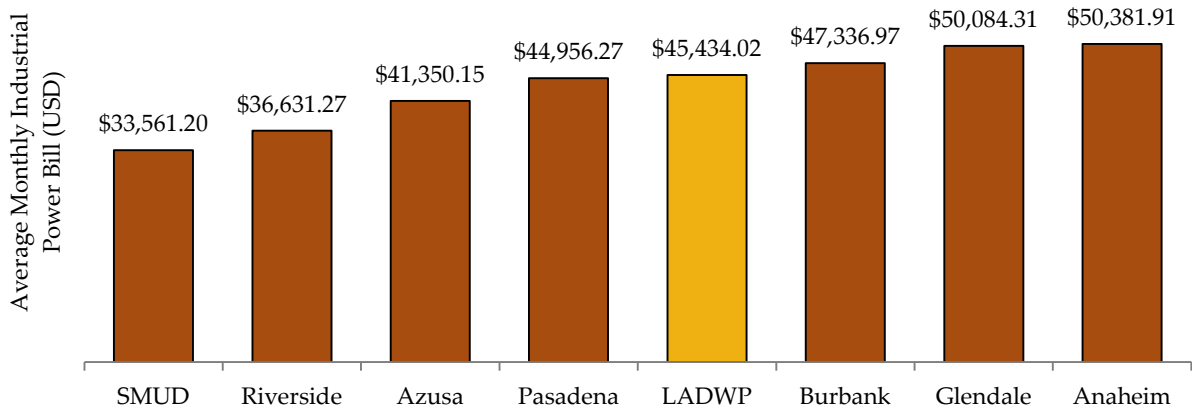



The Power Peer Panel B average monthly bill is $7,930.81, and monthly bills range from a low of $6,315.59 for SMUD to a high of $10,916.02 for SDG&E. LADWP's monthly represents a $338.70 or 4.3% discount compared to the peer panel average. However, when compared to the utilities operating in the Los Angeles area,[26] LADWP's monthly bill is slightly higher than the average of $7,574.86.

## *6.3 Industrial Customers*

The results for the electric rates benchmarking study for industrial customers are presented in Figure 6-8. This results reflect the Medium Usage Scenario, representing a 1000 kW demand and 300,000 kWh monthly energy usage.

**Figure 6-8: Average Monthly Industrial Power Bill - Medium Usage Scenario (1000 kW – 300,000 kWh/mo) – Power Peer Panel A**

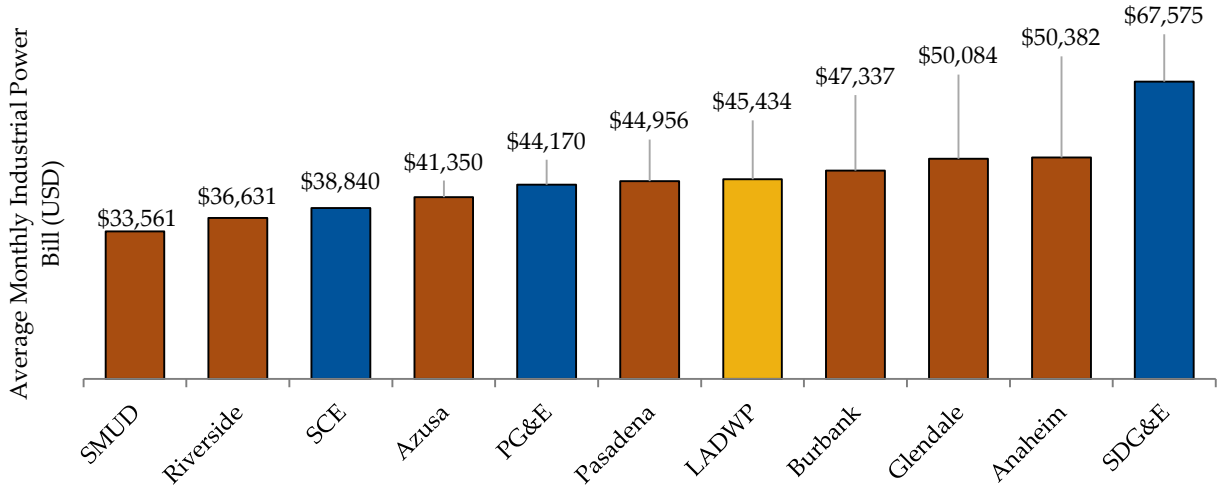



Note: SFPUC does not have an electric rate schedule for customers with an electric demand greater than 200 kW. Therefore, San Francisco was excluded from Figure 6-8.

[26] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside, Anaheim and SCE.

The peer panel average monthly bill is $43,717.01, and monthly bills range from a low of $33,561.20 for SMUD to a high of $50,381.91 for Glendale. LADWP does not compares as favorably against the peer panel companies as it does for the residential and commercial benchmarking. The Department's monthly bill is estimated at $45,434.02, representing a $1,717.01 or 3.9% increase compared to the peer panel average. The average monthly bill for the peer panel utilities operating in the Los Angeles area[27] is $45,167.84. LADWP's monthly bill represents a $266.18 or 0.6% increase relative to the Los Angeles area average.

**Figure 6-9: Average Monthly Industrial Power Bill - Medium Usage Scenario (1000 kW – 300,000 kWh/mo) – Power Peer Panel B**




The average of the Power Peer Panel B monthly bill is $45,483.76, and monthly bills range from a low of $33,561.20 for SMUD to a high of $67,574.56 for SDG&E. The Department's monthly bill is on par with the peer panel, $49.74 or 0.1% below the average. The average monthly bill for the peer panel utilities operating in the Los Angeles area[28] is $44,376.92. LADWP's monthly bill represents a $1,057.10 or 2.4% increase relative to the Los Angeles area average.

[27] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside and Anaheim.
[28] Includes Burbank, Azusa, LADWP, Pasadena, Glendale, Riverside, Anaheim and SCE.

## 7. Rate Structure Design and Water and Power Conservation

As mentioned previously, Navigant has developed multiple usage scenarios in order to capture the impact of low, medium and high use of water and power on monthly bill levels. The rationale for this analysis was to identify differences in the way the peer panel companies' rate structure incentivize water and power conservation.

Figure 7-1 and Figure 7-2 present the variance in residential monthly bills between the low and high usage scenarios for water and power, respectively. The peer panel companies are ranked from top to bottom, with utilities at the top showing the largest bill variance. The rankings highlighted in Figure 7-1 and Figure 7-2 are comparable to the residential monthly bill rankings shown in Figure 5-1 and Figure 6-1: the higher the monthly bill for the medium usage scenario is, the higher the variance between high and low usage monthly bills will be. This is primarily due to the fact that the largest bill components of the peer panel companies are volumetric, therefore any differences in volumetric rates will be magnified as the customer usage increases, resulting in a significantly larger bill for high usage customers. These observation also apply to commercial and industrial bills.

Phoenix's residential water rates are the only major exception to this finding. Phoenix does not apply a volumetric charge to the first 6 HCF used in a month. Since 6 HCF was the usage threshold used for the low usage scenario, the monthly bill only included a fixed monthly fee and a fixed environmental charge. However, beyond 6HCF a volumetric charge is applied, triggering the large variance observed in bill levels between the high and low usage scenarios.

**Figure 7-1: Variance in Residential Monthly Bill Levels between Low and High Water Usage Scenarios**

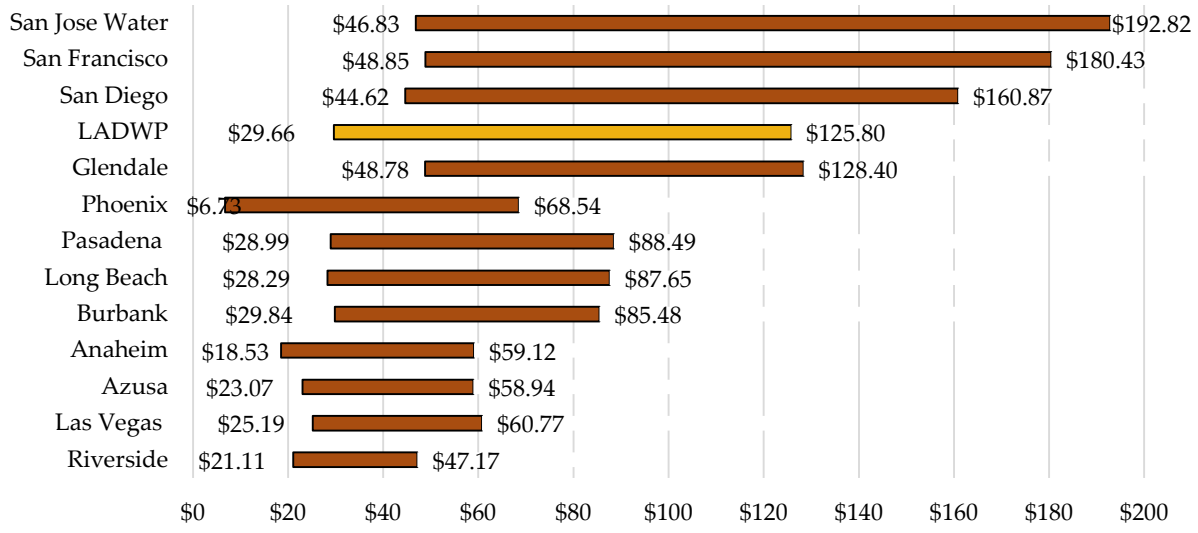
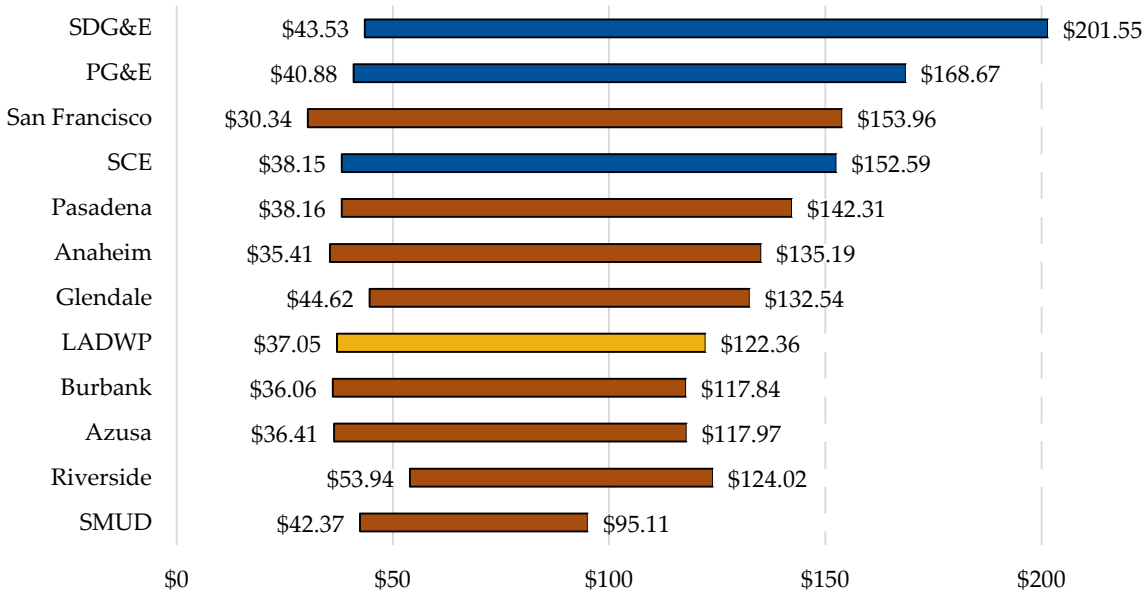


**Figure 7-2: Variance in Residential Monthly Bill Levels Between Low and High Power Usage Scenarios**



## 8. Conclusion

This benchmarking Study compared LADWP's monthly bills for power and water services, for the residential, commercial and industrial customer classes against three peer panels.

The study showed that LADWP's water rates are on the high end of the peer panel but are the lowest for residential customers among California major metropolitan providers. Drivers for LADWP's higher rates include its heavy reliance on costly MWD water purchases, greater O&M costs and capital expenditures required to maintain, repair and replace its aging infrastructure, and limited groundwater supply relative to the other peer panel companies. The Department is currently working on addressing its reliance on purchased water with a plan to cut in half their MWD water purchases by 2024 through increased conservation, recycled water, stormwater capture, and the on-going rehabilitation of the San Fernando groundwater basin.

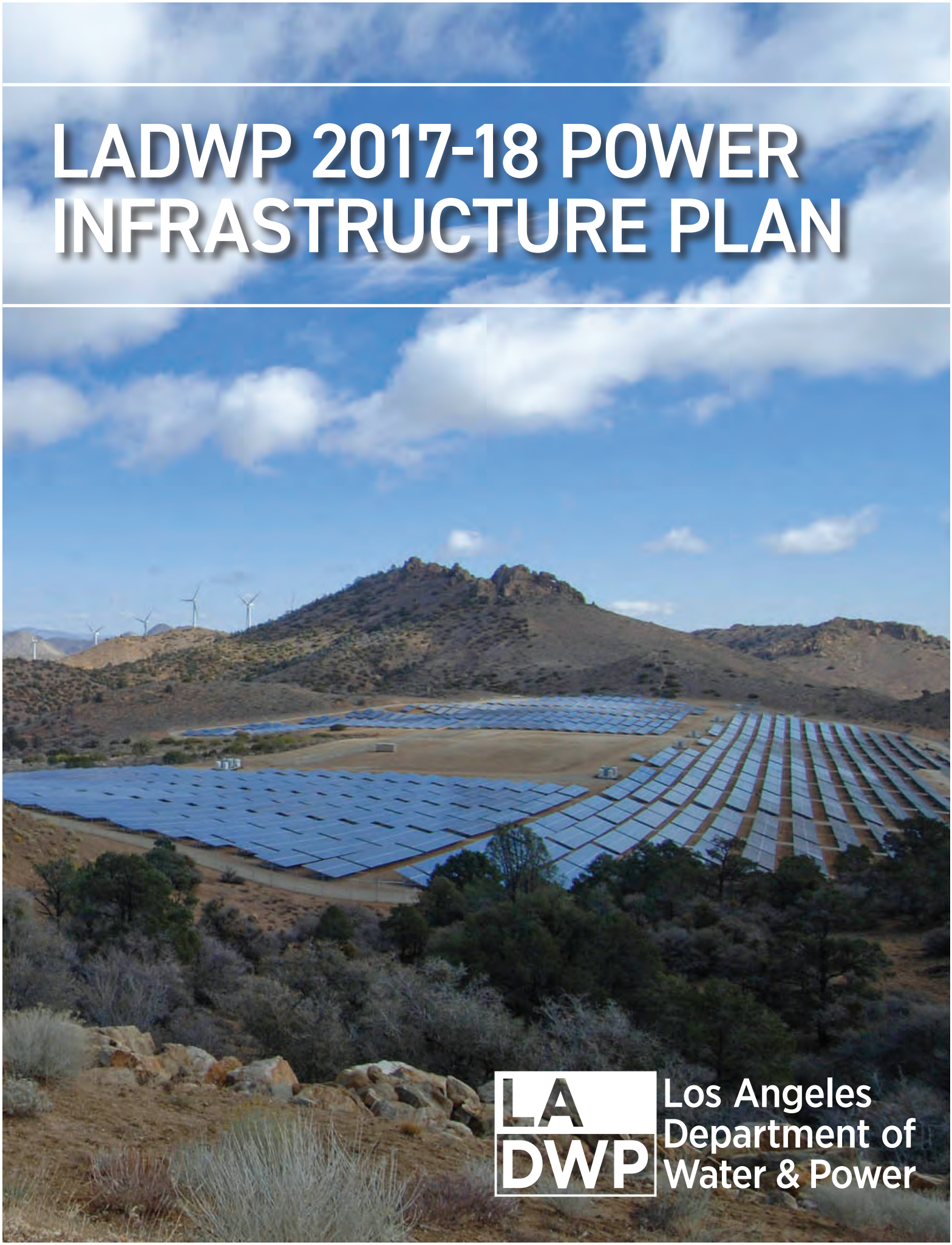
LADWP's power rates compared positively against those of the peer panel companies. However, nearly half of the Department's generation mix is currently sourced from the Navajo and IPP coal power plants, which represent a very cost competitive source of energy. To meet environmental goals and regulations, LADWP will be replacing coal through a combination of energy efficiency, renewable energy, and natural gas within the next 10 years. This transition will come at a cost to LADWP's ratepayers, mostly because the new gas-fired capacity replacing the Navajo and IPP coal power plants will not be as economical.

The assessment of LADWP's rate structures against those of the peer panel companies highlighted that the Department uses more complex rate structures than its peers. The power and water rate structures include a large number of rate adjustment factors, which can create some challenges for LADWP's ratepayers when trying to understand how their water and power bills have been developed.

While LADWP's rate structures appear quite complex, they appropriately support the City's and Department's water and power conservation goals. LADWP uses seasonal rates for both water and power and implemented shortage year water rates that incentivize their customers to limit their water and power usage.

The Study showed that the Department's rate levels are reasonable when compared to the peer panel, especially given LADWP's unique set of challenges related to its size and the characteristics of its service area. However, it is likely that the Department's rates will increase as it seeks additional funding to address current and new challenges, including the maintenance, repair and replacement of its aging infrastructure, the transition from coal to natural gas and the development of its local water resources. In the future, the Department's rates should be examined against the challenges and regulatory requirements it faces, while ensuring that they accurately reflect the costs of providing water and power supply services to its customers. Low rates are not a desirable goal if they are inadequate to provide the level of service required to meet the policy goals of the City of Los Angeles.

# LADWP 2017-18 POWER INFRASTRUCTURE PLAN



LA DWP Los Angeles Department of Water & Power



# Introduction

LADWP has built a vast power generation, transmission and distribution system that spans five Western states, and delivers electricity to about 4 million people in Los Angeles via thousands of miles of overhead conductors and underground cables. The Power Infrastructure Plan evaluates and prioritizes maintenance and replacement of major power infrastructure components. The infrastructure plan is part of the Power System's five-year capital plan, budgeted at $8 billion through fiscal year 2022.

## Overall Objectives

Improve reliability of Power System, including:

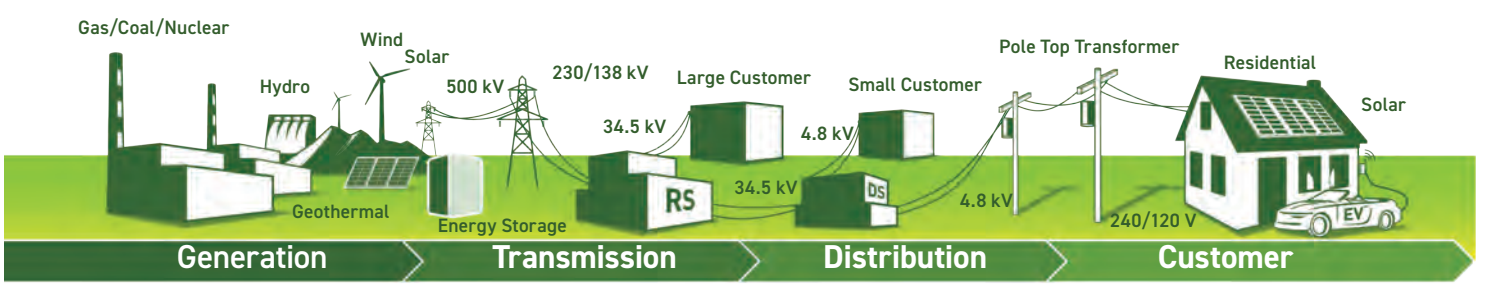
- Generation
- Transmission
- Substation
- Distribution

- Provide proactive replacement and maintenance
- Minimize operational and repair costs
- Standardize materials and processes

## Background

LADWP launched its initial Power Reliability Program after major heat storms in 2006 and 2007 caused widespread and prolonged power outages. The program targeted replacing overloaded transformers and other distribution equipment. Since then, LADWP has seen a 20% reduction in outages.

In fiscal year 2014-2015, LADWP introduced the broader Power System Reliability Program (PSRP), which encompasses generation, transmission, and substation equipment in addition to distribution equipment. This is especially important as new energy sources, such as wind and solar, are integrated into an aging infrastructure. As this power supply transformation unfolds, the PSRP offers a blueprint to safely improve and maintain future reliability for LADWP's customers.



# Generation

Generation assets are either wholly or jointly owned, providing a diverse portfolio of power that is supplemented by long-term power purchase agreements and spot market purchases. Of this, wholly owned and operated in-basin generation sources include:

- 29 units of thermal electricity (located at Harbor, Haynes, Scattergood, and Valley Generating Stations)
- 7 units of large hydro electricity (located at Castaic Power Plant)
- 22 units of small hydro electricity (located at 14 individual plants)
- 168 generation transformers

## Key Points:

- Inspections will determine the need for overhauls or replacements of generating units. Replacements are typically multi-year projects.
- LADWP has put a hold on plans to modernize existing thermal generating units that still use once-through-cooling (OTC) systems until completing an analysis of the current strategy. LADWP is required to eliminate the use of OTC under the federal Clean Water Act. See below for more information.
- 22 small hydroelectric units are performing beyond their design life of 50 years, which is a testament to the hard work of LADWP maintenance personnel. The Control Gorge generator ran until it failed, and was refurbished from January 2012 to September 2014.

## 2016-17 Achievements:

- Completed 3 major inspections (Big Pine Power Plant, Haynes Unit 14, Castaic Unit 2)
- Completed installation of Harbor units 10-14 dissolved gas-in-oil analyzers. These extend the lives of generating units by continually monitoring and sending data to notify operations of potential problems prior to catastrophic failure.

## 2017-18 Goals:

- Complete 18-month decommissioning of Scattergood Generation Station Unit 3.
- Complete third-party study to assess modernization strategy for remaining coastal generating units that still operate with OTC systems. Determine need for all or some of this generation to meet reliability requirements while also achieving OTC compliance.

## Long-Term Goals:

- Inspect 4 units of thermal generation, 1 unit of large hydro, 2 units of small hydro annually by 2020.
- Replace 2 generator step-up transformers and 2 generator station transformers annually by 2020.
- Complete modernization of all Castaic Power Plant units by 2018.

## Once-Through Cooling Study

To reduce the use of fossil fuel power and create a clean energy future for Los Angeles, an independent third-party analysis is underway to assess LADWP's current modernization strategy for the remaining thermal generating units that still operate with OTC systems at Scattergood, Haynes, and Harbor generating stations. LADWP is required to eliminate the use of OTC under the federal Clean Water Act, and has negotiated a schedule for compliance by the end of 2029. Results and recommendations from the OTC study are expected in summer 2018.

## Affected generating units and compliance deadlines:

- Scattergood GS - Units 1 and 2 by 2024
- Haynes GS - Units 1,2 and 8 by 2029
- Harbor GS - Unit 5 by 2029

## OTC Study Objectives:

- To reevaluate LADWP's OTC repowering strategy
- To study various combinations of repowering projects, and environmentally responsible alternatives, to ensure system reliability

## Timeline:

August 2018: Final report



# Transmission System

LADWP maintains 3,760 miles of overhead and underground transmission circuits that are part of a vast transmission system spanning five Western states. Of these, LADWP's wholly-owned and operated in-basin transmission network includes the following key components:

- 3,636 miles of overhead circuits (115 kV to 500 kV)
- 124 miles of underground circuits (138 kV to 230 kV)
  - → Includes 9 low pressure oil-filled (LPOF) circuits
- 15,452 towers
- 506 maintenance holes (138 kV)
- 154 maintenance holes (230 kV)
- 1,293 joints (138 kV)
  - → Includes 213 LPOF cable stop joints

## Key Points include:

- Priorities for replacements are based on inspections and outage history.
- Inspection of transmission towers is currently done on a one-year to five-year basis, depending on criticality.
- Existing 230 kV underground circuits have a high degree of reliability for the next 20 years.
- The 138 kV LPOF cable was originally placed in service in 17 circuits from 1943 to 1959. These 17 circuits are considered critical for replacement due to increasing outages.
- LADWP is also eliminating the problem of stop joint failures on these circuits by rebuilding the lines with synthetic cable.

## 2016-17 Achievements:

- Replaced 5.5 circuit-miles of 138 kV LPOF cable identified for replacement.
- Replaced 2 more 138-kV LPOF cable stop joints.
- Retrofitted 28 maintenance hole covers with restraints.
- Reached 90% completion milestone on 12-mile Scattergood-Olympic Cable A

## 2017-18 Goals:

- Replace 2 138-kV underground transmission circuits
- Replace 36 maintenance hole restraints

## Long-Term Goals:

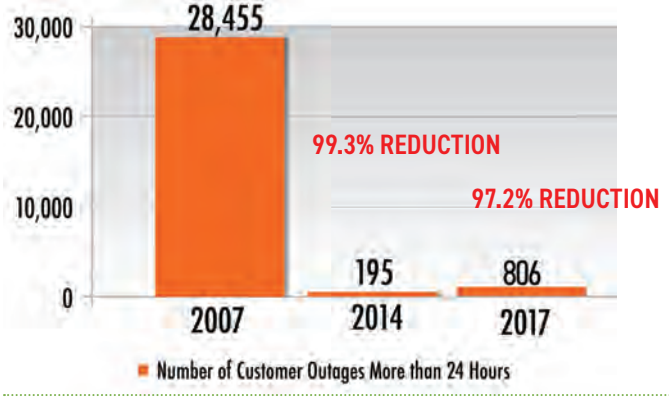
- Replace up to 30 circuit-miles of 138 kV LPOF cable annually with goal of replacing all by 2021.
- Replace 15 LPOF cable stop joints annually; continue to identify those needing replacement.
- Ramp up to 40 maintenance-hole cover restraints per year by 2020, with the goal of retrofitting the remaining maintenance hole covers in 6 years. After FY2016-17 goals were met, 164 have been completed, 198 more will be installed, and 152 do not need restraints.
- Put in place a multi-year painting contract for the 1,400 wholly-owned in-basin galvanized steel transmission towers.
- Upgrade the land and marine cable portion of the Pacific DC Intertie by 2018.
- Install Castaic to Haskell Line 3 by 2019.
- Upgrade 115 kV Power Plant 1 & 2 Line to 230 kV by 2023.

# Benefits of Proactive Infrastructure Replacement

Planned and sustained infrastructure replacement is both a cost-efficient and highly effective approach to maintaining reliability.

This is clearly evident when comparing the outages experienced by customers during the 2007 heat storm with similar heat storms in 2014 and 2017, following a period of sustained investment in infrastructure replacement. As a result of planned infrastructure replacement, customer outages lasting over 24 hours were reduced by 99.3% during the 2014 heat storm and by 97.2% during the 2017 heat storm when compared to the 2007 heat storm.

**Comparison of 2007 and 2014 Heat Storms:**




## Control Gorge Power Plants

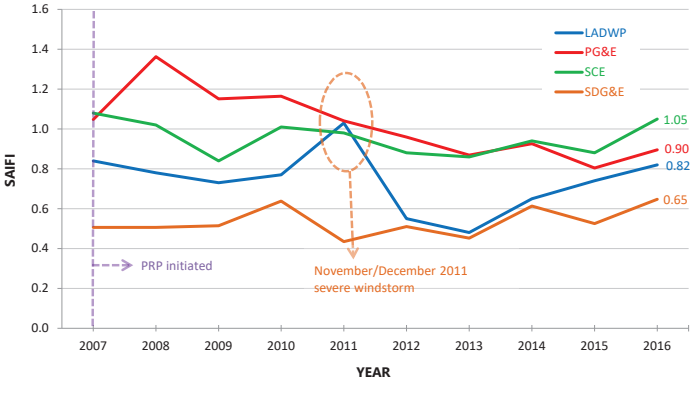
Another example of the benefits of proactive maintenance involves the Control Gorge Power Plant, one of three small hydro plants in the Owens Gorge. Due to funding constraints, LADWP had deferred scheduled maintenance on the plant. When the plant malfunctioned, a forced outage required the same amount of work but on an emergency basis at a higher cost.

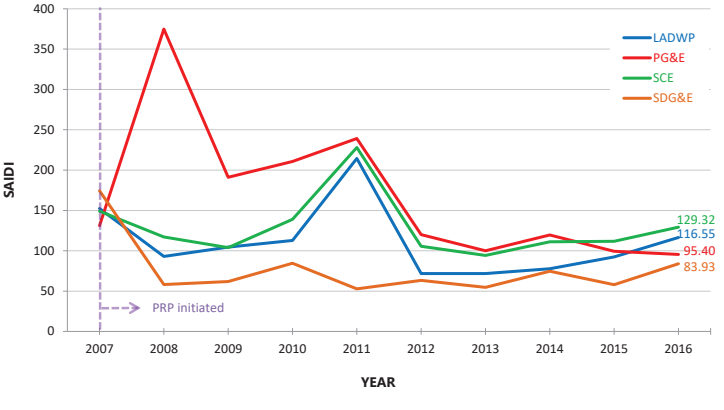


# Reliability

LADWP's Power System reliability fares better when compared to most peer utilities in the state. However, outage levels in recent years have increased in terms of frequency and duration due to heat and rain storms, and additional investment is necessary to maintain the high reliability levels that our customers have relied upon for a century.

To track system performance, the electric utility industry has developed standard measures of reliability. SAIFI (system average interruption frequency index) represents the number of times the average LADWP customer experienced a sustained power Interruption (over five minutes) in a given year. SAIDI (system average interruption duration index) measures the number of minutes of sustained interruptions (in minutes) the average LADWP customer experienced in a given year.



# Distribution System

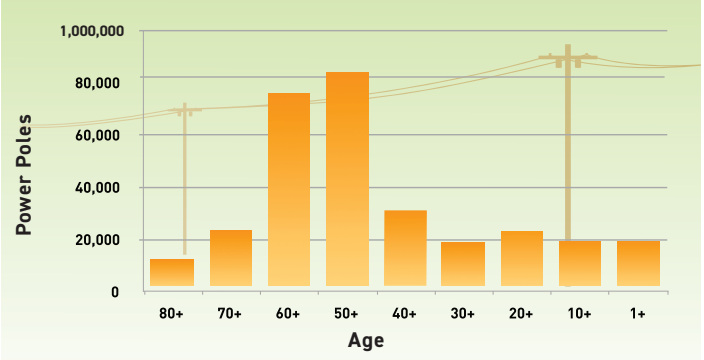
LADWP's distribution infrastructure is the backbone of the city's power grid and crucial for maintaining neighborhood power reliability. Key components include:

- 308,373 poles
- 1,287,120 crossarms
- 128,693 transformers
- 6,763 miles of overhead distribution lines
- 3,732 miles of underground distribution cables

## Key Points:

- There are over 60,000 "fix-it" tickets in the queue. These are job orders for permanent repairs on circuits that were repaired temporarily to resolve an outage, but need further engineering work, design or construction for long-term reliability.
- The challenges facing our distribution system vary by location. For example, higher temperatures in the San Fernando Valley have different effects on transformer performance as a function of age than in the coastal areas.
- Infrared inspections are utilized in overhead and underground distribution systems to identify potential failure points.
- Key distribution infrastructure targeted for replacement include poles, crossarms, transformers, and cables. Inspections identify recommended repairs or replacements. Priorities for each component are based on:
  - Poles – age and pole condition
  - Crossarms – inspections and existing work
  - Transformers – trouble call logs, engineering overload assessments, and inspections
  - Cables – cable type and availability, outage record performance, age and location
- Other criteria for prioritization are:
  - Annual worst-performing circuits
  - Abnormal circuits
  - Outage records
  - Engineering and field crew inspections

The graph below shows the majority of LADWP poles were installed in the 1940s through 1960s. Over 65% of poles are at least 50 years old. More than 40% are older than 60 years, which is the average lifespan of a pole. LADWP needs to increase its investment in repair and replacement of aging poles and other components of the power distribution system.




## 2016-17 Achievements:

- Replaced 2,656 poles
- Replaced 7,064 crossarms
- Replaced 919 transformers
- Replaced 39 miles of lead & synthetic cables (this includes the 8.5 miles replaced from the Pacific Intertie Ground Return)
- Resolved 9,001 "fix-it" tickets

## FY 2017-18 Goals:

- Pole replacement: 3,000 poles (up from 2,500)
- Underground cable replacement: 48 miles (same as FY 16-17)
- Crossarm replacement: 10,000 crossarms (up from 7,000)
- Distribution transformer replacement: 800 transformers (up from 700)

## Long-Term Goals:

- Replace 4,000 poles, 10,000 crossarms, 800 transformers, 55 miles of lead and synthetic cables annually by 2020.
- Ramp up to resolve an additional 5,000 "fix-it" tickets annually to reduce backlog to an acceptable level of 2,000 in 10 years.

# Substations

Transformers and circuit breakers are considered the most critical assets within the LADWP Power System's 3 converter stations (CS), 13 switching stations (SS), 8 switchyards (SY) 22 receiving stations (RS), 127 distributing stations (DS), and 50 pole-top distributing stations. Keeping thousands of transformers and circuit breakers functioning at their best is at the heart of substation reliability.

Key components include:

- 86 transmission level transformers (RS, SS, CS, and SY)
- 100 sub-transmission level load bank transformers (RS)
- 933 distribution level load bank transformers (DS)
- 612 transmission level substation circuit breakers (RS)
- 2,373 34.5 kV sub-transmission level circuit breakers (RS and DS)
- 2,946 4.8 kV distribution circuit breakers (DS)

## Key Points:

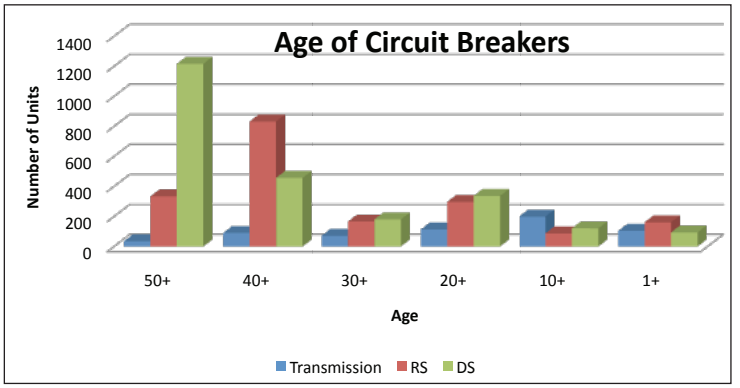
- LADWP prioritizes which substation transformers to replace based on specialized tests (e.g. dissolved gas and furan analysis), critical location, and age.
- Priorities for circuit breaker replacement are based on outage history, maintenance record, and location.
- Circuit breakers have a 30-year design life but many are older than that. The median age of substation transmission circuit breakers is 16 years old; the RS circuit breaker median age is 44 years old; and the DS circuit breaker median age is 49 years old, underscoring the need to ramp up investment in replacing critical infrastructure.

## 2016-17 Achievements:

- Replaced 4 525-kV reactors
- Replaced 3 sub-transmission level load bank transformers (RS)
- Replaced 6 distribution load bank transformers (DS)
- Replaced 8 (3 RS, 5 DS) 34.5 kV circuit breakers (RS and DS)
- Replaced 5 4.8 kV circuit breakers (DS)

## FY 2017-18 Goals:

- Replace 2 transmission level transformers (RS, SS, CS, SY)
- Replace 2 sub-transmission level load bank transformers (RS)
- Replace 13 distribution level load bank transformers (DS)
- Replace 16 (5 RS, 11 DS) sub-transmission level circuit breakers (RS, DS)
- Replace 28 distribution level circuit breakers (DS)




- Automate 12 substations
- Replace 40 industrial and customer station transformers

## Long-Term Goals:

- Install 1 400MVA transmission level spare bank by 2022
- Replace 1 converter transformer by 2019
- Replace 14 transmission level substation circuit breakers by 2022 (RS, SS, CS, SY)
- Replace 2 high side transformers (RS), 1 load side transformer (RS), 18 local substation transformers, 6 substation transmission circuit breakers, 20 circuit breakers (RS), 40 circuit breakers (DS) and automate 12 substations annually by 2020.
- Standardize major assets such as transformers and circuit breakers within each substation to allow for more efficient maintenance, inventory of spare parts, and training of personnel.
- Renovate aging substations and construct new facilities to accommodate load growth and maintain reliability.
- Automate all substations in the next 20 years to improve operational capabilities and communications while reducing operation and maintenance costs.
- Replace Sylmar Converter Station filters by 2020.



LA DWP Los Angeles Department of Water & Power

**LADWP is the nation's largest municipal electric utility, and supplies over 26 million megawatt-hours each year to approximately 1.5 million electric service connections in Los Angeles as well as 5,000 customer connections in the Owens Valley.**

## Infrastructure

### Transmission

3,636 miles of overhead circuits (AC and DC)

124 miles of underground circuits

15,452 transmission towers

### Distribution

6,763 miles of 4.8 kV and 34.5 kV overhead lines

3,732 miles of 4.8 kV and 34.5 kV underground cables

177 substations

308,373 poles

128,693 transformers



/LADWP @LADWP LADWP1 /LADWP1 /LADWP

www.ladwp.com

NEWS + POLITICS

# Dramatic new study questions transit-oriented development

## UC Berkeley scholars say market-rate infill housing can cause displacement and undermine the goal of reducing car use

BY TIM REDMOND - APRIL 18, 2017

The supes decided today to once again delay a decision on the 117-unit luxury condo project at 2675 Folsom, as the developer and community leaders continued to meet to see if there could be some kind of a deal.

At the same time, a new study by researchers at the University of California takes a hard look at the role so-called "transit-oriented development" plays in displacement, particularly in places like the Mission.




*Mission residents take over City Hall to demand an end to displacement*

The study doesn't make dense new market-rate housing in the neighborhood look like such a good idea.

The March 24 study, led by Karen Chapple, a professor of City and Regional Planning at UC Berkeley, runs about 400 pages and is packed with complex economic data. It takes a long time to read, and like many academic reports, is cautious about its conclusions.

But it makes a few remarkable statements that are not generally part of the San Francisco City Planning Department's analysis of housing development.

"This study," Chapple writes, "produces the strongest evidence to date of the relationship between transit-oriented development and displacement."

Chapple is not a radical anti-development type. The report is nuanced, and carefully stops short of opposing market-rate housing in transit corridors. It's full of the sort of language these papers often have — the data is not always conclusive, more work needs to be done, some regions are different than others. Yep. This is complicated.

But there are some facts on the ground that we need to discuss.

The study was funded by the California Air Resources Board as part of the state's effort to figure out how to cut greenhouse gases – in part by cramming a lot more dense housing into urban areas with good transit access.

The problem, of course, is that a lot of that development will go into areas that have existing vulnerable populations – and if it's done wrong, which it often is, the study notes that those populations will be forced out:

> *Overall, we find that TOD has a significant impact on the stability of the surrounding neighborhood, leading to increases in housing costs that change the composition of the area, including the loss of low-income households.*

The study doesn't say that transit-oriented development always displaces people; in detailed studies of Los Angeles and the Bay Area, it concludes that sometimes gentrification is caused by other factors, and development isn't the only reason for it.

But it notes that:

> *TOD tracts in the Bay Area are changing more in the direction of gentrification than non-TOD tracts.*

There's a good reason for that:

> *The reduction in transit costs is also thought to increase land values.*

That discussion was entirely missing from the debate around the Google buses. Sure, the buses get cars off the road, which is good. But they also make housing along the routes that they serve much more desirable to people who work in tech companies on the Peninsula, and many of those workers can pay more rent than the existing residents of the Mission. Thus: Evictions and displacement along the Google bus routes.

Then you get the interesting question of whether market-rate development near transit actually makes the greenhouse gas problem worse. The study looks at Vehicle Miles Traveled, which means how much people drive, and lover VMT are good.

If a lot of development takes place near rail lines (like BART), the residents are less likely to drive. But if, in the process, the development forces existing lower-income residents to move further away for affordable housing, and they have to drive to work, you actually see more VMT, undermining the whole idea of transit-oriented development:

> *Regional Vehicle Miles Traveled are likely to increase "if gentrification results in a reduction in the population living near rail."*

That is: Richer, smaller households move in. Poorer, larger households move out.

A statement from the Mission Economic Development Agency, Calle 24, and five other community-based organization notes that the Mission fits perfectly into that definition:

> *Between 2000 and 2012, while the rest of the city population rose, the Mission lost 4.8 percent of its population, median income increased by 48 percent (gentrification), and households with cars rose from 37 to 64 percent.*

The other critical conclusion of the study – which seems to be obvious to everyone except city planners and supporters of more market-rate housing – is that "upzoning" – that is, increased density in specific areas, like the Divisadero St. corridor – is not necessarily a good way to bring down housing prices.

When the city upzones parcels, the study notes, property owners get a windfall – and are likely to charge more for the land that can be developed into housing. Simply put, upzoning drives up land values – and since the cost of land is one of the defining reasons that new housing is so expensive, maybe making land more expensive isn't such a grand idea.

The community groups note that "this new displacement research is unfortunately absent from the City's socioeconomic report on 2675 Folsom St."

Whatever the deal on this one project, this is the kind of discussion we need to have. In some parts of town, like 23rd and Folsom (and 16th and Mission) new market-rate housing and the upzoning to make dense projects happen will absolutely drive up land values nearby. That will absolutely lead to evictions, rent hikes, and displacement of existing residents.

Is there a way to build housing in transit corridors, to keep people out of their cars, without forcing existing residents to move further away and drive their cars much more? Maybe – but San Francisco, where private developers set the agenda, hasn't managed to find it.

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TAGS Agenda BART Bay Area berkeley Board of Supervisors California Cars City Hall City Planning Developers Development displacement Evictions gentrification Google Google Buses Housing Mission Planning regional planning Rent San Francisco Tech Industry Workers

**Tim Redmond**

Tim Redmond has been a political and investigative reporter in San Francisco for more than 30 years. He spent much of that time as executive editor of the Bay Guardian. He is the founder of 48hills.

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EAST BAY MUNICIPAL UTILITY DISTRICT

# Long-Term Financial Stability Workshop FY17

Board of Directors

December 13, 2016

# Workshop Agenda

- Review of Long-Term Financial Stability Goals
- Review of Financial Planning
  - O&M, Capital and Debt Service Expenses
  - Annual Revenues
  - Rate Increases and Debt Issues
- Update on the long-term financial stability goals after recent drought

# Long-Term Financial Stability Goals from FY15 Workshops

- Significant growth in future capital spending will require prudent use of debt and cash funding
  - Increase revenue funding of capital from 35% to 50%
  - Increase debt service coverage ratio from 1.6 to 2.0
- Largest financial risk is the volatility in water supply that impacts water sales
  - Maintain high level of cash reserves to help address revenue shortfalls
  - Adopt a system of drought rates as part of regular rate setting process

# Where Have We Been the Past Two Years?

- Achieved the 50% revenue funded capital goal in FY16 & FY17 budget while meeting the debt coverage policy target
- To be conservative in the FY16 & FY17 financial plan, budgeted normal water sales were reduced from 166 to 151 MGD
- Making progress on financial stability goals but will be delayed by the impact of the recent drought

# Financial Planning – How Operating and Capital Expenses are Paid

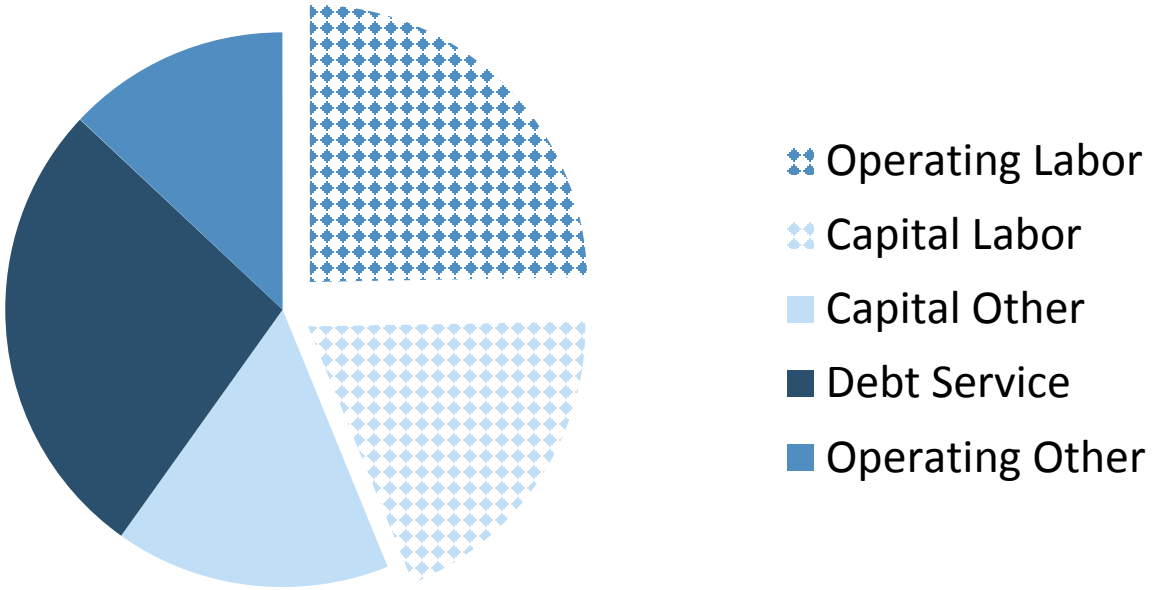
- All expenses must ultimately be paid with cash; when financial plan is created:
  - First look to annual revenues
    - Rate levels and consumption establish annual rate revenue
  - When annual revenues are not sufficient to pay for projected expenses
    - Look to reduce expenses
    - Use cash reserves or fund some capital with cash from debt proceeds
    - Relook at rate increases

# Water System Expenses Capital and Operating

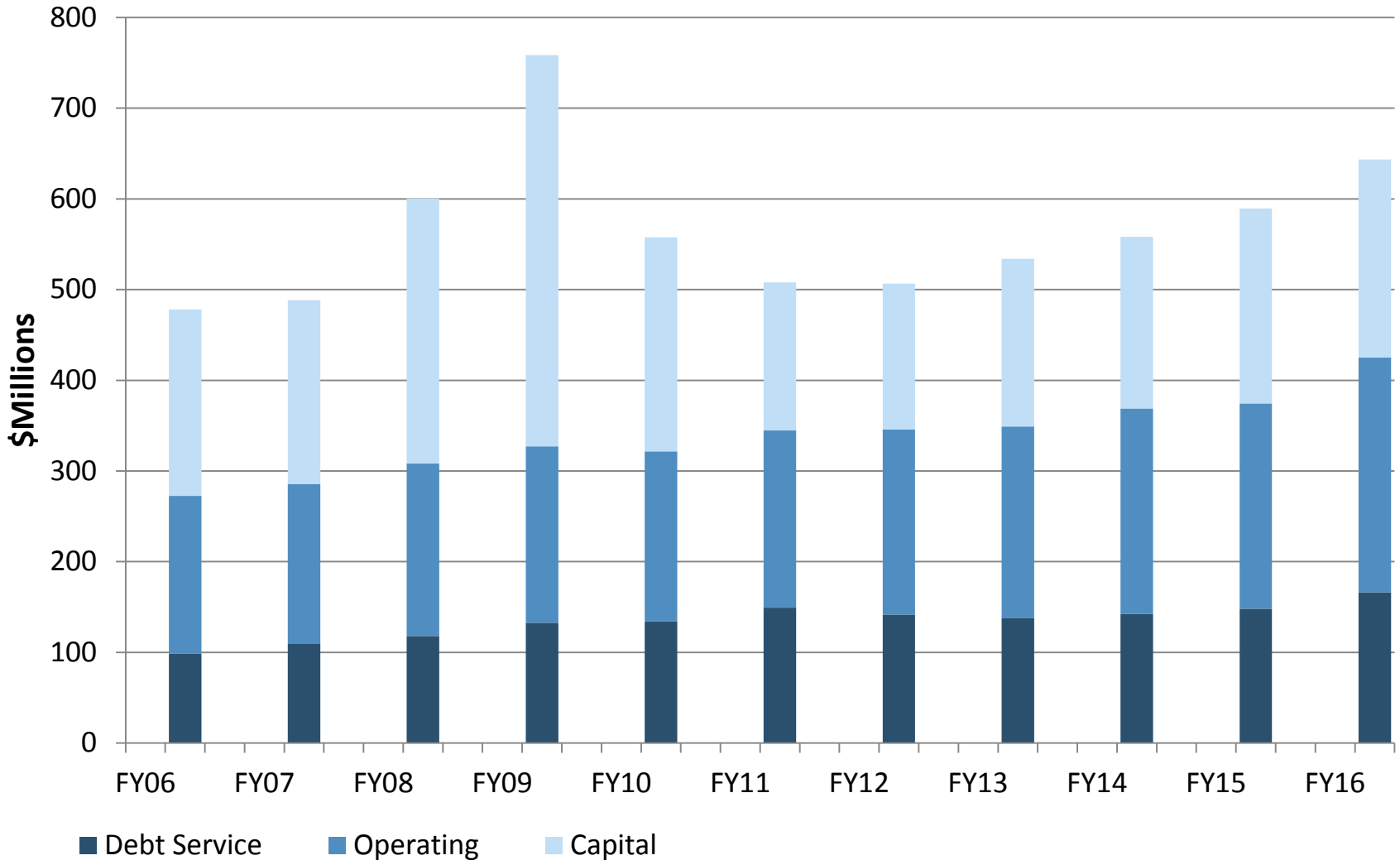
| Expense Category | Operating $M | Capital $M | Total $M |
|---|---|---|---|
| Labor | 154 | 119 | 273 |
| Contracts | 15 | 49 | 64 |
| Materials | 13 | 10 | 23 |
| Equipment | 14 | 31 | 45 |
| Energy/Chemicals/Disposal | 21 | 1 | 22 |
| Misc | 18 | 9 | 27 |
| Debt Service | 169 | - | 169 |
| Total Expenses | $404 M | $219 M | $623 M |

# District Water System Expenses
# Labor is a Large Portion

| | |
|---|---|
| Operating Labor | $154 M |
| Capital Labor | $119 M |
| Operating Other | $ 81 M |
| Capital Other | $100 M |
| Debt Service | $169 M |
| Total | $623 M |



# Water System Historical Expenses

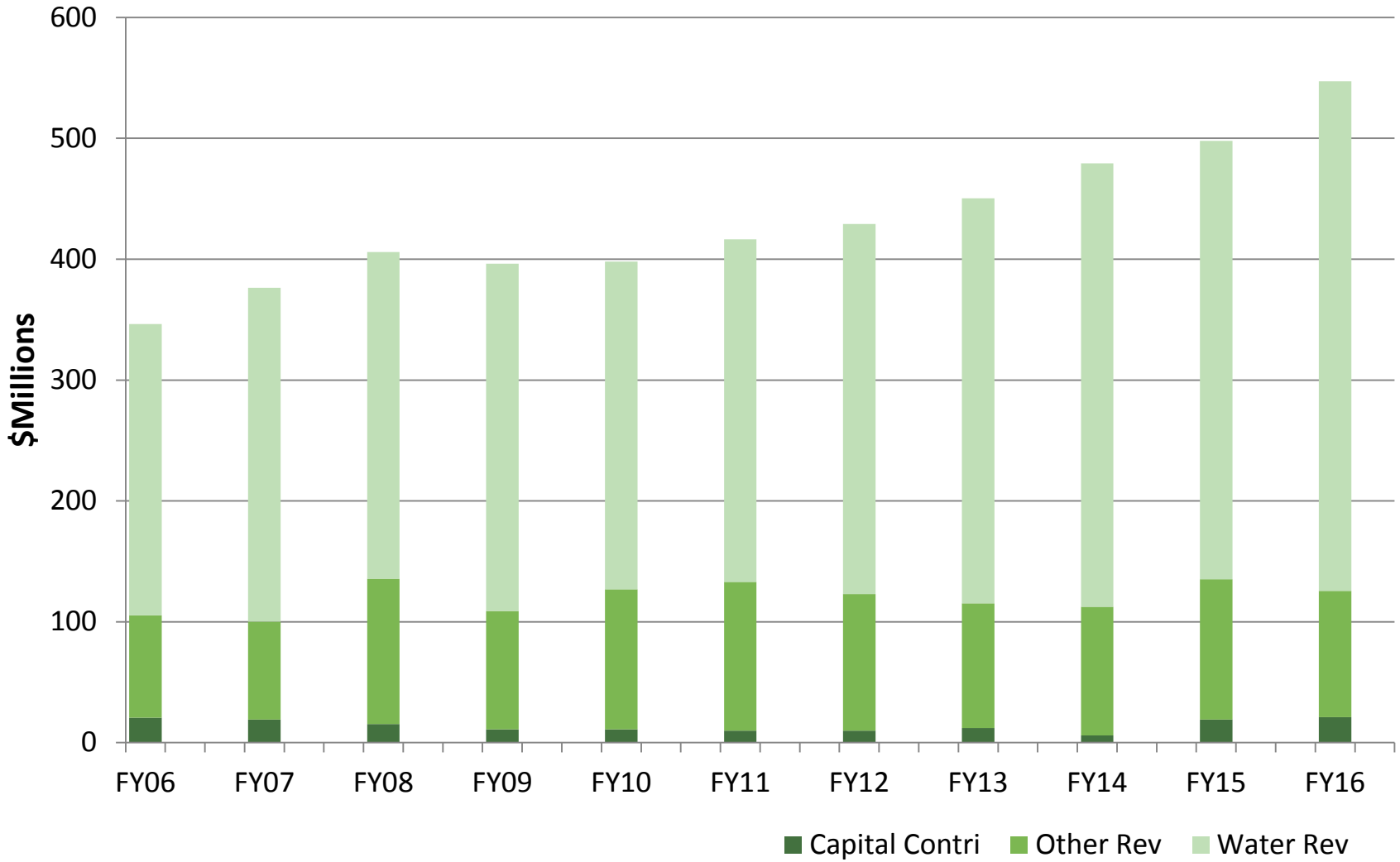


# Water System Annual Revenues

| | $M | Funds Operating | Funds Capital | Funds Debt Service |
|---|---|---|---|---|
| Water rates | 420 | X | X | X |
| Taxes | 25 | X | X | |
| Contributions for Capital | 25 | | X | |
| Power Sales | 4 | X | X | X |
| Reimbursements | 11 | X | | |
| SCC | 25 | | X | X |
| Other | 17 | X | X | X |
| Interest | 3 | X | X | X |
| Total | $530 M | | | |

*80%*

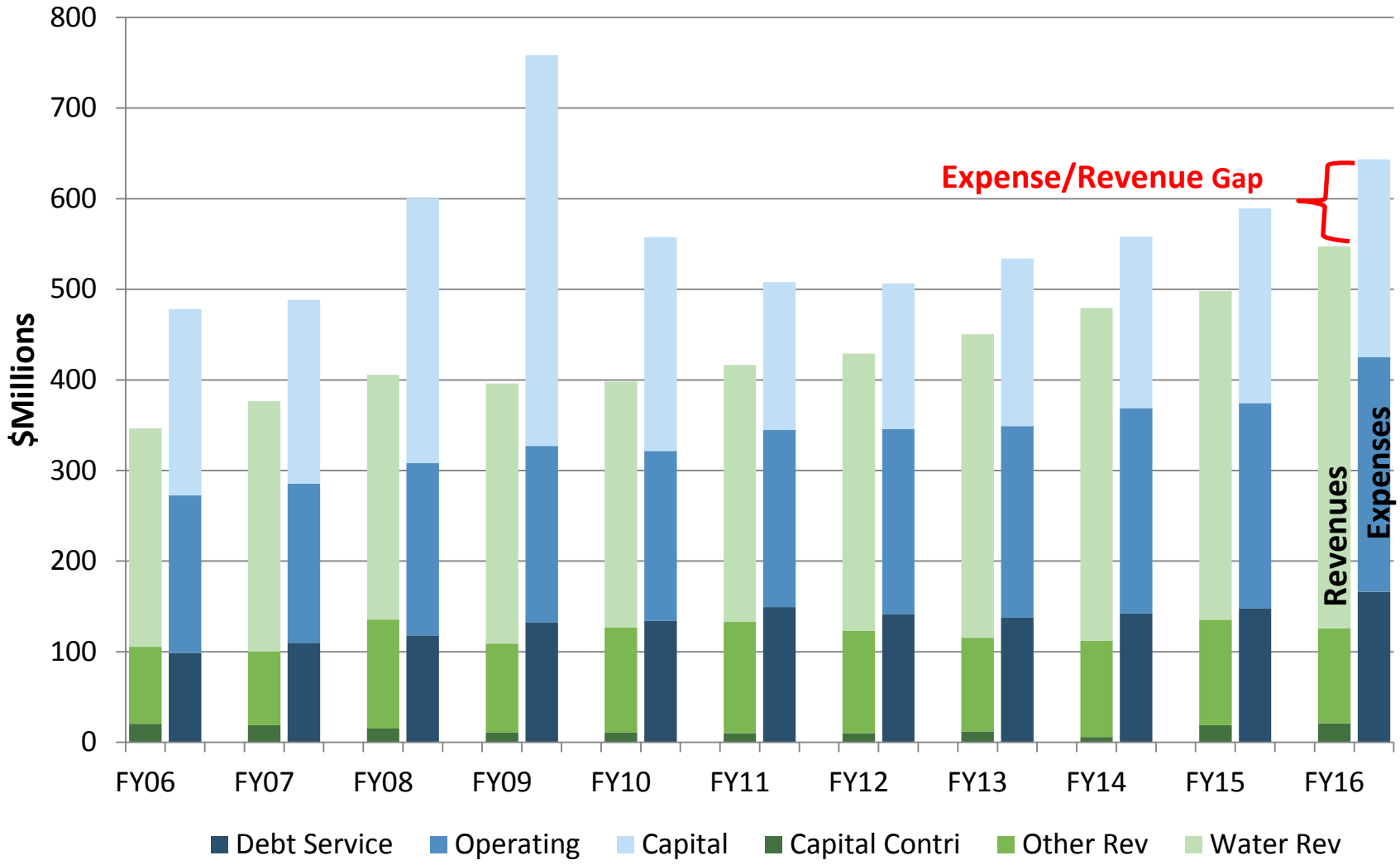
# Water System Historical Revenues



# Financial Planning: Annual Expenses and Revenues

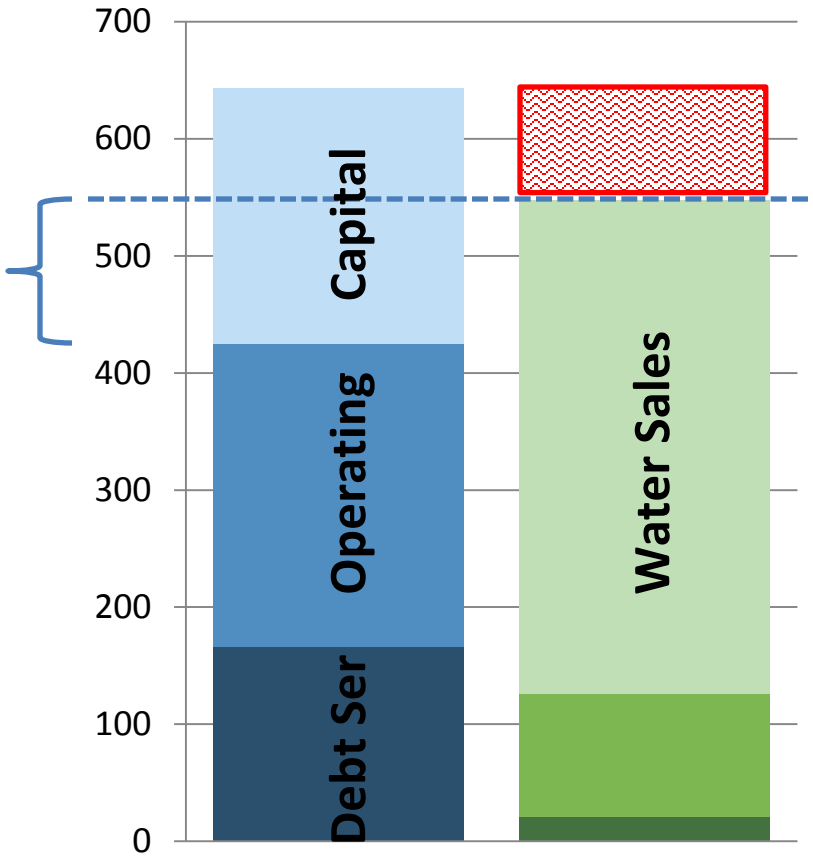
| ANNUAL REVENUE $530 M | | ANNUAL EXPENSES $623 M | |
|---|---|---|---|
| Water Revenue | $390 M | Operating Labor | $154 M |
| 8% Rate Increase | $30 M | Capital Labor | $119 M |
| Taxes/Other | $60 M | Operating Other | $ 81 M |
| SCC | $25 M | Capital Other | $100 M |
| Contrib. for Capital | $25 M | Debt Service | $169 M |
| Total | $530 M | Total | $623 M |
| **EXPENSES NOT FUNDED BY ANNUAL REVENUE = $93 M GAP** | | | |

# Water System Historical Expenses/Revenues



# Planned Annual Revenues Fund About 1/2 of Current CIP

Goal is to fund 50% of Annual Capital Expenses from Annual Revenues




**$93 M gap can be funded with Debt or with Reserves/Additional Rate Increases**

Debt Service | Operating | Capital | Capital Contri | Other Rev | Water Rev

# Use of Debt to Fill Planned $93 M Gap

- Plan to issue $93 M debt to cover gap
  - Legally restricted to capital expenditures
  - Guided by policies and practices
  - Consider the type of capital projects: replacement/rehabilitation or expansion
  - Dependent on financial metrics
- Consider long-term financial stability goals on funding of capital

# Issuing Debt for Expense/Revenue Gap: Policies

- Cash proceeds from debt can only be used for capital expenses
- Policy 4.02 calls for conservative use of debt to fund capital projects

| Policy | Target |
|---|---|
| Debt Coverage | Minimum Target of 1.60 |
| Percent debt funded capital | Maximum Target of 65% |
| Variable rate debt | Maximum Target of 25% |

# Debt Service Coverage Ratio (DSCR)

- Bond Indenture establishes a pledge of "Net Revenues" as security to bondholders

\+ Operating Revenues

\- Operating Expenditures

= Net Revenues

**DSCR Definition**

$$\frac{\text{Net Revenues}}{\text{Debt Service*}}$$

- Measures ability to meet debt service payments from current year revenues
- Primary financial metric and indicator of financial sustainability

*District policy target of 1.60 applies to Parity Debt only – does not include commercial paper or other non parity debt service

# Financial Planning: Debt Service Coverage Ratio

Operating Revenue = $505 M  Operating Expenditures = $235 M

Net Revenue = 505 – 235 = $270 M

Debt Service Coverage Ratio = 270/169 = 1.60

| ANNUAL REVENUE $530 M | |
|---|---|
| Water Revenue | $390 M |
| 8% Rate Increase | $30 M |
| Taxes/Other | $60 M |
| SCC | $25 M |
| Contrib. for Capital | $25 M |
| Total | $530 M |

| ANNUAL EXPENSES $623 M | |
|---|---|
| Operating Labor | $154 M |
| Capital Labor | $119 M |
| Operating Other | $ 81 M |
| Capital  Other | $100 M |
| Debt Service | $169 M |
| Total | $623 M |

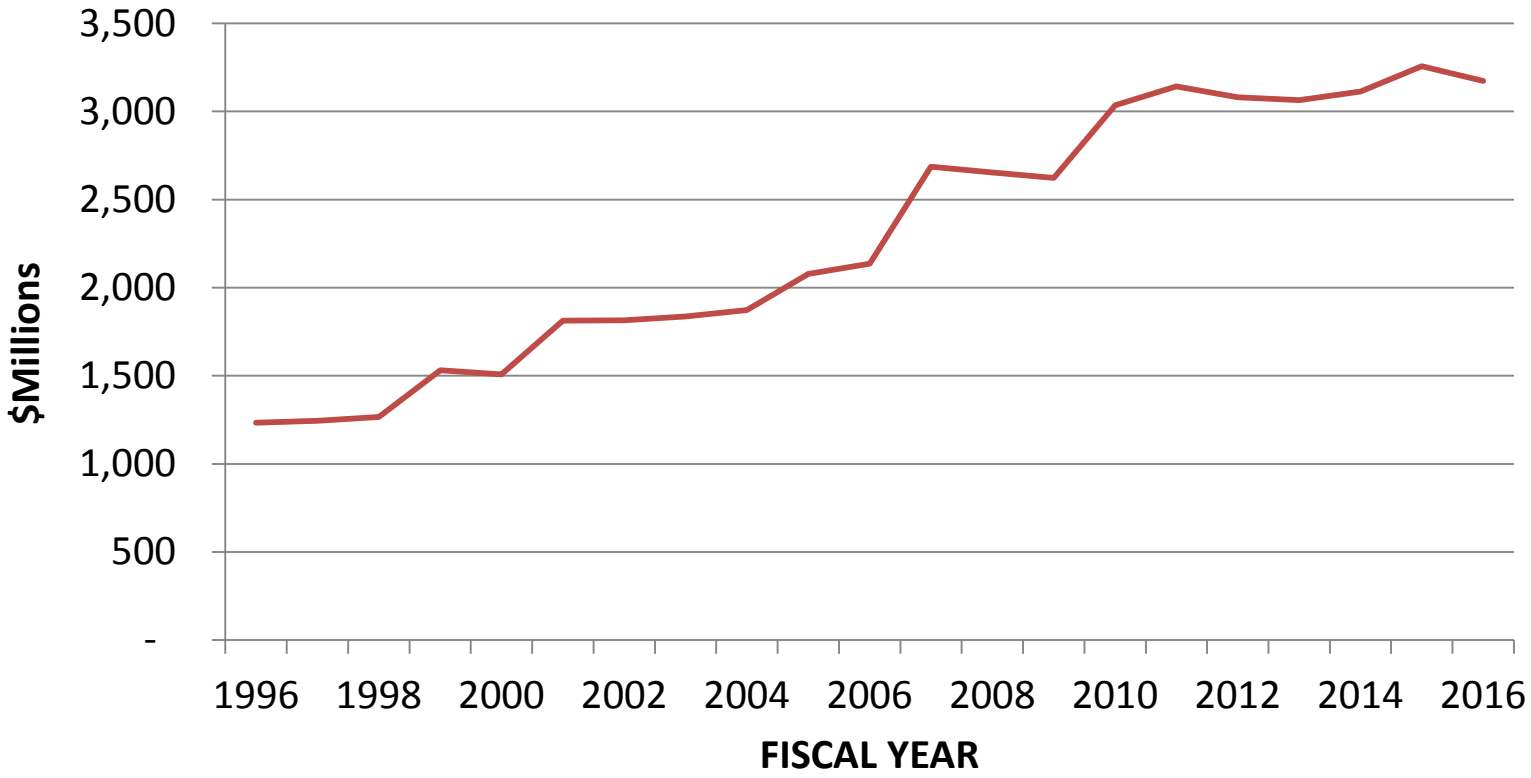
**EXPENSES NOT FUNDED BY ANNUAL REVENUE = $93 M Gap**

# Type of Capital Project: Financing Mix

| | Debt Funding | Cash/PAYGO Funding |
|---|---|---|
| **Description** | • Issue bonds to pay project costs and repay principal with interest over 30 years | • Pay project costs out of current year revenues or cash reserves |
| **Typical use** | • Large, long-lived, "one-time" projects or projects for growth<br>• Spread cost over current and future customers<br>• Urgent project need | • Replacement and reconstruction costs which are regular and predictable<br>• Covers District capital labor |
| **Consider-ations** | – Higher total cost; interest can double the cost<br>+ Mitigates near-term rate impact<br>– Leverage reduces future financial flexibility | + Lower total cost; more funding for capital projects<br>– Near-term rate impact<br>+ PAYGO increases future financial flexibility |

# Financial Metrics: History of EBMUD Outstanding Debt

**Total District debt has grown over the past 20 years from $1.2 billion to $3.2 billion**



# Financial Metrics: Debt-Related Financial Ratios

| | Debt Ratio | Debt Service Coverage Ratio | Debt Per Capita |
|---|---|---|---|
| Definition | $\frac{\text{Outstanding Debt}}{\text{Net Capital Assets}}$ | $\frac{\text{Net Revenue}}{\text{Senior Debt Service}}$ | $\frac{\text{Outstanding Debt}}{\text{Service Area Population}}$ |
| Indicates | Degree of leverage | Revenue available to pay debt service | Debt affordability |
| Aaa Median* | 24.6% | 3.0x | $349 |
| Aa1 Median* | 33.7% | 2.6x | $521 |
| EBMUD Water** | 63.4% | 1.66x | $1,668** |
| EBMUD Wastewater** | 60.0% | 1.75x | $601** |

**Median Debt Ratio and DSCR from Moody's MFRA FY15, Median Debt per Capita from FY15 Fitch Report*
***EBMUD metrics calculated from FY15 CAFR*

# Financial Metrics: Debt-Related Financial Ratios

| | Highest Rating** | Debt Ratio | Debt Service Coverage Ratio | Debt Per Capita |
|---|---|---|---|---|
| **EBMUD—Water** | AAA | **63.4%** | **1.66x** | **$1,668** |
| SFPUC Water Enterprise | Aa3 | 88.2% | 1.04x | $1,579 |
| San Diego Co Water | AAA | 37.4% | 1.50x | $377 |
| LADWP | AA+ | 70.2% | 1.93x | $1,155 |
| Metropolitan Water District | AAA | 61.5% | 2.71x | $240 |
| CCWD | AA+ | 38.4% | 1.72x | $957 |
| Santa Clara Valley Water | Aa1 | 23.8% | 1.59x | $256 |
| ACWD | AAA | 23.0% | 3.64x | $256 |
| **Median – Aaa*** | | **24.6%** | **3.00x** | **$349** |
| **Median – Aa1*** | | **33.7%** | **2.60x** | **$521** |

**Median Debt Ratio and DSCR from Moody's MFRA FY15, Median Debt per Capita from FY15 Fitch Report for AAA ratings, Agency metrics calculated from FY15 CAFRs*

***Ratings represent the highest of each entities ratings from the three rating agencies.*

# Debt-Related Considerations

- Financial metrics require context
  - District ratings higher than metrics would indicate
  - Not unlike other large urban agencies
- No “right answer” for debt metrics

# Decision Factors in Issuing $93 M to Fund Expense/Revenue Gap

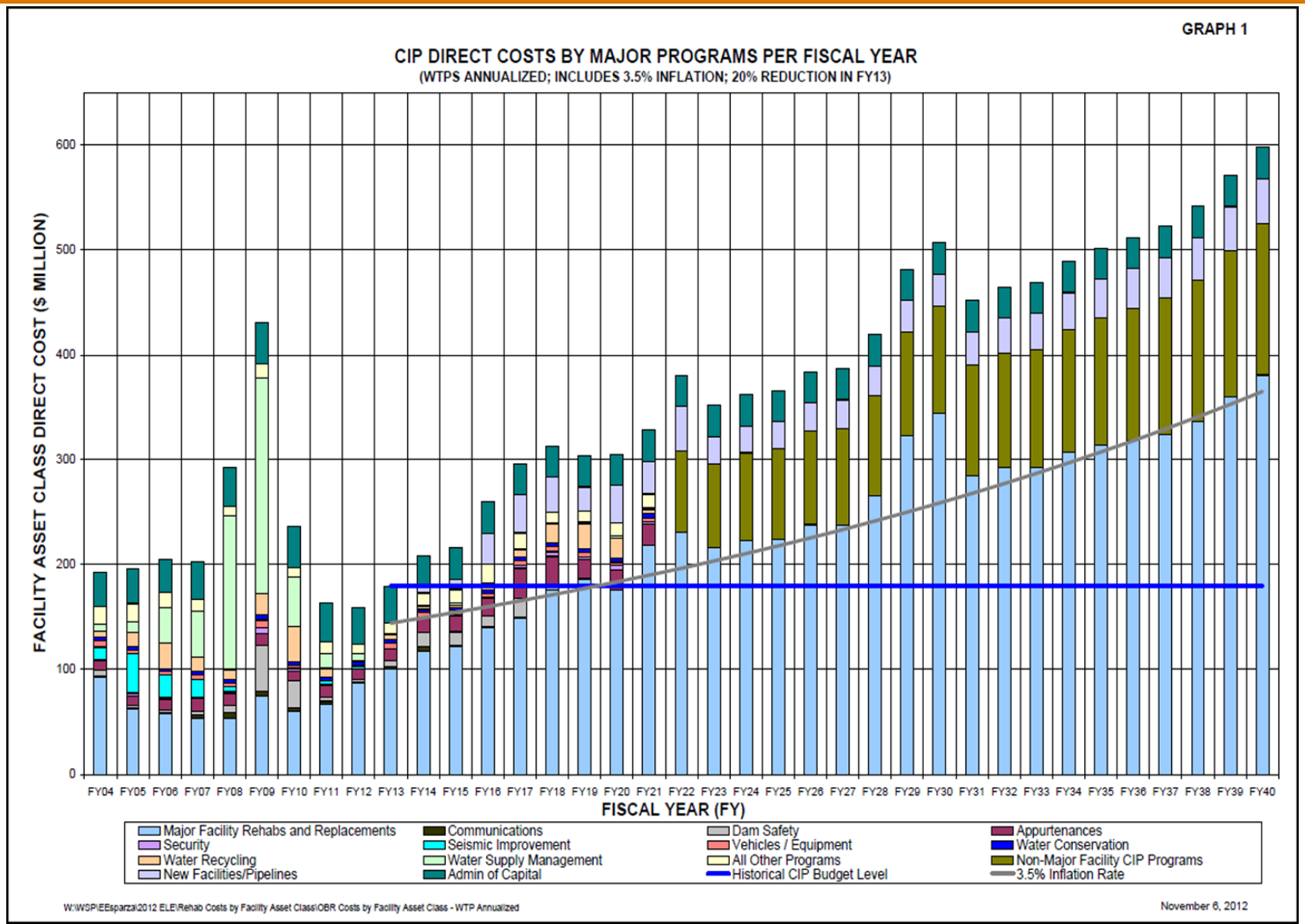
- Issuing $93 M will address the gap**, but:**
  - Annual debt service will increase
  - Debt service coverage ratio will decrease
  - May have to increase rates to meet coverage policy

- Progress on long-term financial stability goals
  - Planned revenue funding of capital 50%
  - Planned debt coverage 1.60 increasing to 1.69 FY20 and 2.0 FY25
  - Maintained our cash balances and Rate Stabilization Fund Reserves

# Future Capital Expense Increases Requires Prudent Use of Debt

- Significant growth in capital improvement plan
  - Rehabilitating aging infrastructure will be expensive and labor intensive
  - Evaluate funding approaches that can deliver the projects and meet our financial goals
- Develop long-range financial plans that look beyond the 5-10 year window
  - Debt levels will grow even higher if we don't maintain the 50% revenue funding and move towards the 2.0 coverage long-term financial stability goals

# Projected CIP Expenditures – Water *with Inflation*



# Debt Financing of Capital at Policy Maximum is Not Sustainable in the Long Term

- Significant growth in capital improvement plan with focus on rehabilitating aging infrastructure
- Debt levels are high now and will increase
  - Currently over 30% of annual revenue goes to pay debt service
  - If we fund 65% of future capital with debt, debt service will grow to 45% or more of all annual revenue
  - Higher debt service will make it difficult to meet debt coverage requirements

# Concerns of Growing Future Debt Service

- Debt and debt service include costs above capital itself
  - Include costs of issuing debt plus interest cost
  - Rates must be raised to cover these “extras”
  - Funds are paid to investors which might otherwise be used for capital or operating costs
- Limited financial flexibility
  - Debt service is a fixed expense
  - Must be paid every year regardless of revenue or expenditure challenges
  - Can “crowd out” other expenditures

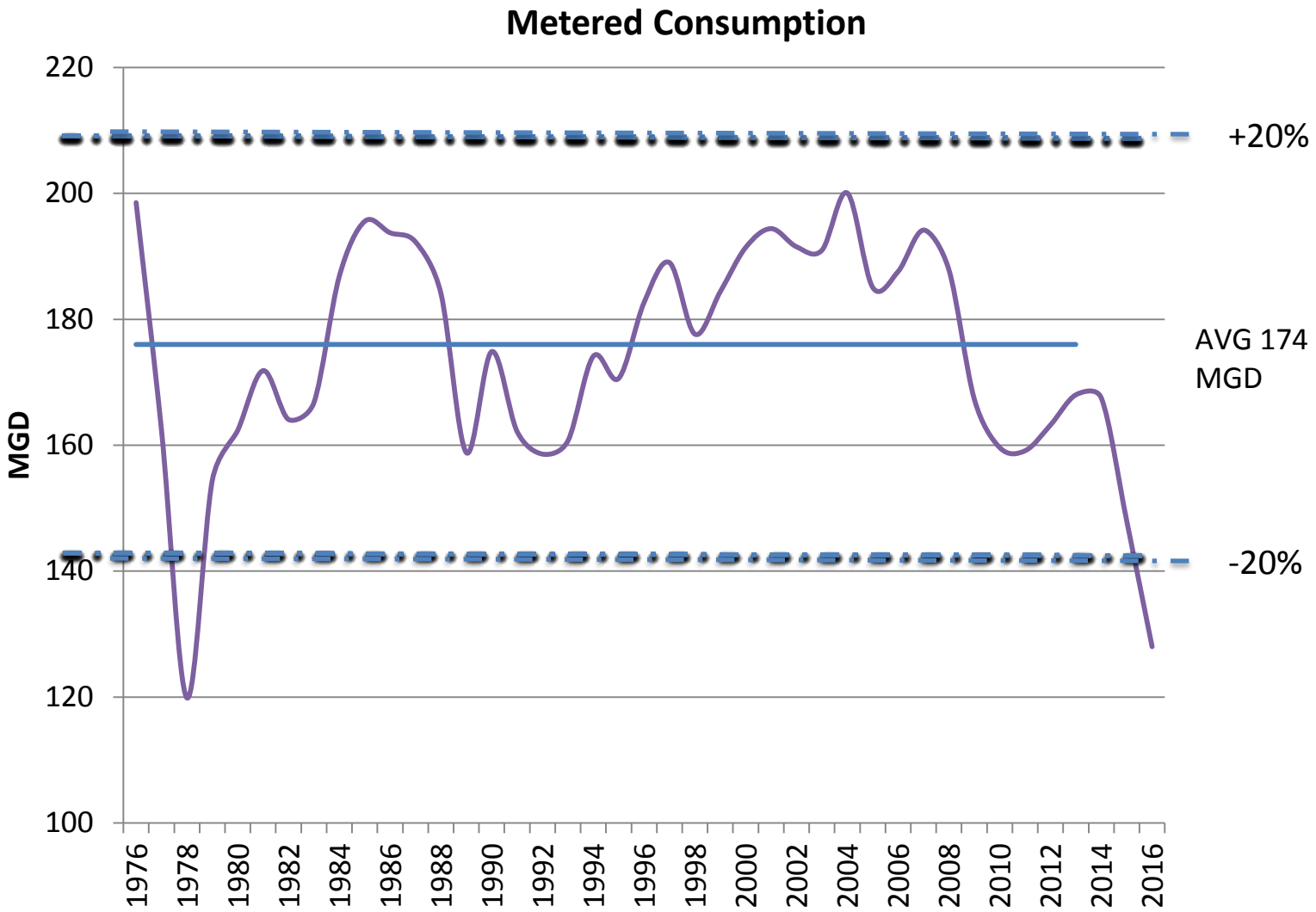
# 50/50 CIP Funding Supports Financial Stability

- Targeting 50% Revenue funded CIP will keep annual expense/revenue gap smaller *but will require higher rate increases in near term*

# Long-Term Financial Stability Goals from FY15 Workshops

- Significant growth in future capital spending will require prudent use of debt and cash funding
  - Increase revenue funding of capital from 35% to 50%
  - Increase debt service coverage ratio from 1.6 to 2.0
- *Increasing volatility in water supply will impact water sales*
  - *Maintain high level of cash reserves to address revenue shortfalls*
  - *Adopt a system of drought rates as part of regular rate setting process*

# Sales Volume - Historical Volatility



# Volatility in Water Sales Disrupts Financial Plan

- Drought can reduce water sales revenue by 10% or more
  - Debt coverage may drop
  - Could have additional costs for supplemental supplies
  - Expense/revenue gap could increase above planned amount
  - Drought recovery: continued depressed demand

# Volatility in Water Sales – Adopted Strategies to Address Impacts

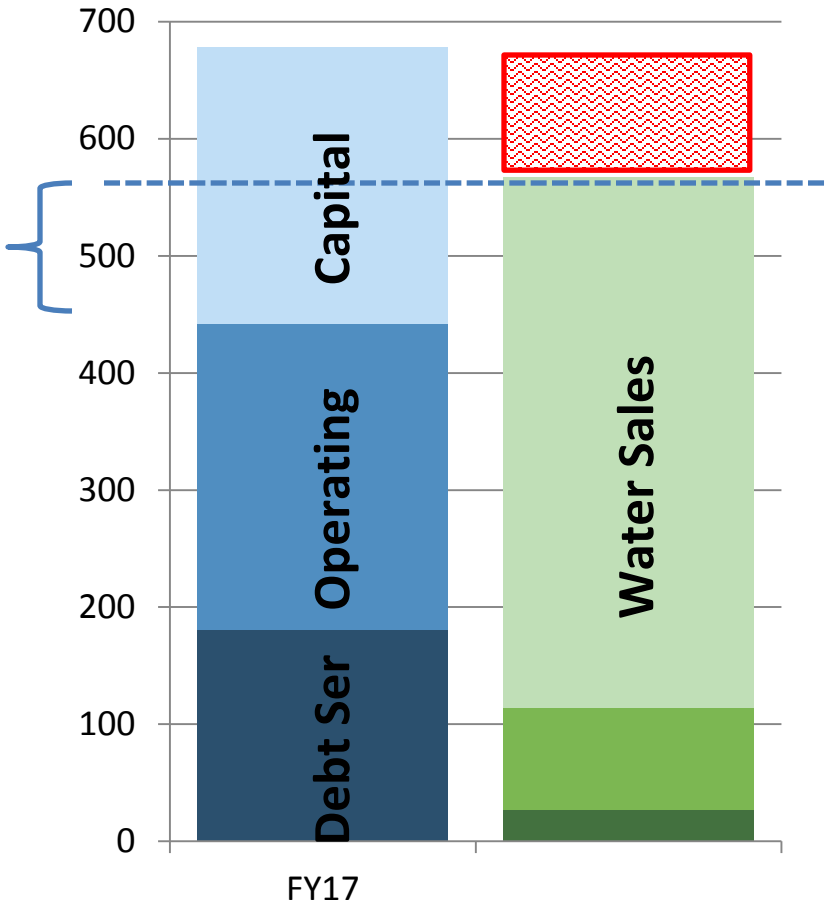
- Drought Rates
  - Address supplemental supply costs
  - Recover some of the lost revenue during drought
  - Rapidly implemented
- Rate Stabilization Fund
  - Helps maintain debt coverage during drought and slow drought recovery
  - Must be replenished after use
- Additional rate increases during drought recovery to address lower consumption

# Recent Drought Has Impacted Financial Plan

- Drought rates and reduced spending eased impact for FY16
  - Did not exceed the planned expense/revenue gap due to higher than planned SCC revenue
  - Achieved debt coverage ratio of 1.65 and 50% revenue funding
- FY17 financial plan will suffer due to lower than planned water sales
  - Planned consumption was 151 MGD, $112 M gap, 1.63 debt coverage
  - Even with potential O&M expense savings, gap may grow by $20 M to $132 M with debt coverage dropping to 1.50

# Planned FY17 Expense/Revenue Gap of $112 M

Goal is to fund 50% of Annual Capital Expenses from Annual Revenues

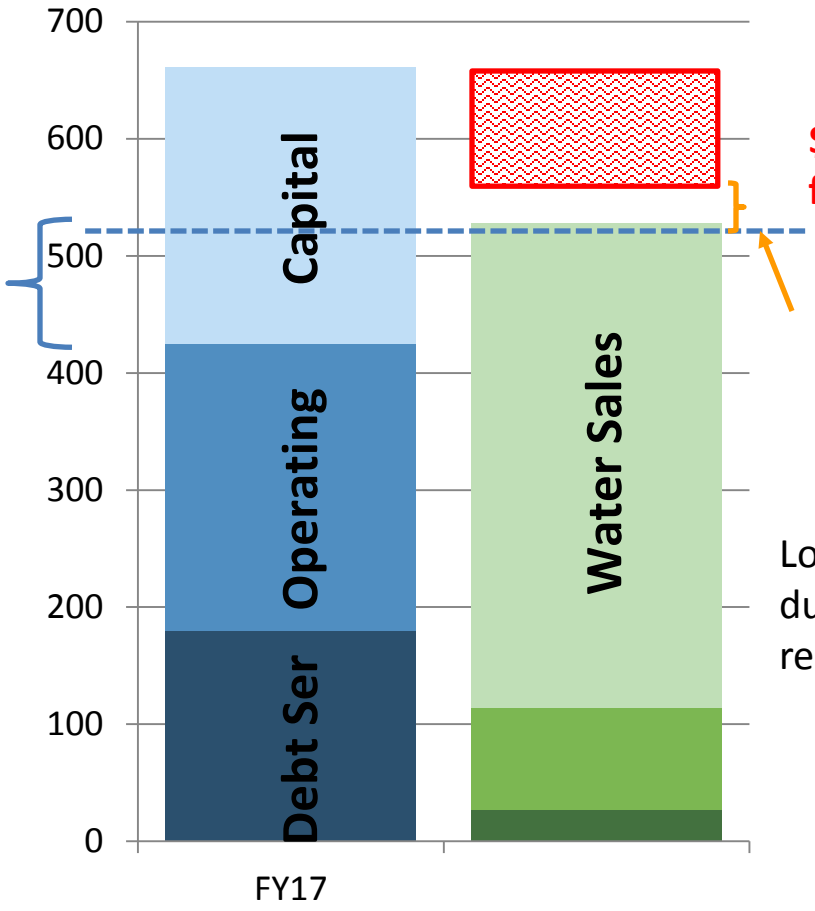



**$112 M gap planned to be funded with Debt**

Planned water sales 151 MGD

# FY17 Expense/Revenue Gap Grows to $132 M Due to Slow Drought Recovery

As a result of lower sales, Annual Revenues to fund about 40% of Annual Capital Expenses




**$112 M gap planned to be funded with Debt**

**Additional $20 M gap requires withdrawal from Rate Stabilization Fund**

Lower water sales due to drought recovery

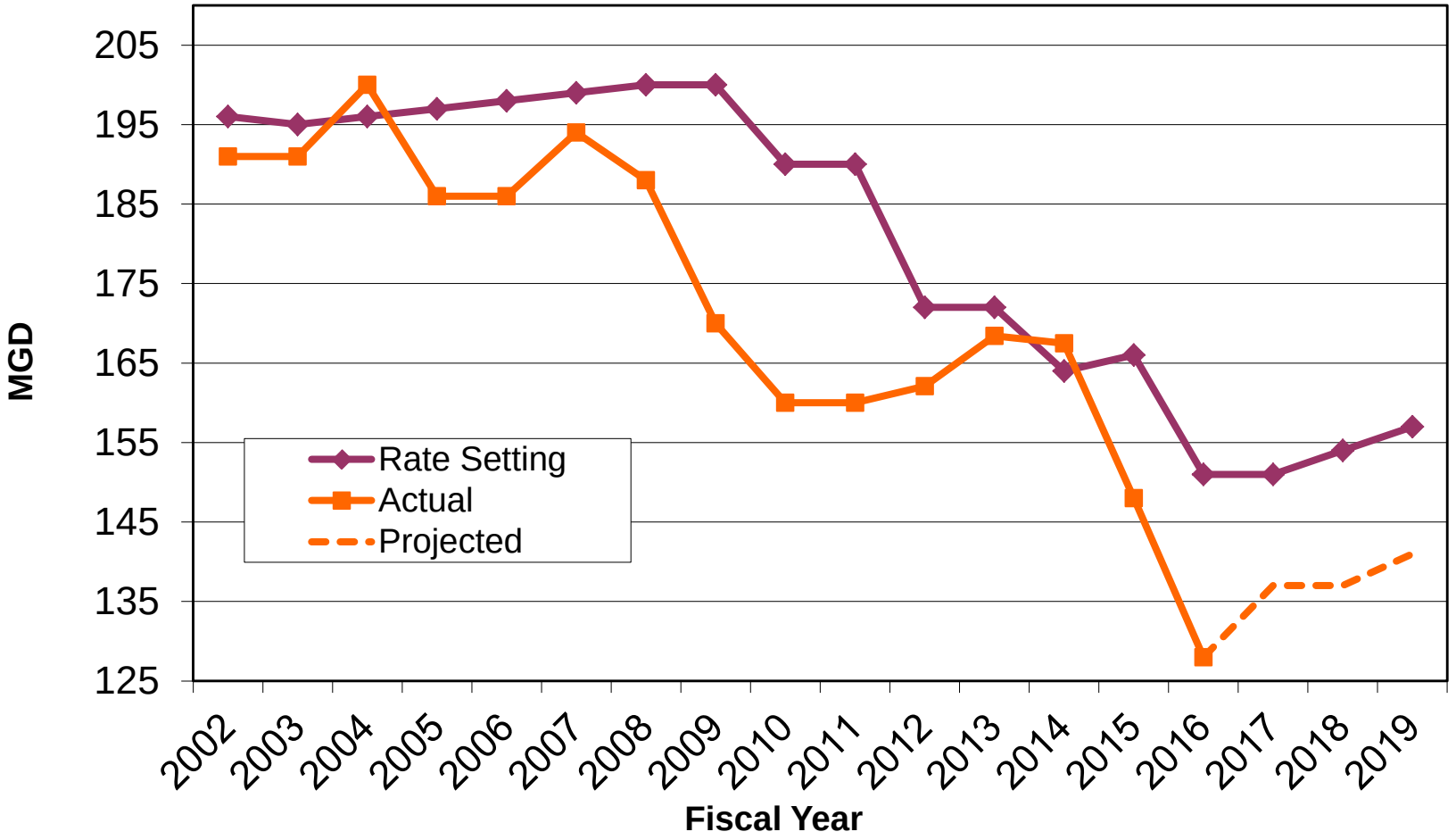
Debt Service | Operating | Capital | Capital Contri | Other Rev | Water Rev

# Financial Planning Typically Focuses on Rate Increases

- Tendency to focus on the level of rate increase when developing the Financial Plan
  - Puts pressure to be optimistic on future water sales assumptions
  - Encourages full use of 65% debt funded CIP policy maximum
  - Pressure to stay at minimum 1.60 debt service coverage ratio (DSCR)
- Financial Plan assumes any water sales disruptions will be addressed by drought rates and Rate Stabilization Fund (RSF)

# Water Sales Projections Drive Financial Planning

Past water sales projections have not been realized, resulting in revenue shortfalls



# Continued Volatility in Water Sales – Expense/Revenue Gap Perspective

- The expense/revenue gap will be an ongoing component of the financial plan
- Using conservative water sales (mgd) assumptions supports the long-term financial stability goals
  - If actual water sales are greater, expense/revenue gap is further reduced – less debt funding/more revenue funding
  - If drought occurs, lost revenue impacts are reduced – less use of rate stabilization fund



# Workshop Conclusions

- Financial planning – expense/revenue gap
- Long-term financial stability goals affirmed
  - 50% revenue funding of capital
  - Move to 2.0 debt coverage
  - Maintain high levels of reserves to help address unplanned shortfall
- Volatility in water sales informs financial planning
  - Impact of drought on financial plan
  - Benefits of conservative water sales assumption

# January Board Workshop

- FY18 & FY19 budget and rates: What has changed
- Other topics
  - Revenue Opportunities
  - Grants and SFR Loans
  - SCC Fees

TODAY'S WEATHER
Scattered T-storms
66° HI | 37° LO

WEDNESDAY 62° | 35°
THURSDAY 63° | 37°

Celebrating Saint Patrick's Day See page 8

What's your favorite springtime activity? See page 6

# The Inyo Register

TUESDAY, MARCH 21, 2017 | INYOREGISTER.COM | SERVING THE EASTERN SIERRA AND BEYOND SINCE 1870 | 75¢

# Perdito Project could mean jobs

## Company to continue exploration for potential mining near Keeler

By Terrance Vestal
Managing Editor

An international mining company hopes to be up and exploring in southern Inyo County by summertime, a project geologist for Canada-based Silver Standard said Monday.

Angela Johnson said the company's Perdito Project is located directly east of Owens Lake or eight miles directly east of Keeler. The company has about 300 mining claims that cover about 5,000 to 6,000 acres.

The project currently is going though the Bureau of Land Management's permitting process.

Johnson said the company in 2015 solidified an agreement with the property owner to explore the area for potential mining. The agreement calls for Silver Standard to pay a fee to the owner and invest a certain amount of money in exploring the project.

The company has made payments to the BLM in the amount of $88,000 and owner payments of $150,000.

Johnson said exploration has shown what are termed high-grade "Carlin-style" sediment-hosted gold target deposits. She said these are "perfect for open mining." The location also is near existing infrastructure, which also makes the site desirable. She also said there is water available and it is hidden from view.

The company hired locally during exploration activities last summer and it plans to do the same this summer.

She said members of the public sometimes don't have

See MINING ▶ Page 5

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QUOTE OF THE DAY

"We cannot live only for ourselves. A thousand fibers connect us with our fellow men."

– *Herman Melville*

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Vol. 147, Issue 34

# LA mayor declares state of emergency

## Officials express concerns regarding flooding, infrastructure, dust control

By Kristina Blüm
Register Staff

Los Angeles Mayor Eric Garcetti declared a state of local emergency for the Los Angeles Aqueduct Monday at a press conference in Los Angeles.

"When we see a potentially disastrous situation coming that could hurt our economy, families and the environment, we won't wait to get out in front of it," Garcetti said, during the conference that was streamed live. "We do our very best to do preemptive action and that is what this is about."

Garcetti said that with the Sierra snowpack at 241 percent of normal, the Los Angeles Department of Water and Power estimates that more than 1 million acre feet of water will flow down into the Owens Valley this year.

Because of this, LADWP is concerned about infrastructure along the aqueduct and the massive mitigation efforts that have been done on the Owens Lake.

"Public safety is among our core values as an organization," said LADWP General Manager David H. Wright. "LADWP has made a commitment to the residents of the Owens Valley to control dust emissions that can be harmful to breathe and have spent over $1 billion on infrastructure to mitigate this dust. As storm waters threaten to destroy much of this investment, we must honor our commitment to the residents of the Owens Valley to reduce this form of air pollution, just like we honor our commitments to rate payers in the L.A. Basin."

Garcetti's declaration came as no surprise to Inyo County Chief Administrative Officer Kevin Carunchio, who said in

See EMERGENCY ▶ Page 5



The water level on the Owens River was so high on Sunday that water was flowing across the bank behind the rope tree at "The Ropes" west of Bishop. High flows will likely be the norm this summer as LADWP prepares for roughly 1 million acre feet of snow runoff this summer.

Photo by Kristina Blüm



Local cowboy Rob Pearce ties a pack on Enoch during the Backcountry Horsemen of California Rendezvous held over the weekend in Bishop.

Photo courtesy Sarah Sheehan

# Bringing the horsemen to Bishop

## Backcountry Horsemen of California host Rendezvous in Eastern Sierra

By Kristina Blüm
Register Staff

The Tri-County Fairgrounds was full of life over the weekend as the Backcountry Horsemen of California held its 30th annual rendezvous in Bishop.

"The Rendezvous had great attendance, with incredible clinics, helpful vendors

See HORSEMEN ▶ Page 54

# County to receive presentation on El Camino Sierra today

## Supervisors to also mull becoming Groundwater Sustainability Agency

Register Staff

The Inyo County Board of Supervisors at its meeting today is scheduled to receive an extensive presentation on El Camino Sierra Project.

In light of the county celebrating its 150th birthday last year, the county is looking to restore El Camino Sierra designation on the portion of U.S. Highway 395 that runs through Inyo County. The route originally was designated "The Mountain Highway" in the early 1900s.

After the supervisors hear the presentation, they are anticipated to provide county staff direction on how to proceed with the second phase of the project, which would include developing a comprehensive wayfinding system that would indicate points of interest and historical markers.

The presentation, according to the agenda, is expected to include:

· Local historians and authors Howard Walker, Ted Williams and David Woodruff will present a snapshot of their research on the history of El Camino Sierra, accompanied by historical photographs and artifacts curated by the Eastern California Museum, Laws Railroad Museum and Historic Site and others.

· An Assembly proclamation, championed by Rep. Devon Mathis, recognizing and reaffirming the designation of U.S. Highway 395 where it traverses Inyo County as El Camino Sierra, will be presented by Assistant

See ROAD ▶ Page 5

# Veteran nurse gets promotion at NIHD

## Aspel best known for assisting in establishing Rural Health Clinic

Register Staff

Veteran registered nurse Tracy Aspel, perhaps best known in the community for her role in establishing the Rural Health Clinic alongside Dr. Stacey Brown, is now Northern Inyo Healthcare District's chief nursing officer.

Prior to being named CNO, Aspel served as director of Nursing Practice and interim CNO. As chief nursing officer, Aspel is responsible for overseeing and coordinating NIHD's nursing team and its daily operations.

"Tracy has a strong rapport with our nurses and has earned the respect of NIHD's entire team for her tireless dedication to improving health care outcomes whether as a nurse, at the RHC or as an administrator," said Dr. Kevin S. Flanigan, NIHD's chief executive officer. "She also brings a strong leader-

See CNO ▶ Page 5






## Time Warp Tuesday

# From the *Chronicle*

*The San Francisco Chronicle*, possibly recognizing that the Eastern Sierra as a community outgrowing the raucous reputation of boom town like Bodie, placed this ad in the March 4, 1915 edition of The Inyo Register. The ad invites residents to the Panama-Pacific International Exposition World's Fair, which was held between Feb. 4 and Dec. 20 of that year. The event celebrated the completion of the Panama Canal, but for locals, it was also an opportunity to show the world how quickly San Francisco recovered from the 1906 earthquake that devastated the city.

**Inyo Register image**

## BIRTHS

**FRANKSON –** daughter, Emma Grace Ernestine Frankson, was born on Saturday, March 4, 2017, at 11:54 p.m. at Northern Inyo Hospital, to Jonathen and Marcella Frankson, both of Bishop.

Weight: 8 pounds, 9 ounces
Length: 21 inches
Grandparents: Yvonne and Craig Deming of Bishop
Beatriz Hidalgo of Orange, Calif.

Baby Emma was welcomed home by her big brothers Jaxson Frankson, Darren Spoonhunter and Daniel Anderson and big sisters Jordan Frankson, Hannah Frankson, Talicia Frankson and Joslyn Anderson.

## LOTTO

**Daily 3**
Friday's midday picks:
5, 5, 7
Friday's evening picks:
0, 4, 9
Saturday's midday picks:
2, 3, 3
Saturday's evening picks:
0, 3, 4
Sunday's midday picks:
2, 2, 1
Sunday's evening picks:
1, 7, 9

**Daily 4**
Friday's picks:
2, 3, 4, 4
Saturday's picks:
1, 3, 3, 5
Sunday's picks:
0, 0, 6, 9

**Fantasy 5**
Friday's picks:
3, 10, 27, 37, 39
Saturday's picks:
1, 12, 23, 24, 32
Sunday's picks:
8, 29, 31, 33, 37

**Daily Derby**
Friday's picks: First place No. 7 Eureka; second place No. 2 Lucky Star; third place No. 1 Gold Rush. Winning race time was 1:49.70.

Saturday's picks: First place No. 2 Lucky Star; second place No. 8 Gorgeous George; third place No. 1 Gold Rush. Winning race time was 1:43.13.

Sunday's picks: First place No. 7 Eureka; second place No. 8 Gorgeous George; third place No. 11 Money Bags. Winning race time was 1:41.95.

**Mega Millions**
Numbers for Friday, March 17:
11, 27, 31, 58, 60 **10**

**SuperLotto Plus**
Numbers for Saturday, March 18:
29, 33, 38, 44, 46 **5**

**Powerball**
Numbers for Saturday, March 11:
13, 25, 44, 54, 67 **5**

## SENIOR CENTER MENU

**Tuesday, March 21**
Beef soft taco, Spanish rice, refried beans, coleslaw, fresh fruit

**Wednesday, March 22**
Lasagna, Italian veggies, garlic bread, green salad, cottage cheese with fruit

**Thursday, March 23**
Chili-stuffed potato, mixed veggies, corn bread, yogurt with fruit

**Friday, March 24**
Turkey divan, spinach, french bread, green salad, fresh fruit

**Monday, March 27**
Chicken chow mein, brown rice, muffin, Oriental salad, apricots

**Tuesday, March 28**
Pizza deluxe, zucchini, green salad, fruit cup

**Teen Challenge International**
*The Proven Cure for the Drug Epidemic*
Director **Herlindo Salinas** and
Assistant Director **Michael Conway**
will be sharing testimonies and information at the
**House of Mercy Pentacostal Church.**
*Join us* **Sunday, March 26th at 10:00 am.**
*If you or a loved one are suffering from addiction.... this is where you need to be*
393 S. PaHa Lane - Bishop, CA • 760-873-4883

## Inyo Register Weather — March 21, 2017

### Seven Day Forecast

**TUESDAY** — Scat'd T-storms — High: 66 Low: 37
**WEDNESDAY** — Scat'd T-storms — High: 62 Low: 35
**THURSDAY** — Partly Cloudy — High: 63 Low: 37
**FRIDAY** — Mostly Cloudy — High: 63 Low: 38
**SATURDAY** — Mostly Cloudy — High: 62 Low: 38
**SUNDAY** — Few Showers — High: 59 Low: 37
**MONDAY** — Partly Cloudy — High: 61 Low: 35

### In-Depth Local Forecast

Today we will see mostly cloudy skies with a 40% chance of showers and thunderstorms, high temperature of 66°, humidity of 31%. South southwest wind 7 to 11 mph. The record high temperature for today is 82° set in 1994. Expect mostly cloudy skies tonight with a slight chance of showers and thunderstorms, overnight low of 37°.

### Last Week's Local Almanac

| Day | Hi | Lo | Normals | Precip |
|---|---|---|---|---|
| Sun | 79 | 33 | 63/30 | 0.00" |
| Mon | 81 | 32 | 64/31 | 0.00" |
| Tue | 80 | 33 | 64/31 | 0.00" |
| Wed | 81 | 34 | 64/31 | 0.00" |
| Thu | 78 | 39 | 64/31 | 0.00" |
| Fri | 81 | 35 | 64/31 | 0.00" |
| Sat | 81 | 43 | 65/31 | 0.00" |

Rainfall. . . . . 0.00"
Normal rainfall. . . . . 0.14"
Departure . . . . . -0.14"

Average temp. . . . . 57.9°
Average normal . . . . 47.4°
Departure . . . . . +10.5°

### Weather History

**March 21, 1932** - A tornado swarm occurred in the Deep South. Between late afternoon and early the next morning, severe thunderstorms spawned 31 tornadoes in Alabama, Mississippi, Georgia and Tennessee. The tornadoes killed 334 people and injured 1,784.

### Weather Trivia

*How strong have thunderstorm winds ever been without evidence of a tornado?*

**Answer:** The highest recorded thunderstorm wind ever clocked was 149.5 mph.

For more weather, please visit: www.WhatsOurWeather.com

### Local Sun/Moon Chart This Week

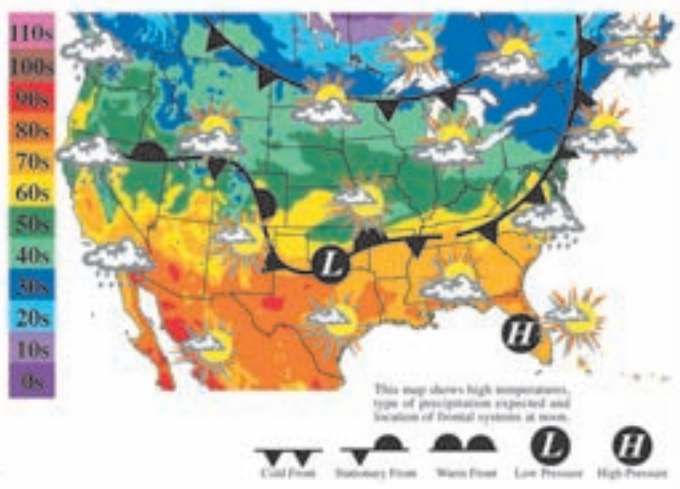
| | Day | Sunrise | Sunset | Moonrise | Moonset | |
|---|---|---|---|---|---|---|
| New 3/27 | Tuesday | 6:53 a.m. | 7:07 p.m. | 2:36 a.m. | 12:56 p.m. | Full 4/11 |
| | Wednesday | 6:52 a.m. | 7:08 p.m. | 3:23 a.m. | 1:49 p.m. | |
| | Thursday | 6:50 a.m. | 7:08 p.m. | 4:07 a.m. | 2:45 p.m. | |
| | Friday | 6:49 a.m. | 7:09 p.m. | 4:49 a.m. | 3:46 p.m. | |
| First 4/3 | Saturday | 6:47 a.m. | 7:10 p.m. | 5:28 a.m. | 4:49 p.m. | Last 4/19 |
| | Sunday | 6:46 a.m. | 7:11 p.m. | 6:06 a.m. | 5:54 p.m. | |
| | Monday | 6:44 a.m. | 7:12 p.m. | 6:43 a.m. | 7:01 p.m. | |

### National Cities

| City | Today Hi/Lo | Wx |
|---|---|---|
| Atlanta | 79/59 | pc |
| Baltimore | 57/36 | mc |
| Boston | 48/28 | s |
| Chicago | 48/28 | pc |
| Cincinnati | 54/29 | sh |
| Cleveland | 46/26 | pc |
| Detroit | 48/23 | s |
| Los Angeles | 66/55 | ra |
| Miami | 74/63 | s |
| Nashville | 72/44 | t |
| New York | 51/32 | pc |
| Philadelphia | 56/34 | pc |

Weather (Wx): cl/cloudy; fl/flurries; pc/partly cloudy; mc/mostly cloudy; r/rain; rs/rain & snow; s/sunny; sh/showers; sn/snow; t/thunderstorms

### Today's National Map




### Astronomy Watch — March 21, 2017

Sunrise: 7:26 AM PDT
Sunset: 6:34 PM PDT

All rise and set times are for a uniform horizon of 5½ degrees.

**The Moon**
3rd Qtr — New — 1st Qtr — Full



Mar 20 — Mar 27 — Apr 3 — Apr 10

Moonrise: 3:13 AM PDT
Moonset: 12:18 PM PDT

**Planets**

Before sunrise:
**Jupiter**: bright; mid-sky SW
**Saturn**: dim; low SSE
After sunset:
**Mercury**: dim; very low W
**Mars**: dim; low W

When describing celestial phenomena, I often find it useful to have people think of the celestial sphere as a very large plastic sphere with the Earth at the center. If you extend the Earth's equator out to the celestial sphere, it makes a line that goes all the way round the celestial sphere called the celestial equator. This plane is tilted by about 23½° to the plane of the Earth's orbit, which, when extended to the celestial sphere creates the ecliptic. The Sun lies on the ecliptic so through the year the Sun goes from its lowest point, -23½° in December to its highest point, +23½° in June. In March every year, the Sun crosses the celestial equator from south to north and this year that instant occurred yesterday at 3:29 a.m. PDT. At that instant, the northern and southern hemispheres were both equally illuminated, thus it is called the March or Vernal Equinox. Athough it is not official, it is traditional to say the Vernal Equinox is the beginning of spring in the northern hemisphere, which will end with the summer solstice on June 20.

By Dr. Mark Hodges of Caltech's Owens Valley Radio Observatory

## Smile of the Week!



Weston John Mason is smiling because he took his sister, Little Eva Lent, balloons and flowers during her senior night of varsity volleyball.

**Photo submitted**

*Do you have a Smile of the Week photo you want to share with us? Simply email terry@inyoregister.com*

*SMILE OF THE WEEK IS SPONSORED BY:*

**Medical & Dental Clinics**
Accept most insurances • Dental services now available for Medi-Cal adult patients
**Bishop • 52 Tu Su Lane**
Medical: 760.873.8461 • Dental: 760.873-3443
**Lone Pine • 1150 Goodwin Rd.**
Medical & Dental 760.876.4795
**Coleville Clinic • 73 Camp Antelope Rd.**
Medical & Dental & Behavioral • 530.495.2100
TOIYABE INDIAN HEALTH PROJECT

# AT A GLANCE

## County supervisors

**INDEPENDENCE** – The Inyo County Board of Supervisors meet in regular session at 10 a.m. Tuesday.

The meeting will be held in the Board Chambers at the County Administrative Center in Independence, 224 N. Edwards St.

## Town hall meeting

**BISHOP** – The Bishop City Council will host the Second Annual Town Hall meeting at 5:30 p.m. Tuesday at the Tallman Pavilion at the Tri-County Fairgrounds. The theme is "Your City: Working to support Bishop businesses."

## Community auction

**BISHOP** – The sixth annual community auction will take place from 6-8 p.m. March 25 at the First United Methodist Church Community Center.

The event will be a free evening of desserts, appetizers, door prizes and coffee with both a live auction and silent auction. Curt Van Nest will be the night's professional auctioneer and Chuck Kilpatrick will be the master of ceremonies. Call the church office at (760) 872-7701 in advance for childcare reservations.

The proceeds from this event will help benefit United Methodist Church Social Services.

## Chamber Music

**BISHOP** – Chamber Music Unbound presents The Felici Piano Trio and guests Corey Cerovsek, violin, and Joel Pagán, viola, in a concert titled "Spring Quartets" – a bouquet of the brightest blossoms of the quartet repertoire at 4 p.m. Sunday, March 26, at Cerro Coso College, Bishop. Music by Haydn, Shostakovich and Dvorak. Tickets ($22 adult, $17 senior, $7 student) are available online (www.ChamberMusicUnbound.org), at the Booky Joint, the Inyo Council for the Arts, or at the door 45 minutes before performances.

## Archeology lecture

**BISHOP** – The White Mountain Research Center is pleased to host a free public lecture on Thursday, March 23. Michael Delacorte professor with the Department of Anthropology, and Bridget Wall, staff archaeologist, at CA State University Sacramento, will present a talk titled: "The Geology of Prehistoric Human Behavior." This talk will begin promptly at 7 p.m. Seating is limited. WMRC is located at 3000 East Line Street in Bishop. For more info, please call: 760-873-4344.

## Alabama Hills Day

**LONE PINE** – The sixth annual Alabama Hills Day has been set for April 8-9. The event will include hikes, tours, climbing, biking, off-roading and more, with more than 40 sponsors and exhibitors set up at the Interagency Visitor Center in Lone Pine. A stewardship work day will take place April 9.

## Carl Lind scholarship

**BISHOP** – A scholarship fund has been set up in memory of Dr. Carl Lind. The scholarship will be given to a Bishop Union High School graduate who will pursue a college degree in the sciences. Donations can be made at Bishop Veterinary Hospital.

Checks can be made out to Bishop Veterinary Hospital, memo Carl Lind, 1650, N. Sierra Highway in Bishop. For questions, call (760) 873-5801.

## Visit California

**MAMMOTH** – Visit California will be presenting a seminar titled "China Ready" about engaging Asian tourism to California. The seminar will be from 9:30 a.m.-12:30 p.m. Wednesday, March 29, in the Sierra Center Mall in Mammoth Lakes Registration is $30 and is limited. Register at industry.visitcalifornia.com/GlobalReady.

# UCLA group to perform at Manzanar Pilgrimage

## Kyodo Taiko to open ceremony set for April

Register Staff



UCLA Kyodo Taiko, shown here during a previous Manzanar Pilgrimage, will once again open this year's annual Manzanar Pilgrimage on April 29 at the Manzanar National Historic Site.

Photo by Gann Matsuda/Manzanar Committee

UCLA Kyodo Taiko will perform at the 48th annual Manzanar Pilgrimage, sponsored by the Manzanar Committee, on Saturday, April 29, at the Manzanar National Historic Site, located on U.S. Highway 395 between the towns of Lone Pine and Independence

UCLA Kyodo Taiko will open the program at 11:30 a.m., while the main portion of the program will begin at noon.

The theme for this year's Pilgrimage is "Never Again to Anyone, Anywhere! 75th Commemoration of Executive Order 9066."

The event also will recognize the 25th anniversary of Manzanar being declared a National Historic Site on March 3, 1992.

Each year, more than 1,000 people from diverse backgrounds, including students, teachers, community members, clergy and former incarcerees attend the Pilgrimage, which commemorates the unjust incarceration of over 110,000 Americans of Japanese ancestry in 10 American concentration camps, and other confinement sites, located in the most desolate, isolated regions of the United States, during World War II. Manzanar was the first of the American concentration camps to be established.

Making its 11th consecutive appearance at the Manzanar Pilgrimage this year, UCLA Kyodo Taiko is the first collegiate taiko (Japanese drum) group in North America. They made their debut at the Opening Ceremony of the University of California, Los Angeles' commemoration of the 50th Anniversary of the Japanese American Internment, which was held in February 1992 at UCLA's famed Royce Hall.

UCLA Kyodo Taiko is comprised entirely of UCLA students. They have performed annually at local K-12 schools, Nisei Week, Los Angeles Tofu Festival and the Lotus Festival in Los Angeles, the Intercollegiate Taiko Invitational, during halftime at UCLA basketball games, as well as the inaugural USA Sumo Open, in addition to many other campus, community and private events.

UCLA Kyodo Taiko has also become a fertile training ground for those who wish to continue with taiko after their college careers end, as many Kyodo alumni have become members of professional taiko groups, including Nishikaze Taiko Ensemble, TaikoProject and Progressive Taiko (Prota).

In addition to the afternoon event, the Manzanar At Dusk program follows that same evening, from 5-8 p.m., at the Lone Pine High School gymnasium, located at 538 South Main Street (U.S. Highway 395), in Lone Pine, nine miles south of the Manzanar National Historic Site, across the street from McDonald's.

Manzanar At Dusk is co-sponsored by the Nikkei Student Unions at California State University, Long Beach, California State Polytechnic University, Pomona, the University of California, Los Angeles, and the University of California, San Diego.

Through a creative presentation, small group discussions and an open mic session, Manzanar At Dusk participants will have the opportunity to learn about the experiences of those incarcerated in the camps. Participants will also be able to interact with former incarcerees in attendance to hear their personal stories, to share their own experiences, and discuss the relevance of the concentration camp experience to present-day events and issues.

Pilgrimage participants are advised to bring their own lunch, drinks and snacks, as there are no facilities to purchase food at the Manzanar National Historic Site (restaurants and fast food outlets are located in Lone Pine and Independence, which are nearby). Water will be provided at the site.

Both the Manzanar Pilgrimage and the Manzanar At Dusk programs are free and are open to the public. For more informations, call (323) 662-5102 or send e-mail to 48thpilgrimage@manzanarcommittee.org.

The Manzanar Committee is dedicated to educating and raising public awareness about the incarceration and violation of civil rights of persons of Japanese ancestry during World War II and to the continuing struggle of all peoples when Constitutional rights are in danger. A non-profit organization that has sponsored the annual Manzanar Pilgrimage since 1969, along with other educational programs, the Manzanar Committee has also played a key role in the establishment and continued development of the Manzanar National Historic Site.












## Do You Know an 'Unsung Hero'?

In every successful community, club or organization there are those people that just go about doing the kinds of things that make those communities, clubs or organizations better. These are not the folks who chair committees or head up projects, but these are the people who volunteer to do the work behind the scenes that ensures those events or projects are all they can be.

This is not the mayor of a town, just the guy down the block who makes sure everyone's sidewalk is free of snow, or who happens along when you need a tow.

We call these folks Unsung Heroes, and it's time to share their deeds with the rest of the community in The Inyo Register's special tribute to community: Profile, 2016-17.

This special project will take a snapshot of Inyo County in 2016, and part of that story are the unsung heroes chosen by their neighbors for special attention.

To nominate an Unsung Hero, simply fill out this form and send it or drop it off to The Inyo Register office at 407 W. Line St. #8, Bishop, CA 93514 by March 27, 2017. Or feel free to e-mail the information to tvestal@inyoregister.com

Name of your Hero _____

Hero's address _____ Phone _____

My hero is a hero because _____

_____

_____

_____

_____

_____

_____

My Name _____

Address _____ Phone _____

The Guidelines:

Unsung Heroes must be unsung. Their works and deeds must not have been featured in the newspaper, on the radio or TV. Also, their efforts (in 2016) cannot be part of their employment or their capacity as an elected official.

The Inyo Register will select up to 10 Heroes who will be notified and invited, along with their nominator, family and friends, to a special reception in April 2017. The details of each Hero's work will appear in our special publication, Profile, 2016-17

Nominations received after 5 p.m. March 27 will not be considered. Decision of the judges is final.

MIKE GERVAIS *Publisher* | TERRANCE VESTAL *Managing Editor*

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# Health care – At what cost?

**By Richard Fedchenko**

**TOP OF THE MORNING**



**GUEST COLUMNIST**

Southern Inyo Healthcare District (SIHD) has been reopened for a little more than one year following the catastrophic financial meltdown at the end of 2015. Income for the prior year had been down while expenses were increasing, so cash was in short supply. At that time vendors were not being paid, employee health insurance was cancelled and payroll was 3-5 weeks behind schedule. Employees were leaving to find more stable employment and in December the CEO resigned, followed by the resignation of the five members of the board of directors. The hospital and clinic were left with no executive management and no governance.

Physician support for the emergency department was withdrawn due to non-payment and the emergency room (ER) was closed. With no ER the state shut down the Skilled Nursing Facility (SNF) and 17 residents were transferred to other facilities or released to their homes. The hospital building was closed to all but necessary administrative and maintenance personnel and thus the laboratory, radiology, dietary and physical therapy departments were shuttered. The state also put the hospital license into suspension. Fortunately the Rural Health Clinic was allowed to remain in operation, serving the health care needs of the district.

At the end of December 2015 a new board quorum (three members) was appointed by the County Board of Supervisors. Faced with a financial crisis and a serious shortage of health care capability in the district the board priorities were to find new executive management and a source of funding to allow the hospital to be reopened. With no money in the bank and a poor credit rating this seemed unlikely. However, through the efforts of Supervisor Matt Kingsley and state Assemblyman Devon Mathis the board was introduced to the hospital restructuring and management firm of Healthcare Conglomerate Associates (HCCA) at a public board meeting in late December 2015. Early in January 2016 a board meeting was held to consider a contract with HCCA as well as declaring a fiscal emergency and declaring Chapter 9 bankruptcy. This meeting was well-attended by the public and the support was overwhelming for reopening the hospital by executing a contract with HCCA and beginning the bankruptcy proceedings. An amazing aspect was the willingness of HCCA to establish a line of credit for the district and to provide funds to cover the advance required for the bankruptcy law firm, Baker-Hofstetler (BH).

By the first of March 2016 a full staff of medical personnel was on hand, supplies had been updated, the facilities were cleaned and repaired, the state released the license and the hospital was open for business.

Jump one year forward to March, 2017. The hospital remains opened and all departments are operating at historic levels or above, although it has proven to be very difficult to keep beds filled in the SNF unit, despite glowing reports on the quality of care the residents receive. The clinic also is as busy as usual. To the casual observer everything seems good – we can take the hospital for granted again.

But to those who have been attending board meetings there is a realization that the hospital is in jeopardy. Yes, payroll is being met regularly, employees once again have insurance and the ER doctors are being paid. But cash flow continues to be problematic and there is a daily struggle to keep a positive balance in the bank accounts. Frequent use is being made of the line of credit, drawing upon it one week only to pay it down the next as revenues are received from patient and government payments, and supplemental funding programs such as PRIME. Even though the experts at HCCA have added more than $1 million to cash flow through government supplemental programs, it has not been possible to remain current with all hospital vendors. HCCA has received only one payment of its monthly management fee. BH has received no payment for their efforts on the bankruptcy filing. Local suppliers and other vendors are in some cases as much as 12 months behind in payments.

The result is that the district is now some $2.9 million further in debt than 15 months ago. To some extent that should not be a surprise. The hospital was closed for three months so there was no revenue for that period. Before the hospital could be opened a full staff was required, so there was payroll before there were patients. It took time to build activities back to historic levels. And even at its best, for the past nine years the hospital has only had positive net revenues in two years.

The bankruptcy court has asked for a readjustment plan for pre-petition and post-petition debt by the end of March. This is to deal with the $4.5 million of debt that existed when the hospital closed plus the $2.9 million incurred since then. Payments of bankruptcy claims will be in addition to the continuing operating expenses. By the time the plan becomes effective another six months will have passed and the debt will be even higher.

At the end of 2015 citizens of the district made it very clear that they wanted the hospital open. It has been successfully caring for the health care needs of citizens and visitors to our beautiful lands for the past year. But the cost has been high and is unsustainable. If we are to continue having a hospital in our community the first things required are to pay off the debt as required by bankruptcy law and to fill the beds in our SNF unit. Only then will we have the possibility of a self-sustaining medical facility.

One more sobering consideration is that the year 2030 is the state deadline for meeting earthquake standards for all hospitals. The current SIH building cannot be retrofitted, so a new building will be required by then. The citizens of our district must decide soon if having a replacement hospital is worth the cost.

*(Richard Fedchenko is the president of the Southern Inyo Healthcare district board.)*

## LETTERS TO THE EDITOR

### *Liberals want to put limits on public discourse*

The following is provided to provide perspective on who exactly is leading the assault on free speech and freedom of the press. The quote below is from Tyler Durden and was published on "Zero Hedge's" website dated March 16, 2017

"In a bill aimed at securing a 'right to be forgotten,' introduced by Assemblyman David I. Weprin and (as Senate Bill 4561 by state Sen. Tony Avella), liberal New York politicians would require people to remove 'inaccurate,' 'irrelevant,' 'inadequate' or 'excessive' statements about others …"

Are we seeing a pattern here, folks? It is not the conservatives that want to limit public discourse but the liberal/left. It is their agenda that does not like to be criticized.

**Thaddeus W. Taylor**
*Bishop*

### *Political dissent has just switched sides*

In response to a letter published on March 18. The writer advises us to withhold judgement about our current president and "give him a chance. If in four years you think he's doing a bad job vote him out. That's how it works here."

A valid point. So i am sure the writer was upset when Rush Limbaugh, in regard to then President Elect Obama, said "I hope he fails." This was on Jan. 20, 2009, even before the inauguration, so I am sure this breaks the rule of "give him a chance." Then of course on Nov. 23, 2010, Mitch McConnel said his priority was to make Obama "a one-term president." Not as bad as Rush but certainly not in the spirit of the rule.

We won't discuss the birther movement claims since I am sure we all agree that it is beneath our dignity to honor such baseless claims with our time and intellect.

My point in the above is that there was a steady drum beat set up to delegitimize our duly elected leader, President Obama. Now the shoe is on "the other foot" someone else's "ox is being gored" and many on the right give us the same advice "fall in line."

Beyond that, our history is one of almost constant dissent and giving leaders or institutions a chance when a segment of society feels threatened? Does not seem to be a much used method.

I whole heartedly share the letter writers hope that our leaders will finally try to take care of the average person over the wealthy and the vested interests but i think he is betting on the wrong man.

**Coale Johnson**
*Lone Pine*




## LETTERS AND TOP OF THE MORNING POLICY

- Limit for letters is 500 words; for Top of the Morning, 1,000 words.
- Submission must be original and not published in any other print and/or online media. We will not print letters also submitted to other local media for publication.
- Writer must include a daytime phone number for confirmation of authorship and town. (Number will not be published.)
- Anonymous submissions and pseudonyms are not permitted.
- Inyo County writers and local topics are given priority.
- Top of the Morning writers should include a one- or two-line bio and recent color photo.
- Emailed and typed submissions are preferred.
- Writers may submit one item during a one-week period.
- Writers must refrain from libelous, slanderous and derogatory content.
- Pieces may be edited for content.
- *The Inyo Register* reserves the right to reject any submission.
- Email letters or Top of the Morning submissions to editor@inyoregister.com or mail to: Editor, The Inyo Register, 407 W. Line St., Ste. 8, Bishop, CA 93514






## EMERGENCY

Continued from front page

an email Monday that the county has been discussing ways to manage the massive runoff with various local agencies, including LADWP.

"The runoff poses significant threats to property, and potentially life, in Inyo County – both public infrastructure and private property, primarily in the form of flooding," Carunchio said. "This could include bridges, roads, highways, structures, you name it."

He then explained that only the Inyo County Board of Supervisors can declare a state of emergency within the county, but the board likely will be considering such a declaration within the next few weeks.

"The intense and necessary water spreading currently, and the water spreading that will continue to be undertaken by LADWP will be a real challenge with regard to mosquito control, which poses its own health and safety issues," Carunchio said.

In addition, there could be long-term environmental consequences to the necessary spreading, such as the spread of invasive species, such as salt cedar. Carunchio said much of the salt cedar issues faced by the county and LADWP in the Owens Valley were caused by water spreading that occurred following the winter of 1969.

Carunchio said it is vitally important for Owens Valley residents to clear out any ditches, ponds and other waterways on their property as soon as possible.

Bob Harrington, director of the Inyo County Water Department, echoed Carunchio's concerns about mosquitoes and inversive plant species in an email Monday.

He added his concerns about mud slides, damage to roads from saturated ground, high flows in the Owens River that could cause fish mortality and the high water table issues that have occurred in West Bishop.

Two years ago, more than 25 private wells had to be re-drilled in West Bishop. The very next year, many residences faced flooding, even though the region was facing one of the worst droughts in recorded history.

If any good could come out of the situation, Harrington said it is a relief to actually have water available after the drought.

"There will be good groundwater recharge this year and good water supply for mitigation projects," Harrington said.

While LADWP is forging ahead with its plans to drill two new wells in the Bishop area, B2 and B5, the utility has postponed its intent to test the modified wells in the Laws wellfield "because they don't want to put additional water in the aqueduct system when they already have more runoff than the system can handle," Harrington said.

## MINING

Continued from front page

a full understanding between exploration and the mining operation itself.

"Just because we are exploring doesn't necessarily mean there will be a mine there," Johnson said.

Johnson said she expects the BLM permitting process to be completed in the next six months if not sooner.

The process included the company submitting a plan of operation, base-line surveys and a third-party environmental analysis that looks at the area's archaeology, biology, flora and fauna.

There will be a period for public comment as well, she said.

As far as disturbing the land, there is little of that, she said.

"And we have to put up a reclamations bond," meaning any disturbance made by the company must be mitigated by the company. "We're on the hook for that."

Johnson was in Inyo County last week when she made a presentation before the Inyo County Board of Supervisors.

Interest piqued in mining of metals in the area after the BLM issued a Segregation Notice in the Federal Register Dec. 28. This notice resulted in the temporary segregation of 270,110 acres in Inyo County within California Desert National Conservation Lands from metallic mineral location for up to two years, which means there cannot be new metallic mineral claims within those two years. It also started a 90-day public scoping period and initiated the development of an environmental impact statement. The statement could, in turn, lead to the withdrawal continuing for another 20 years after the two years. The notice is supposed to not impact current mining claims but the future of mining in Inyo County appears to be uncertain. Mining industry representatives said that question could make investors skittish.

County supervisors drafted a letter last week officially opposing the notice. Public comment on the notice ends March 27.

## ROAD

Continued from front page

County Administrator Richard J. Benson.

· Graphic designer Elizabeth Glazner will unveil the El Camino Sierra logo, featuring a proprietary font she created along with her re-working of the classic Inyo Good Roads Club seal.

· Assistant Clerk of the Board Darcy Ellis will walk the audience through the "business development" kit that she has developed to make the El Camino Sierra Project concept and artwork available to Inyo County businesses and organizations free of charge.

· Representatives from local chambers of commerce will share their fledging efforts to promote El Camino Sierra, incorporate the logo and seal in marketing efforts, and plans for the future.

· Museum Director Jon KIusmire will present the county's 2017-2018 advertising purchases incorporating the El Camino Sierra logo.

· Road Superintendent Christopher A. Cash will unveil the new "Inyo County, The Heart of El Camino Sierra" highway signs being installed on El Camino Sierra near the county line.

· Park Manager Jonathan Jones will present his super-sized replica of the original El Camino Sierra sign, intended to serve as El Camino Sierra's "mission bell" icon as well as the template for designating historical sites and points of interest along El Camino Sierra.

A potential third Phase for the El Camino Sierra Project, to be funded in Fiscal Year 2018-2019, after the wayfinding system is installed, could include a dedicated web presence and possibly a mobile device app.

**Groundwater Sustainability Agency**

The board also is scheduled to have a public hearing to consider a decision to become a Groundwater Sustainability Agency for portions of the Owens Valley Groundwater Basin as per the Sustainable Groundwater Management Act of 2014.

While the Sustainable Groundwater Management Act calls for groundwater management, it also emphasizes that it would be done at a local level through groundwater sustainablity agencies. It also, however, established a June 30 deadline. It also requires the state Department of Water Resources (DWR) to rank each groundwater basin in the state as a high, medium, or low priority basin. As a medium priority basin, the groundwater sustainability agency is mandated to develop a sustainability plan by Jan. 31, 2022.

County Chief Administrator Keven Carunchio has said there are 13 eligible entities in the basin that could file as a groundwater sustainability agency.

According to county documents, those entities are Inyo and Mono counties, the Tri Valley Groundwater Management District, the city of Bishop, and numerous community service districts, including Big Pine CSD; Eastern Sierra CSD; Indian Creek-Westridge CSD; Keeler CSD; Lone Pine CSD; Sierra Highlands CSD; Sierra North CSD; Starlite CSD; and, Wheeler Crest CSD.

The issue is set to be discussed at 1:30 p.m. today at the County Administrative Center, 224 N. Edwards, Independence. The public session of the meeting begins at 10 a.m.

## HORSEMEN

Continued from front page

and lots of fun," said Jen Roeser, owner of McGee Creek Pack Station and Mule Days board member. "Lee (Roser, her husband) and I really enjoyed the folks who attended our sessions. There were a lot of great questions and such good interest."

Lee and Jen Roeser were among the numerous presenters who showed participants the many aspects of packing, recreating, staying safe and working in the wilderness.

More than 200 people attended both the concert and the dinner, local volunteer Sarah Sheehan said. A mix of community members and horsemen from around the state attended the clinics and demonstrations.

Friday night, cowboy entertainer Dave Stamey delighted the crowd with songs about the Western way of life, including a few that are based on local lore, like the story of Bart McGee, who was the Inyo County deputy in 1873 and the McGee Creek "Packer's Song."

"I love performing for this group because I don't have to explain everything," Stamey said, gaining a laugh from the crowd, many of whom could sympathize with Stamey's songs about the rugged life of a packer.

Clinics were held throughout the weekend, ranging from a wide variety of subjects from equine first aid in the wilderness to proper use of a chain saw.

Much of what the Backcountry Horsemen do is maintain the trails in the backcountry and when it comes to using saws, Dave Moser is the expert.

"You can use chain saws up to the wilderness boundary, but once you get into the wilderness, you have to do things like we did in the old days," Moser said, running his hand over the back side of a two-man cross cut saw. "Many of the saws we use are over 100 years old – and they still have a lot of good years left in them. They just don't make them like they used to."

When the handles are removed, the saws can be fit into a pack saddle.

Over by the food court, backcountry cook Kay Bruns demonstrated how to cook in a Dutch oven. She made apricot chicken and cream cycle cake, much to the delight of the audience members who got to sample the finished product.

In the Main Arena, riders participated in a trail trials, which is a test of how well an equine can maneuver through various obstacles. In one, a horse and its rider pulled a weight around the arena, first behind the horse, then in front of the horse as it walked backwards.

One demonstration was given by the Marines from Pickle Meadows Mountain Warfare Training Center above Bridgeport.

Aanthony Parkers "Chief Cook and Bottle Washer," or rather the civilian packer in charge of the Pickle Meadow's packing program, explained to the audience why the Marines need a packing program. It was started in 1985, when the Russians were using pack strings to haul military equipment over the mountains of Afghanistan. The United States began its packing program, which was only expected to last five years, however, the program was so successful, it remains to this day. Pickle Meadows is the only packing program in the military, training 75 students at a time, although the class' maximum capacity is 48, Parker said.

Parker was assisted in the arena by four active-duty combat veterans, who received enthusiastic support from the crowd.

Other highlights of the weekend included a presentation by local packer and 20 Mule Team teamster Bobby Tanner and a well attended talk about the 100 Mules Walking the Los Angeles Aqueduct project.

## CNO

Continued from front page

ship ethic to this position, which will well serve the district, its nurses and ultimately its patients."

Aspel served as the RHC director for 14 years before stepping into a nursing administrative role a little more than a year ago. She was asked to be the acting chief nursing officer in 2016. Flanigan said Aspel more than proved her abilities to take on the demanding role in a full-time capacity.

"I love this hospital and our community," Aspel said. "I have worked the majority of my career at Northern Inyo, where I have gotten to provide nursing care to my neighbors and be a part of an amazing team. Nursing is a wonderful career, where what you do matters each day. "

Aspel and her husband, Greg, live in Bishop and have two daughters.

In another leadership change, Maria Sirois, NIHD's chief performance excellence officer, announced her resignation effective March 17 after three years of service. Sirois cited her desire to pursue her doctorate as her reason for leaving NIHD.

"We appreciate Maria's service to the NIHD community and wish her well as she starts the next chapter of her academic and professional career," Flanigan said. "We will miss the energy and passion for continuous improvement that Maria brought to our organization."

Flanigan went on to say that during her tenure at NIHD, Sirois improved survey readiness and actively led and participated in Joint Commission and regulatory activities. She also built a team and a culture that is committed to improving processes and service for patients and their families.

Recruiting efforts are underway to locate a new leader for the risk and quality departments.

In other NIHD news, the district signed on to participate in Caltrans' Adopt-A-Highway program and will be responsible for the two-mile stretch of U.S. HIghway 395, which serves as Bishop's Main Street, and a similar area near Warm Springs Road.

The Adopt-A-Highway program, which began in the state in 1989, is one of the truly successful government-public partnerships of modern time. More than 120,000 Californians have cleaned and enhanced more than 15,000 shoulder-miles of roadside.

Participation can include removing litter, planting and establishing trees or wildflowers, removing graffiti and controlling vegetation. Caltrans solely administers the Adopt-A-Highway Program. Adoptions usually span a two-mile stretch of roadside, and permits are issued for five-year periods.

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## OBITUARY NOTICES



### WILMA IRENE MICHENER
1927-2017

Wilma Irene Michener, age 89, died in Bishop, California on Monday, March 6, 2017. Wilma was born on March 26, 1927 in Colorado to parents, Earl D. Hartschen and Bertha Ellen Hartschen. Wilma graduated from Cheyenne Wyoming High School in 1945 and went on to Graceland College in Iowa where she met her late husband, Robert E. (Bob) Michener.

Wilma & Bob were married in 1947 and moved to Los Angeles, California to start their family and careers. They moved to Mammoth Lakes, California in 1963 where they owned and operated Pine Cliff Resort for 16 years. This was definitely a family business with everyone pitching in. Wilma greeted customers, handled the reservations, cleaned cabins and did mountains of laundry.

In 1979 they settled in Bishop, California where Wilma became a Mary Kay Cosmetics Representative which she continued to do until the last couple of years. She loved the social part of the cosmetics business and she was very successful as well, qualifying for the Mary Kay "Pink Car" for many years. She was an excellent cook and loved to entertain.

Wilma was preceded in death by her husband of 68 years, Robert Michener and her son, Jon Michener.

She is survived by her daughter, Robin Fernandez; son, Michael Scott Michener and his wife, Sharon Michener; Vicki Michener (Jon's wife); grandchildren, Kristen, Jackie, Torey, Garrett and Jake and great grandchildren, Mason, Sadie, Taryn, Dylan and Easton.



### THOMAS ALLEN SAFSTROM
1938 - 2017



Thomas Allen Safstrom was born on May 4, 1938 in Kane, PA to Thelma Jane Peterson and Allen Safstrom. His mother died from TB when Tom was age 5, so he was raised by his beloved maternal grandparents, Ben and Anna Peterson of Ludlow, PA. Tom built a thriving plastics manufacturing business in Southern California, but his passion was spending time in the outdoors.

After he retired, Tom made many good friends in the Bishop, CA and Mammoth Lakes, CA areas that shared his deep love for the beauty and majesty of the Eastern Sierra. He loved riding into the back country on horseback and even volunteered to help the Forest Service when needed. Tom was a dedicated husband, remarkable father and loving grandfather who took great pride in caring and providing for the needs of his entire family. Tom was a skilled craftsman. He was generous and always willing to share his knowledge and skills to help others. Tom is survived by his wife, Loni Safstrom; his son, Kristian Safstrom; daughter, Lisa Coons and three wonderful granddaughters. He passed away on March 13, 2017 after a valiant two year battle with Stage 4 cancer. We will have a graveside service at East Line Cemetery in Bishop at 2 p.m. on Wednesday, March 22, 2017.

## MAN ON THE STREET

# What is your favorite spring activity?

By Mike Chacanaca



"Geocaching."
*– Beth Himelhoch, Bishop*



"Geocaching."
*– Ed Himelhoch, Bishop*



"Road riding (bicycling)."
*– Chris Morgan, Bishop*



"Hiking."
*– Ana Lara, Bishop*



"Fishing and mowing the lawn with a push mower."
*– Elsy Avalos, Bishop*



"Planting flowers and being outdoors with my family."
*– Karina Morales, Bishop*

# TV FOR TUES./WED.




**TUESDAY 21 MARCH 2017** — MOVIES | SPORTS | NEWS/TALK | KIDS — B - Bishop, Big Pine, Round Valley, Independence L - Lone Pine C - Chalfant Valley S1 - Dish S2 - Directv

| B | L | C | S1 | S2 | | 5 PM | 5:30 | 6 PM | 6:30 | 7 PM | 7:30 | 8 PM | 8:30 | 9 PM | 9:30 | 10 PM | 10:30 | 11 PM | 11:30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | | 2 | 2 | KCBS | CBS 2 News at 5:00 | | CBS 2 News | Evening News | The Insider | Ent. Tonight | NCIS "Pay to Play" | | Bull "E.J." | | NCIS: New Orleans | | CBS 2 News | Late-Colbert |
| 4 | 4 | | 4 | 3 | KNBC | NBC 4 News at 5pm | | NBC 4 News | Nightly News | Extra | Ac. Hollywood | The Voice | | Trial & Error | Trial & Error | Chicago Fire | | NBC 4 News | Tonight Show |
| 5 | 5 | 5 | | 5 | KTLA | The Steve Wilkos Show | | KTLA News at 6 | KTLA News | Two/Half Men | Two/Half Men | The Flash "Duet" | | DC's Legends of Tomorrow | | KTLA 5 News at 10 | | KTLA 5 News | Friends |
| 6 | 50 | | | | KOCE | Wild Kratts | SoCal Favorites | PBS NewsHour | | Soldier On: Life After Deployment | | American Masters Photographer Dorothea Lange. | | | | Frontline "Iraq Uncovered" | | Tavis Smiley | Charlie Rose |
| 7 | 7 | | 7 | 7 | KABC | Eyewitness News 5:00PM | | News | World News | Jeopardy! | Wheel Fortune | The Middle | Am Housewife | Fresh Off-Boat | blackish | People Icons "Gone Too Soon" | | News | Jimmy Kimmel |
| 8 | | 19 | | | KOLO | KOLO 8 at 5pm | KOLO 8 5:30 | World News | KOLO 8 6:30 | Jeopardy! | Wheel Fortune | The Middle | Am Housewife | Fresh Off-Boat | blackish | People Icons "Gone Too Soon" | | KOLO 8 at 11 | Jimmy Kimmel |
| 9 | 9 | | 9 | 9 | KCAL | The People's Court | | Family Feud | Family Feud | 2 Broke Girls | 2 Broke Girls | KCAL 9 News at 8:00PM | | KCAL 9 News at 9:00PM | | KCAL 9 News | Sports Central | Mike & Molly | Mike & Molly |
| 11 | 11 | | | 11 | KTTV | Fox 11 Five O'Clock News | | TMZ | Dish Nation | Modern Family | Modern Family | New Girl | (:31) The Mick | (:01) Bones | | Fox 11 Ten O'Clock News | | TMZ | Dish Nation |
| | 28 | | 28 | 28 | KCET | World News | Business Rpt. | World News | Steves' Europe | California Gold | California Gold | SoCal | Earth Focus | The Blue Planet | | Penny: Champ | Klocked Wom | The Blue Planet | |
| | | 2 | | | KMGH | 7News Right | The List | The Middle | Am Housewife | Fresh Off-Boat | blackish | People Icons "Gone Too Soon" | | 7News at 10PM | (:35) Jimmy Kimmel Live | | (:37) Nightline | Inside Edition | RightThisMinute |
| | | 4 | | | KUSA | 9News Next | Ent. Tonight | The Voice | | Trial & Error | Trial & Error | Chicago Fire | | 9News at 10pm | Tonight Show-J. Fallon | | (:37) Late Night With Seth Meyers | Last Call/Daly | |
| | | 7 | | | KCNC | CBS4 News at 6 | CBS4 News | NCIS "Pay to Play" | | Bull "E.J." | | NCIS: New Orleans | | News | Late Show-Colbert | | Late Late Show/James Corden | News Repeat | |
| 23 | 602 | 8 | 140 | 206 | ESPN | NBA Basketball Chicago Bulls at Toronto Raptors. | | | NBA Basketball San Antonio Spurs at Minnesota Timberwolves. | | | | | SportsCenter With Scott Van Pelt | | SportsCenter | | SportsCenter | |
| 24 | 603 | 15 | 144 | 209 | ESPN2 | College Basketball | | College Basketball | | | | SportsCenter | | Baseball Ton. | Jalen & Jacoby | GameDay | Sp. Olympics | NBA Basketball: Bulls at Raptors | |
| 25 | 772 | | | | FXSP | (4:30) College Baseball Oklahoma at Oklahoma State. | | | | | MLB Baseball Los Angeles Angels of Anaheim at Cincinnati Reds. | | | | | Angels Post | Kings Weekly | World Poker | |
| 26 | 109 | 22 | 138 | 245 | TNT | (:15) ★★★ G.I. Jane (1997) Demi Moore. A female Navy SEALs recruit completes rigorous training. | | | | | | ★ Law Abiding Citizen (2009) Jamie Foxx, Gerard Butler. | | | | (:15) ★★★ Django Unchained (2012, Western) Jamie Foxx. | | | |
| 27 | 113 | 13 | 139 | 247 | TBS | Friends | Friends | Seinfeld | Seinfeld | Big Bang | Big Bang | Big Bang | Big Bang | Big Bang | Big Bang | The Detour | Big Bang | Conan Actor Reese Witherspoon. | |
| 28 | 125 | | 105 | 242 | USA | Chrisley Knows | Chrisley Knows | Chrisley Knows | Chrisley Knows | Chrisley Knows | Chrisley Knows | WWE SmackDown! | | | | Chrisley Knows | Chrisley Knows | Modern Family | Modern Family |
| 29 | 361 | | 108 | 252 | LIFE | Little Women: LA "Sail Away" | | Little Women: LA | | Little Women: LA "Tough Crowd" | | Little Women: LA | | Little Women: LA "On Thin Ice" | | (:02) Little Women: Atlanta | | (:02) Little Women: LA | |
| 30 | 362 | | 109 | 253 | LMN | Stalked by My Doctor (2015) Eric Roberts, Brianna Chomer. | | | | Stalked by My Doctor: The Return (2016, Suspense) Eric Roberts. | | | | Stalked by My Doctor (2015) Eric Roberts, Brianna Chomer. | | | | Stalked by My Doctor: Return | |
| 31 | 121 | 9 | 182 | 278 | DISC | Moonshiners: Art of the 'Shine | | Moonshiners: Art of the 'Shine | | Moonshiners: Art of the 'Shine | | Moonshiners: Outlaw Cuts | | Moonshiners | | Killing Fields | | Moonshiners: Art of the 'Shine | |
| 32 | 251 | 26 | 183 | 280 | TLC | Say Yes, Dress | Say Yes, Dress | Say Yes, Dress | Say Yes, Dress | My Big Fat Fabulous Life | | My Big Fat Fabulous Life | | My Big Fat Fabulous Life | | (:02) She's in Charge | | (:04) My Big Fat Fabulous Life | |
| 33 | 253 | 24 | 184 | 282 | AP | River Monsters "Death Ray" | | River Monsters | | River Monsters | | River Monsters | | Wild Patagonia | | | | River Monsters "Asian Slayer" | |
| 34 | 256 | | 120 | 269 | HIST | Pawn Stars | Pawn Stars | Counting Cars | Counting Cars | Counting Cars | Counting Cars | Counting Cars | Counting Cars | Counting Cars Supercharged | | Forged in Fire: Cutting Deeper | | Counting Cars | Counting Cars |
| 35 | 132 | 25 | 118 | 265 | A&E | Intervention "Kevin" | | Intervention "Kathy" | | Intervention "Tiffany" | | Intervention "Katie" | | Intervention "Dana" | | (:01) Intervention "Kristie" | | (:03) Intervention "Katie S." | |
| 36 | 119 | | | 254 | AMC | (4:00) ★★★★ The Shawshank Redemption (1994) Tim Robbins. | | | | ★★★ The Italian Job (2003, Crime Drama) Mark Wahlberg, Charlize Theron. | | | | ★★★ Ocean's Eleven (2001, Comedy-Drama) George Clooney, Matt Damon. | | | | | |
| 37 | 790 | | 132 | 256 | TCM | ★★★★ Double Indemnity (1944, Crime Drama) Fred MacMurray. | | | | ★★ Detour (1945) Tom Neal, Ann Savage. | | | ★★★ Cape Fear (1962, Suspense) Gregory Peck, Robert Mitchum. | | | | ★★★ Point Blank (1967) Lee Marvin. | | |
| 38 | 179 | | 180 | 311 | FREE | The Middle | The Middle | ★★ She's All That (1999) Freddie Prinze Jr., Rachael Leigh Cook. | | | | The Fosters | | (:01) Switched at Birth | | The Twins: Happily Ever After? | | The 700 Club | |
| 39 | 303 | 17 | 173 | 291 | DISN | Liv and Maddie | L&M:Cali Style | Bunk'd | Bizaardvark | K.C. Undercover | Good-Charlie | Stuck/Middle | Good-Charlie | Liv and Maddie | Liv and Maddie | Bunk'd | Bunk'd | Jessie | Jessie |
| 41 | 326 | | 176 | 296 | TOON | Wrld, Gumball | Cloudy, Meat | Teen Titans Go! | Teen Titans Go! | We Bare Bears | We Bare Bears | King of the Hill | Cleveland Show | American Dad | American Dad | Bob's Burgers | Bob's Burgers | Family Guy | Family Guy |
| 42 | 451 | | 112 | 229 | HGTV | Fixer Upper | | Fixer Upper | | Fixer Upper | | Fixer Upper | | Fixer Upper "The Flipper Upper" | | Home Town | | House Hunters | House Hunters |
| 43 | 453 | | 110 | 231 | FOOD | Chopped "Viewers' Vengeance" | | Chopped "Entree Basket Blues" | | Chopped "Best Laid Pans" | | Chopped "Back in Time" | | Chopped "Entree Basket Blues" | | Chopped "Best Laid Pans" | | Chopped "Back in Time" | |
| 44 | 129 | | 137 | 248 | FX | (4:00) ★★ White House Down (2013) Channing Tatum, Jamie Foxx. | | | | ★★★ Gone Girl (2014, Mystery) Ben Affleck. A woman disappears on her fifth wedding anniversary. | | | | | | The Americans "The Midges" | | The Americans "The Midges" | |
| 48 | 152 | | 122 | 244 | SYFY | Face Off "Child's Play" | | Face Off "Lost Languages" | | Face Off "Covert Characters" | | Face Off "Odd Couples" | | Face Off "Frightening Families" | | Cosplay Melee | | Face Off "Frightening Families" | |
| 64 | 181 | | 129 | 273 | BRAVO | Real Housewives/Beverly | | Real Housewives/Beverly | | Real Housewives/Beverly | | Real Housewives/Beverly | | Real Housewives/Beverly | | Imposters | | Watch What | Housewives |
| 65 | 135 | | 114 | 236 | E! | Kardashian | Keeping Up With the Kardashians | | Kardashian | E! News | | ★★★ Mean Girls (2004, Comedy) Lindsay Lohan, Rachel McAdams. | | | | The Arrangement "The Leak" | | E! News | |
| 66 | 165 | | 204 | 246 | TRUTV | Imp. Jokers | Imp. Jokers | Imp. Jokers | Imp. Jokers | Imp. Jokers | Imp. Jokers | Imp. Jokers | Imp. Jokers | Imp. Jokers | Inside Jokes | Prentice Penny | Hack My Life | Imp. Jokers | Imp. Jokers |
| 67 | 255 | | 215 | 277 | TRAV | Delicious | Delicious | Bizarre Foods/Zimmern | | Bizarre Foods America | | Delicious | Delicious | Bizarre Foods | | Bizarre Foods/Zimmern | | Bizarre Foods America | |
| 69 | 560 | | 260 | 372 | TBN | Praise Pastor Tony Suarez hosts. | | Joseph Prince | Bil Cornelius | Joyce Meyer | Israel Matters | Praise Pastor Tony Suarez hosts. | | Adventures | World Impact | Sekulow | Creflo Dollar | Jewish Voice | The Watchman |
| 70 | 567 | | | 374 | BYU | Undercover Angel | | College Volleyball Princeton at BYU. | | | | Undercover Angel | | College Volleyball Princeton at BYU. | | | | Undercover Angel | |
| 79 | 356 | | 185 | 312 | HALL | Home Improve. | Home Improve. | Last-Standing | Last-Standing | Last-Standing | Last-Standing | Last-Standing | Last-Standing | The Middle | The Middle | The Middle | The Middle | Golden Girls | Golden Girls |
| | 315 | | 171 | 300 | NICK | Loud House | Loud House | Henry Danger | Henry Danger | Hunter Street | Thundermans | Thundermans | Game Shakers | Full House | Full House | Full House | Full House | Friends | Friends |
| | 141 | | 107 | 249 | COM | (4:45) Futurama | (:20) Futurama | (5:50) Futurama | (:20) Futurama | South Park | South Park | South Park | South Park | Tosh.0 | Tosh.0 | Tosh.0 | Detroiters | The Daily Show | At Midnight |
| | 146 | 16 | 168 | 325 | SPIKE | ★★ Super Troopers (2001) Jay Chandrasekhar, Kevin Heffernan. | | | | ★★★ Knocked Up (2007) Seth Rogen, Paul Rudd. A one-night stand has an unforeseen consequence. | | | | | | Adam Carolla and Friends | | ★★★ Knocked Up (2007) | |
| | 139 | | 106 | | TVL | M*A*S*H | M*A*S*H | Andy Griffith | Andy Griffith | Andy Griffith | Andy Griffith | Andy Griffith | Love-Raymond | Love-Raymond | Love-Raymond | Teachers | Throwing Shade | King of Queens | King of Queens |
| | 384 | | 115 | 235 | ESQTV | Friday Night Tykes | | Friday Night Tykes | | Friday Night Tykes | | Friday Night Tykes | | Friday Night Tykes | | Best Bars in America | | Best Bars in America "Chicago" | |

**WEDNESDAY 22 MARCH 2017** — MOVIES | SPORTS | NEWS/TALK | KIDS — B - Bishop, Big Pine, Round Valley, Independence L - Lone Pine C - Chalfant Valley S1 - Dish S2 - Directv

| B | L | C | S1 | S2 | | 5 PM | 5:30 | 6 PM | 6:30 | 7 PM | 7:30 | 8 PM | 8:30 | 9 PM | 9:30 | 10 PM | 10:30 | 11 PM | 11:30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | | 2 | 2 | KCBS | CBS 2 News at 5:00 | | CBS 2 News | Evening News | The Insider | Ent. Tonight | Survivor | | Criminal Minds "In the Dark" | | Criminal Minds: Beyond Borders | | CBS 2 News | Late-Colbert |
| 4 | 4 | | 4 | 3 | KNBC | NBC 4 News at 5pm | | NBC 4 News | Nightly News | Extra | Ac. Hollywood | Blindspot | | Law & Order: SVU | | Chicago P.D. | | NBC 4 News | Tonight Show |
| 5 | 5 | 5 | | 5 | KTLA | The Steve Wilkos Show | | KTLA News at 6 | KTLA News | Two/Half Men | Two/Half Men | Arrow "Kapiushon" | | The 100 "Gimme Shelter" | | KTLA 5 News at 10 | | KTLA 5 News | Friends |
| 6 | 50 | | | | KOCE | Wild Kratts | Studio SoCaL | PBS NewsHour | | SuperNature -- Wild Flyers | | Nature "Great Zebra Exodus" | | NOVA | | Spillover -- Zika, Ebola & Beyond | | Tavis Smiley | Charlie Rose |
| 7 | 7 | | 7 | 7 | KABC | Eyewitness News 5:00PM | | News | World News | Jeopardy! | Wheel Fortune | The Goldbergs | Speechless | Modern Family | (:31) blackish | Designated Survivor "Backfire" | | News | Jimmy Kimmel |
| 8 | | 19 | | | KOLO | KOLO 8 at 5pm | KOLO 8 5:30 | World News | KOLO 8 6:30 | Jeopardy! | Wheel Fortune | The Goldbergs | Speechless | Modern Family | (:31) blackish | Designated Survivor "Backfire" | | KOLO 8 at 11 | Jimmy Kimmel |
| 9 | 9 | | 9 | 9 | KCAL | The People's Court | | Family Feud | Family Feud | 2 Broke Girls | 2 Broke Girls | KCAL 9 News at 8:00PM | | KCAL 9 News at 9:00PM | | KCAL 9 News | Sports Central | Mike & Molly | Mike & Molly |
| 11 | 11 | | | 11 | KTTV | Fox 11 Five O'Clock News | | TMZ | Dish Nation | Modern Family | Modern Family | Shots Fired "Hour One: Pilot" | | Empire "Sound & Fury" | | Fox 11 Ten O'Clock News | | TMZ | Dish Nation |
| | 28 | | 28 | 28 | KCET | World News | Business Rpt. | World News | Steves' Europe | Huell Howser | California Gold | Globe Trekker "Antarctica" | | Link Voices "Los Wild Ones" | | | Globe Trekker "Antarctica" | | Link Voices |
| | | 2 | | | KMGH | 7News Right | The List | The Goldbergs | Speechless | Modern Family | (:31) blackish | Designated Survivor "Backfire" | | 7News at 10PM | (:35) Jimmy Kimmel Live | | (:37) Nightline | Inside Edition | RightThisMinute |
| | | 4 | | | KUSA | 9News Next | Ent. Tonight | Blindspot | | Law & Order: SVU | | Chicago P.D. | | 9News at 10pm | Tonight Show-J. Fallon | | (:37) Late Night With Seth Meyers | Last Call/Daly | |
| | | 7 | | | KCNC | CBS4 News at 6 | CBS4 News | Survivor | | Criminal Minds "In the Dark" | | Criminal Minds: Beyond Borders | | News | Late Show-Colbert | | Late Late Show/James Corden | News Repeat | |
| 23 | 602 | 8 | 140 | 206 | ESPN | NBA Basketball Atlanta Hawks at Washington Wizards. | | | | | NBA Basketball New York Knicks at Utah Jazz. | | | | | SportsCenter | | SportsCenter | |
| 24 | 603 | 15 | 144 | 209 | ESPN2 | College Basketball | | 2017 World Baseball Classic Championship: Teams TBA. | | | | | | SportsCenter | | Baseball Ton. | Jalen & Jacoby | NBA Basketball | |
| 25 | 772 | | | | FXSP | Rodeo RodeoHouston, First Semifinal. From Houston. | | | | MLB Baseball Texas Rangers at Los Angeles Angels of Anaheim. | | | | | | Angels Post | Halo Hurlers | World Poker | |
| 26 | 109 | 22 | 138 | 245 | TNT | Bones "The Gunk in the Garage" | | Bones "The Tiger in the Tale" | | Bones | | Major Crimes "Dead Drop" | | Major Crimes "Bad Blood" | | Major Crimes "Bad Blood" | | Hawaii Five-0 | |
| 27 | 113 | 13 | 139 | 247 | TBS | Friends | Friends | 2 Broke Girls | 2 Broke Girls | Big Bang | Big Bang | Big Bang | Big Bang | Big Bang | Big Bang | Big Bang | Full Frontal | Conan Sportscaster Erin Andrews. | |
| 28 | 125 | | 105 | 242 | USA | NCIS "Oil & Water" | | NCIS "Better Angels" | | NCIS "Kill Chain" | | NCIS "React" | | NCIS "Scope" | | NCIS "Reasonable Doubts" | | Modern Family | Modern Family |
| 29 | 361 | | 108 | 252 | LIFE | Little Women: Atlanta | | Little Women: Atlanta | | Little Women: Atlanta | | Little Women: Atlanta | | Little Women: Atlanta | | (:02) Bringing Up Ballers | | (:02) Little Women: Atlanta | |
| 30 | 362 | | 109 | 253 | LMN | A Surrogate's Nightmare (2017) Poppy Montgomery, Ty Olsson. | | | | The Wrong Boyfriend (2015) Francesca Eastwood, James Caan. | | | | A Surrogate's Nightmare (2017) Poppy Montgomery, Ty Olsson. | | | | The Wrong Boyfriend (2015) | |
| 31 | 121 | 9 | 182 | 278 | DISC | The Last Alaskans | | The Last Alaskans "On Thin Ice" | | The Last Alaskans "Dark Winter" | | The Last Alaskans "Fire and Ice" | | The Last Alaskans | | Bering Sea Gold | | The Last Alaskans | |
| 32 | 251 | 26 | 183 | 280 | TLC | (4:00) My 600-Lb. Life | | My 600-Lb. Life | | My 600-Lb. Life | | My 600-Lb. Life "Tracey's Story" Tracey's weight resides in her legs. | | | | | | My 600-Lb. Life "Tracey's Story" | |
| 33 | 253 | 24 | 184 | 282 | AP | Treehouse Masters | | Treehouse Masters | | Treehouse Masters | | Treehouse Masters | | Treehouse Masters | | Treehouse Masters | | Treehouse Masters | |
| 34 | 256 | | 120 | 269 | HIST | American Pickers | | American Pickers | | American Pickers "The Big Bet" | | American Pickers | | American Pickers | | (:03) American Pickers | | (:03) American Pickers | |
| 35 | 132 | 25 | 118 | 265 | A&E | After the First 48 | | The First 48 | | Duck Dynasty | Duck Dynasty | Duck Dynasty | Duck Dynasty | Duck Dynasty | Jep & Jessica | Jep & Jessica | Duck Dynasty | Duck Dynasty | Duck Dynasty |
| 36 | 119 | | | 254 | AMC | (4:30) ★★★ The Italian Job (2003) Mark Wahlberg, Charlize Theron. | | | | ★★★ Gladiator (2000) Russell Crowe, Joaquin Phoenix. A fugitive general becomes a gladiator in ancient Rome. | | | | | | | ★★★★ The Dark Knight (2008) Christian Bale. | | |
| 37 | 790 | | 132 | 256 | TCM | ★★★★ The Man Who Shot Liberty Valance (1962) James Stewart. | | | | (:15) ★★★ Hombre (1967) Paul Newman, Fredric March. | | | | (:15) ★★★★ Touch of Evil: Extended (1958) Charlton Heston. | | | | (:15) Kansas City Confidential | |
| 38 | 179 | | 180 | 311 | FREE | The Middle | The Middle | The Middle | ★★ Nanny McPhee (2005) Emma Thompson, Colin Firth. | | | | ★★ Nanny McPhee Returns (2010) Emma Thompson, Maggie Gyllenhaal. | | | | | The 700 Club | |
| 39 | 303 | 17 | 173 | 291 | DISN | Liv and Maddie | L&M:Cali Style | Bunk'd | Bizaardvark | Tangled Before Ever After (2017) | | Stuck/Middle | Good-Charlie | Liv and Maddie | Liv and Maddie | Bunk'd | Bunk'd | Jessie | Jessie |
| 41 | 326 | | 176 | 296 | TOON | Wrld, Gumball | Cloudy, Meat | Teen Titans Go! | Teen Titans Go! | We Bare Bears | We Bare Bears | King of the Hill | Cleveland Show | American Dad | American Dad | Samurai Jack | Bob's Burgers | Family Guy | Family Guy |
| 42 | 451 | | 112 | 229 | HGTV | Property Brothers | | Property Brothers | | Property Brothers | | Property Brothers | | Property Brothers | | House Hunters | Hunters Int'l | Property Brothers | |
| 43 | 453 | | 110 | 231 | FOOD | Chopped Junior | | Cooks vs. Cons | | Cooks vs. Cons | | Spring Baking Championship | | Cooks vs. Cons | | Cooks vs. Cons | | Spring Baking Championship | |
| 44 | 129 | | 137 | 248 | FX | (3:30) ★★★ Gone Girl (2014) Ben Affleck. | | | ★★ Transformers: Age of Extinction (2014) Mark Wahlberg. Optimus Prime and the Autobots face fearsome challengers. | | | | | | | Legion "Chapter 7" | | Legion "Chapter 7" | |
| 48 | 152 | | 122 | 244 | SYFY | (3:00) ★★ A Knight's Tale | | ★★ Pirates of the Caribbean: Dead Man's Chest (2006, Adventure) Johnny Depp, Orlando Bloom. | | | | | | The Magicians "Lesser Evils" | | The Expanse | | Narnia: Prince Caspian | |
| 64 | 181 | | 129 | 273 | BRAVO | Housewives/NYC | | Housewives/NYC | | The Real Housewives of Atlanta | | The Real Housewives of Atlanta | | The Real Housewives of Atlanta | | The Real Housewives of Atlanta | | Watch What | Housewives |
| 65 | 135 | | 114 | 236 | E! | Keeping Up With the Kardashians | | Keeping Up With the Kardashians | | E! News | | So Cosmo | | So Cosmo | | So Cosmo | | E! News | |
| 66 | 165 | | 204 | 246 | TRUTV | Imp. Jokers | Imp. Jokers | Prentice Penny | Carbonaro Eff. | Carbonaro Eff. | Carbonaro Eff. | Carbonaro Eff. | Carbonaro Eff. | Carbonaro Eff. | Carbonaro Eff. | Carbonaro Eff. | Carbonaro Eff. | Prentice Penny | Carbonaro Eff. |
| 67 | 255 | | 215 | 277 | TRAV | Expedition Unknown | | Expedition Unknown | | Expedition Unknown | | Expedition Unknown | | Expedition Unknown | | Expedition Unknown | | Expedition Unknown | |
| 69 | 560 | | 260 | 372 | TBN | John Gray | Turning Point | Joseph Prince | Steven Furtick | Living Proof | Blessed Life | John Gray | Drive History | Ravi Zacharias | Jesse Duplantis | GregLaurie.TV | Creflo Dollar | Driven By | Christine Caine |
| 70 | 567 | | | 374 | BYU | College Softball Utah at BYU. | | Terry (2005, Docudrama) Shawn Ashmore, Ryan McDonald. | | | | Random Acts | Studio C | Terry (2005, Docudrama) Shawn Ashmore, Ryan McDonald. | | | | Random Acts | Studio C |
| 79 | 356 | | 185 | 312 | HALL | Home Improve. | Home Improve. | Last-Standing | Last-Standing | Last-Standing | Last-Standing | Last-Standing | Last-Standing | The Middle | The Middle | The Middle | The Middle | Golden Girls | Golden Girls |
| | 315 | | 171 | 300 | NICK | Loud House | Loud House | Henry Danger | Henry Danger | Hunter Street | Thundermans | Thundermans | Game Shakers | Full House | Full House | Full House | Full House | Friends | Friends |
| | 141 | | 107 | 249 | COM | (4:45) Futurama | (:20) Futurama | (5:50) Futurama | (:20) Futurama | South Park | South Park | South Park | South Park | Tosh.0 | Tosh.0 | The Comedy | Tosh.0 | The Daily Show | At Midnight |
| | 146 | 16 | 168 | 325 | SPIKE | (4:00) ★★★ The Town (2010) Ben Affleck, Rebecca Hall, Jon Hamm. | | | | ★★ Shooter (2007, Suspense) Mark Wahlberg, Michael Peña, Danny Glover. | | | | | | TIME: The Kalief Browder Story | | ★★ The Book of Eli (2010) | |
| | 139 | | 106 | | TVL | (:12) M*A*S*H | | (5:48) M*A*S*H | Andy Griffith | Andy Griffith | Andy Griffith | (:12) The Andy Griffith Show | | Love-Raymond | Love-Raymond | Love-Raymond | Love-Raymond | King of Queens | King of Queens |
| | 384 | | 115 | 235 | ESQTV | Brew Dogs "Portland" | | Brew Dogs "Boston" | | Brew Dogs "Durham" | | The Agent | | The Agent | | Brew Dogs "Los Angeles" | | Brew Dogs "San Francisco" | |

## MAN ON THE STREET

# What is your favorite spring activity?

By Mike Chacanaca



"Hanging out with friends."
*– Taylor McCormick, Bishop*



"Snowboarding for as long as the mountain is open."
*–Taryn Greenman Bishop*



"Riding my bike."
*– Carlos Gonzales, Bishop*



"Going to the park with friends."
*– Autum Davis, Bishop*



"Family get togethers and barbecues."
*– Jordon Hess, Bishop*



"Floating on the river."
*– Michael Jones, Bishop*

Uncommon Sense

# Remembering Chuck Berry

*"If you tried to give rock and roll another name you could call it 'Chuck Berry.'"*
*John Lennon*



CARNE LOWGREN
COLUMNIST

Chuck Berry died last Saturday. On the Mt. Rushmore of Rock & Roll Chuck Berry would be George Washington. His music is so ubiquitous that his songs are clichés: "Anybody can play Chuck Berry." It is safe to say anyone who plays rock-based music has – his riff-based songs are the template of pre-Beatles rock and roll. Berry knew this – he famously toured without a band because he correctly assumed that he could conscript a backup band anywhere because everyone knew his songs.

Chuck Berry's songs are so well written and seamlessly constructed that it is easy to forget how good they are. Berry was a seemingly offhand lyrical genius whose compressed and evocative vignettes of young American life were as specific as they were universal.

One would think that someone who wrote songs as simple, straightforward and light hearted as Chuck Berry did would be an affable, likeable guy in real life. Chuck Berry certainly wasn't. He was as weird in his way as the late Michael Jackson – a famously irascible, edgy and evasive man who traveled alone without a band because he was cheap and apparently did not play well with others long enough to have a band. Like everyone else he had his reasons. He saw the music business for what it was, and growing up under American apartheid in the St. Louis area he was personally aware that the sunny '50s America so well evoked in his songs was mostly on the other side of the tracks.

Back in 1987 Keith Richards decided Chuck Berry needed the best band in the world to back him up for a concert held at the elegant Fox Theater in his hometown, and a whites-only venue in Berry's youth. Richards assembled a band of rock 'n' roll luminaries for the occasion, and they made a documentary called "Hail Hail Rock 'n' Roll" about it. This doc is a must-see, even if you are not a fan of either Berry or Richards or their music, as a character study. Watching it, it is easy to understand why Chuck Berry traveled alone with his guitar and a suitcase full of money and why the outwardly rough around the edges Keith Richards is one of the most beloved people in popular culture. Richards, a famously proud badass that takes no guff had the patience of a saint in dealing with his hero Chuck Berry and it did not appear that Berry was particularly gracious and thankful for the love. When the concert was played it seemed like the only person Berry obviously loved was not there: John Lennon – another famously blunt and prickly guy.

Rock 'n' roll is the offspring of blues and country. Of all the founding rockers Chuck Berry was the most country of the bunch. He sung like a white country crooner of the times, and his original recordings sound way country to modern ears. He is as well loved and often played in Nashville as he was in every local bar band circuit. But Chuck's riffage is as easily adaptable as his songs, and his style forms the bedrock of just about every classic rocker this side of the Rolling Stones, Aerosmith and AC/DC.

This style of music falls in and out of fashion, and nowadays it feels like maybe it will not come back around big again. The house that Chuck built has fallen on hard times, a casualty of changing tastes and zero-tolerance culture. Bar band culture, the temple for which this music forms the liturgy, has become a casualty of modern life. Would-be guitar slingers go directly to the hard stuff now – the kind of music guaranteed to clear the dance floor. The festival and jam band crowd are the only folks left who dance to live music – everyone else dances to electronically generated marching orders spun by faceless hipsters at raves and dance clubs, while the cops troll the remaining local bars for easy prey at closing time.

Yet Chuck Berry duck walks merrily on into the cosmos, and eternity. There is a gold plated copper record on Voyager 1, the first spacecraft to leave the solar system, upon which there is a selection of music representing the human race. "Johnny B Goode," along with the opening movement of Beethoven's Fifth, is one of the cuts. Roll over Beethoven, tell Chuck Berry the news – you're in good company.

So here's to Chuck Berry: a man I am probably happy to have never met or had to deal with, but whose songs I have played in bars – and by god the people always danced.

*(Carne's favorite Chuck Berry cover is the long version of ELO's Roll Over Beethoven, which starts with the Beethoven's Fifth intro.)*

# WRITE YOUR REPRESENTATIVES

## City of Bishop

City Hall: 377 W. Line St., Bishop, CA 93514; (760) 873-5863; www.cityofbishop.com

**City Council:**

· Mayor Joe Pecsi
(760) 784-0699
joepecsi210@gmail.com
· Mayor Pro Tem Karen Schwartz
(760) 920-7136.
kschwartz@cityofbishop.com
· Laura Smith
(760) 872-4034
eastsmith5@aol.com
· Jim Ellis
ellis_jim@ymail.com
(760) 872-0780
· Patricia Gardner
(760) 873-8579
patgardner2012@gmail.com

Address for all: 377 W. Line St., Bishop, CA 93514

*Regular meetings of City Council: second, fourth Mondays, 6 p.m., City Hall*

City Administrator/ Community Services Director: Jim Tatum, (760) 873-5863, cityclerk@cityofbishop.com

City Attorney: Ryan Jones

City Treasurer: Robert Kimball

Fire Chief: Ray Seguine, (760) 873-5485

Police Chief: Ted Stec, (760) 873-5866

Public Works Director: David Grah, (760) 873-8458, publicworks@cityofbishop.com

## County of Inyo

168 N. Edwards St., Independence; (760) 878-0366, (760) 873-8481,(760) 876-5559, (800) 447-4696; www.inyocounty.us

**Inyo County Grand Jury:**

David Bay, Kathleen Carmical, Peter Hart, Phil Hartz, Lester Inafuku, Kathy Powell, William Richmond, Rockwell Smith and Rochelle Hair.

*To submit a concern or complaint to the 2015-16 Grand Jury, send correspondence to: Inyo County Grand Jury, P.O. Box 401, Independence, CA 93526. To use a formal complaint form, visit Inyocourt.ca.gov/grandjury.html. The current Grand Jury accepts signed or anonymous letters.*

**Board of Supervisors:**

· District 1 Dan Totheroh:
(760) 872-2137
· District 2 Jeff Griffiths:
(760) 937-0072 Office and Cell
jgriffiths@inyocounty.us
· District 3 Richard Pucci:
(760) 878-0373 Office
supervisor.pucci@gmail.com
· District 4 Mark Tillemans:
(760) 938-2024 Office
(760) 878-8506 Cell
mtillemans@inyocounty.us
· District 5 Matt Kingsley:
(760) 878-8508 Office and Cell
mkingsley@inyocounty.us
· Address for all:
P.O. Drawer N, Independence,
CA 93526

*Regular meetings of Board of Supervisors: Every Tuesday, 9 a.m. (some exceptions), County Administrative Center in Independence.*

County Administrator: Kevin Carunchio, (760) 878-0291, kcarunchio@inyocounty.us

Agricultural Commissioner: Nate Reade, (760) 873-7860

Assessor: David Stottlemyre, (760) 872-2702, (760) 878-0302,
InyoAssessor@inyocounty.us

Auditor-Controller: Amy Shepherd, (760) 878-0343

Coroner: Jason Molinar, (760) 873-4266

County Clerk: Kammi Foote, (760) 878-0223, (760) 873-2710

County Counsel: Marshall Rudolph, (760) 878-0229, (760) 872-1169

District Attorney: Tom Hardy (760) 878-0282, (760) 872-1078, (760) 873-6657

Health & Human Services Director: Jean Turner, (760) 878-0242, (760) 873-3305

Integrated Waste Management Director: Pam Hennarty, (760) 873-5577

Museum Director: Jon Klusmire, (760) 878-0364, (760) 878-0258

Parks & Recreation Director: Rick Benson, (760) 873-7191

Planning Department: (760) 878-0263, (760) 872-2706

Probation Dept. Director: Jeff Thomson, (760) 878-0274, (760) 872-4111, (760) 872-4005

Public Administrator: Patricia Barton, (760) 873-5895

Public Works Director: Clint Quilter, (760) 878-0201, (760) 872-2707

Sheriff: Bill Lutze, (760) 878-0320

Treasurer-Tax Collector: Alisha McMurtrie, (760) 878-0312, inyottc@inyocounty.us

Water Department Director: Bob Harrington, (760) 878-0001

## State of California

California State Capitol, Sacramento, CA 95814; www.ca.gov

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c/o State Capitol, Suite 1173
Sacramento, CA 95814
Phone: (916) 445-2841
Fax: (916) 558-3160
Website: www.gov.ca.gov

**Senator, 8th Senate District: Tom Berryhill**
Capitol Office:
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Sacramento, CA 95814
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Fax: (916) 651-4908
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Modesto, CA 95356
Phone: (209) 576-6470
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6215 N. Fresno St., Ste. 104
Fresno, CA 93710
Phone: (559) 253-7122
Fax: (559) 253-7127
Website: http://berryhill.cssrc.us/?utm_source=cssrc&utm_medium=senator_list&utm_campaign=senator_list

**Assemblyman, 26th Assembly District: Devon Mathis**
Capitol Office:
State Capitol
Sacramento, CA 95814
Phone: (916) 319-2026
District Office:
113 North Church St., Ste. 505
Visalia, CA 93291
Website: http://ad26.asmrc.org/



# Celebrating St. Patrick's Day

## IRISH FARE SERVED BY KNIGHTS OF COLUMBUS AT OUR LADY OF PERPETUAL HELP



Mellie and David Oldenburg pose for a photo during the St. Patrick's Day celebration hosted by the Knights of Columbus at Our Lady Of Perpetual Help in Bishop.

**Photos by Gayla Wolf**



Grad Wilkins and wife, June, handle raffle ticket sales during the St. Patrick's Day celebration at Our Lady of Perpetual Help.




John Harris, left, sells raffle tickets to John Hoyt and Anne Gazior.




Knights of Columbus members Mike Conley, Erni Dominguez and Larry Blain served up liquid refreshments during the St. Patrick's Day celebration.



Carol Harris and Pat and Mike Nolan pictured together enjoying the Knights of Columbus St. Patrick's Day celebration.



Christina, Faith and Joshua Arnal smile for the camera.



Cooking up a great St. Patrick's Day meal were Knights of Columbus members front, from left, Jack Dahlstrom, Jim Ellis, Ramon and Jerri; back, Solomon, Jose, Alex and Dave.



Jeanie and Jack Johangten, happy to be in attendance at the Knights of Columbus St. Patrick's Day celebration at Our Lady of Perpetual Help.

# SCHOOL NOTES

## Honor roll

**ROUND VALLEY** – The following students have made the honor roll at Round Valley Elementary School.

**Principal's list**

Rylee Arcularius, Ty Arcularius, Tylar Banta, Jodie Bedore, Alyssa Buchholz, Ryder Delmas, John Henry Drew, Emma Dutton, Elizabeth Ellsworth, Jacob Gilbert, Sophia Gutierrez, Kylee Jorgensen, Jilly Maurice, Kash Maurice, Laurel McElroy, Alexandra Morales, Lilly Morrison, Jade Scott, Jack Slovacek, Clair Vetter, Blake Winzenread and Luke Winzenread.

**Honor roll**

Marley Bayhurst, Ella Boehme, Jayden Butler, AJ Doegris, Victor Esparza, Tyler Gilbert, Jocelyn Gonzalez, Madeleine Morrison, Sam St. Claire, Thomas St. Claire, Mary Suver, Gregory Tordoff, Gabrielle Veenker and Lyriq Willis.

**B Honors**

Elan Boehme, Chase Butler, Trinity Crowder, Kalena DeVincent, Jonathan Diosdado, Faith Ellis, Caleb Gillem, Luke Gutierrez, Camyla Hernandez, Taylor Johle, Landen Lujan, Jasmine Mayhugh, Kaia McGrale, June Perry, Nikki Roberts, Julissa Rock, Quincy Smith, Walker Thomas and Duke Watson.



## Future Farmers from Lone Pine

Lone Pine Future Farmers of America students show off their equipment; back, from left, Dylan Noland, Aman Singh, Celia Ray, Matt Campbell, Jessianne Joiner, Tinh LeTrung, Sean Kandler, Seth Tsosie and Ethan Reisen; front, from left, Jaye Eaton, Taylor Corona and Juliann Jones. The Lone Pine FFA Boosters Club will hold its Blue & Gold Fundraiser Spring Round-up from 7-10 p.m. Friday, March 31, at the Lone Pine's Museum of Western Film History. Billy and Sue Ruiz from Cowboy Favor will be cooking up hearty hors d'oeuvres, and Fiddlin' Pete Watercott will play in the main building. There will be dozens of silent auction items, including student-made items from Lone Pine High School. There also will be a beer and wine tasting. Fundraising efforts from 2016 were enough to purchase a state-of-the art Lincoln Torchmate 4800 Plasma Cutting System for the growing agricultural mechanics fabrication shop.

**Photo courtesy Lone Pine Unified School District**

# Owens Valley takes 'Treasure Island' adventure



Students from Independence participated in the Missoula Children's Theatre production of "Treasure Island" earlier this month; back, from left, the Missoula Children's Theatre director, students Steven Allen, Laura Allen and Justice Knox; front, from left, Sarah Faircloth, Evan Smith and Dante Allen.

**Photos courtesy Owens Valley Unified School District**



"Treasure Island" gave Independence students a taste of live theater; back, from left, Kylee Mullen and Nichole Asher; front, from left, Daniela Alvarez, Milianie Castro and Kevin Carranza.



The cast of "Treasure Island" gathers in the gymnasium for a photo after the Missoula Children's Theatre performance.



Back, from left, Emma Gonzalez, Orion Nash and Madison Harms. Front, from left, Julian Carter, Alejandra Gonzalez, Nathan Pischel and William Howard perform a scene from "Treasure Island."

**WAY TO GO, INYO COUNTY!**

**You have logged 965 acts of kindness and submitted many great stories at www.inyokindness.us**

Join in the Inyo County Superintendent of Schools and Inyo County Office of Education's county-wide One Million Acts of Kindness Campaign. Our goal is to shine a spotlight on our students, staff, community members and partner organizations who display simple acts of kindness every day.

***Inyo County: Where Kindness Counts!***

INYO COUNTY
SUPERINTENDENT OF SCHOOLS
Dr. Lisa Fontana

## 015 FREE TO YOU

PORCH SWING - Needs refinishing, Large swing, sits 3. Free. Call 760-872-1914

## 020 HAPPINESS IS ...

HAPPINESS IS A LANON
Help and Hope for Families and Friends of Alcoholics
Monday Night Group meets at the Methodist Church in Bishop (corner Fowler & Church Streets) every Monday from 7:00PM - 8:30PM. For more information call 760-873-8225

HAPPINESS IS O
OVEREATERS ANONYMOUS
*Help and Hope for People Who have Problems with Food*
Overeaters Anonymous members meet to share their experience, strength, hope and the OA program of recovery every Saturday from 10:00AM-11:00AM in the library of the Calvary Baptist Church, 1100 W. Line St., Bishop. For more information, call Marilyn at (760) 872-3757 or (760) 920-8013. Hope to see you next Saturday!

HAPPINESS IS.....
NAMI Eastern Sierra (National Alliance on Mental Illness) Family Support Group meets the first Wednesday of every month, 5:30-7:00pm, at the First United Methodist Church adult lounge, 205 North Fowler St., Bishop. (Follow pathway into courtyard on the right side of the church itself, then go through glass door into building on the right.) NAMI Family Support Groups, offered by NAMI Affiliates across the country, are free, confidential and safe groups of families helping families who love, live with and/or care for a family member with diagnosed mental illness.
We support one another through our learned wisdom, gaining renewed hope for ourselves and our loved ones. Join us and realize that you are not alone.

## 035 BUSINESS OPPORTUNITIES



**BUSINESS FOR SALE**
National Tax Franchise
w/ Proven Business Model
No Experience Needed
For More Info. Please Call:
**949-345-9491**

## 045 HELP WANTED

**TOIYABE INDIAN HEALTH PROJECT, INC.**
Toiyabe is currently accepting applications for the following open positions with deadline dates as listed:

**Family Nurse Practitioner**
Status: Non-Exempt/Full-time with benefits
Salary Range: $93,322 - $140,645 annually DOE
Work station: Bishop Clinic
Closing date: Open until filled

**Family Practice Physician**
Status: Exempt/Part-time
Salary Range: DOE
Work station: Bishop Clinic
Closing date: Open until filled

**Environmental Services Worker**
Status: Non-Exempt/Full Time
Salary Range: $14.04 -$22.22 per hour DOE
Work station: Bishop Clinic
Closing date: March 21, 2017 at 5 PM

**Dialysis Receptionist**
Status: Non-Exempt/Part Time
Salary Range: $14.04 -$22.22 per hour DOE
Work station: Bishop Clinic
Closing date: March 21, 2017 at 5 PM

**Certified Patient Care Tech**
Status: Non-Exempt/Full Time
Salary Range: $15.45 - 23.28 per hour DOE
Work station: Bishop Clinic
Closing date:March 21, 2017 at 5 PM

**Pharmacy Technician**
Status: Non-Exempt/Full Time
Salary Range: $15.45-$25.70 per hour DOE
Work station: Bishop Clinic
Closing date: March 21, 2017 at 5 PM

**Elders Program Coordinator / LVN**
Status: Non-Exempt/Full Time
Salary Range: $17.11 - 28.50 per Hour DOE
Work station: Bishop Clinic
Closing date: March 21, 2017 at 5 PM

**Dialysis Office Manager**
Status: Non-Exempt/Full Time
Salary Range: $15.45 - 23.28 per hour DOE
Work station: Bishop Clinic
Closing date: March 21, 2017 at 5 PM

**Bookkeeper II**
Status: Non-Exempt/Full Time
Salary Range:$18.90 - 28.50 per hour DOE
Work station: Bishop Clinic
Closing date: March 24, 2017 at 5 PM

Toiyabe is an E.O.E. within the confines of the Indian Preference Act.

For more information, complete job descriptions and applications, please visit www.toiyabe.us or contact: Toiyabe Human Resource Office, 52 Tu Su Lane, Bishop, CA 93514 Telephone: 760-873-8464 Fax: 760-873-3935 email: cyndee.kiddoo@toiyabe.us or geraldine.weaver@toiyabe.us

**Toiyabe is an E.O.E. within the confines of the Indian Preference Act.**

## 045 HELP WANTED

**BIG PINE PAIUTE TRIBE**
**FORCE ACCOUNT**
**CONSTRUCTION WORKER**

DEPARTMENT : Big Pine Paiute Tribe CDD Housing Department
RATE OF PAY: Tribal Prevailing Wage Rate based on work performed
POSITION SUMMARY: Under immediate supervision of the Project Coordinator, the Force Account Construction Worker performs general construction related work as required in the construction trade. The FACW will perform any combination of duties on construction projects where demands require a skilled worker with varied experience and ability to work without close supervision. Tasks performed may include rehabilitation and new construction work assignments or related work as required by the Big Pine CDD Housing Program activities. Work week is approximately 30 hours per week.
DUTIES AND RESPONSIBILITIES:
1. Aids with or performs construction related tasks including demolition, plumbing, electrical, carpentry, drywall, sheetrock, brink, cement, laborer, painter, roofer, fencing, or as assigned;
2. All assigned construction tasks in line with CDD housing projects to rehabilitate homes.
3. Temporary short-term Maintenance Department work tasks;
4. Loads, unloads, and moves material, supplies, and equipment on to and off of trucks to jobsites, or other locations as assigned;
5. Cleans tools, equipment, and jobsite areas;
6. Lifts and lays lumber/timber or beams, places barricades, cuts and mixes cement, builds forms and pours cement; operates construction tools and equipment.
MINIMUM QUALIFICATIONS:
1. Good physical health and physically able to perform normal physical activity which can be strenuous and may involve prolonged standing, walking, reaching, bending, crouching, stooping, and lying prone. The employee must use arm strength to manipulate hand tools such as saws, sanders, and jointers. The employee must occasionally push, pull, and/or lift objects up to and over fifty (50) pounds.
2. Ability to work indoors and outdoors in all weather conditions with occasional exposure to weather extremes. The employee may occasionally be subject to electrical shock hazards, dangerous heights, dangerous chemicals, and skin irritants (e.g. cleaning solvents and insecticides).
3. Previous experience in general building construction;
4. Ability to interpret, understand, and apply construction skills to carry out a variety of construction-related instructions furnished in written, oral, or schedule form;
5. Ability to operate hand and power tools and equipment;
6. General knowledge of construction safety requirements in consideration of him/herself and others;
7. Must pass pre-employment and random drug screening.
INDIAN PREFERENCE: Native American Indian Preference shall apply pursuant to the Big Pine Tribal Employment Rights Ordinance No. 00-88 and the Indian Self-Determination and Education Assistance Act (24 USC 450. Et.seq.) 25 CFR 271.44 and other relevant laws.

Job Applications are available at the Big Pine Tribal Office, 825 S. Main Street, Big Pine, CA. **Deadline to apply is March 27, 2017 by 12:00 noon**. For more information contact Charlotte David, Secretary/Council at the CDD Housing Department at (760) 938-2003.

DIESEL TECH WORK at reputable repair shop. Perform bumper to bumper repairs on light to heavy duty. Send resume to P.O. Box 595 Bishop CA 93515 or Fax: 760-872-4838

**THE COUNTY OF INYO**
Currently accepting applications to fill the following Countywide positions, with deadline dates as listed:

**FIELD ASSISTANT (SEASONAL)**
Department - Agriculture - Mosquito Control
Salary - $14.75/hour - 40 hours per week
Term of Season - April through September, 2017
Closing Date - March 23, 2017

**PARK & CAMPGROUND MAINTENANCE HELPER (SEASONAL)**
Department - Parks
Salary - $14.75/hour - 40 hours per week
Term of Season - April through October, 2017
Closing Date - March 23, 2017

**EQUIPMENT OPERATOR I OR II**
Department - Road
Salary - Level I - $3310-$4027
Level II- $3471-$4216
Closing Date - March 31, 2017

**PARK & CAMPGROUND ATTENDANT (SEASONAL)**
Department - Parks
Salary - $14.75/hour - 40 hours per week
Term of Season - May through October, 2017
Closing Date -April 7, 2017

**FIELD PROGRAM MANAGER**
Department - Agriculture
Salary - $4601-$5589
Closing Date - OPEN UNTIL FILLED

**ASSISTANT CIVIL ENGINEER**
Department - Public Works
Salary - $4709-$5728
Closing Date - OPEN UNTIL FILLED

**AUDITOR-APPRAISER**
Department - Assessor
Salary - $5303-$6445
Closing Date - OPEN UNTIL FILLED

**PLANNING DIRECTOR**
Department - Planning
Salary - Up to $10,000 mo.
Closing Date - OPEN UNTIL FILLED

**DIRECTOR, ENVIRONMENTAL HEALTH**
Department - Environmental Health
Salary - $96,000 - $120,000/year
Closing Date - OPEN UNTIL FILLED

All of the above monthly salaries are paid over 26 annual pay periods.

For more information, complete job descriptions and an Inyo County application form, visit www.inyo-county.us , or contact the Personnel Office at 760-878-0377. Must apply on Inyo County application form. EEO/ADA.

**DOW VILLA MOTEL**
**Now Hiring - Front Desk Agents**
Looking for responsible persons with great customer service. Full time position with full benefits . Apply In person at 310 S. Main, Lone Pine, CA.

**COOK, PART TIME**
The Back Alley Bowl and Grill is looking for a part time cook. Hourly wage plus tips. Please inquire within at 649 N. Main St., Bishop.

**FRONT DESK/NIGHT AUDIT**
Graveyard shift. Stop by front desk for application to apply at 636 N. Main, Bishop. No phone calls.

**FULL TIME RECEPTIONIST**
Bishop Veterinary Hospital is looking for a full time Receptionist to join our fast paced work environment. Previous experience in field is preferred. Taking applications now, please submit resume with application. For questions please contact Lisa at 760-873-5801.

**UNIQUE SEASONAL COOKING POSITIONS AVAILABLE**
The University of California White Mountain Research Center will be hiring full time cooks for 2017 Summer season, Mon-Thurs, May-Sept., $18 - $20/hr. To apply, send resume to: jeremiah33@ucla.edu
**760-937-3525**

**PIONEER CEMETERY DISTRICT**
**Groundskeeper** - Part time, temporary until November 30, 2017. Pay $11/hr. Maintenance of cemeteries. High school graduate or equivalent, must posses a valid California Motor Vehicle License. Drug & alcohol free work environment. Applications can be picked up at the East Line Street Cemetery business office, 2000 Poleta Road, Bishop. Must be returned by March 31, 2017.

**TELLERS**
El Dorado Savings Bank-Lone Pine has 2 Teller positions available: 1 Full and 1 Part time. Cash handling and computer experience preferred with strong customer service skills. Please apply in person at 400 N. Main, Lone Pine. 760-876-5514 EOE

**CREEKSIDE RV PARK**
Janitorial & Ground Maintenance
Seasonal, April - Oct. South Fork Bishop Creek. $13/hr. For application call Creekside RV Park 760-873-4483

**ADMINISTRATIVE ASSISTANT**
**Part time- Hourly, 15-20 hrs/week**
California Indian Legal Services is seeking a qualified individual to support our Bishop office. $14-$16/hr DOE. Email resume to hiring@calindian.org. See our website for full job ad: www.calindian.org

**COOKS, FOOD RUNNERS, DISHWASHERS**
Schat's Roadhouse is now hiring all positions FT/PT. No experience necessary, will train the right people. EOE. Please apply in person at 871 N. Main St., Bishop, CA 93514 or send resume to: mschat@schat.com

**CAFE ASSOCIATE**
Great Basin Bakery is looking for energetic, early risers to join our retail team. Excellent customer service and strong work ethic required. Must be able to start work as early as 5 am, work weekends and holidays. Food service experience and a current CA food handlers card is a plus. Please apply in person at 275-D S. Main, Bishop.

**7/11 Materials Is Now Hiring**
**Part Time In Bishop**
7/11 Materials is hiring a part time **Weighmaster & Quality Control Technician**. Entry level position and we are willing to train. Must have good computer skills. Please apply on our website **www.711materials.com**, go to the Careers page and apply for the position in your location.

**P/T DIETARY AIDE**
Bishop Care Center is accepting applications for a part time Dietary Aide. Varied shifts, hourly rate based on experience. Pick up applications at 151 Pioneer Lane, Bishop, CA 93514. Equal Opportunity Employer - M/F/D/V pdavis@plum.com

LOOKING FOR INSIDE MULTI-TASKING INDIVIDUAL
Basic Bookkeeping, hardware ordering, receiving and entry. Full to part time seasonally. Looking for hard working self- motivated individual that enjoys working with the public. Must be willing to working occasional Saturdays. Pay according to experience. Medical, dental and vision. EOE

Apply in Person:
Home Lumber Co
1130 N Main Street
Bishop, Ca 93514

**BISHOP CARE CENTER**
**Housekeeping & Laundry Supervisor**
Our supervisor plays an integral part in the success of our center and satisfaction of our residents. We are looking for individuals that want to make a difference and are committed to the growth of their co-workers, staff, the company and themselves. As a supervisor for the Bishop Care Center, your responsibilities will include managing and supervising housekeeping, laundry and floor care staff according to policies and procedures and Federal/State requirements; periodic inventories of supplies & materials and train new employees. For further information and to apply please call 760-872-1000 or email pdavis@plum.com

Eastern Sierra Community Bank is a growing community bank looking for motivated individuals with a strong commitment to our local communities. We are currently seeking qualified individuals **Part-Time Tellers** for our Bishop location. Eastern Sierra Community Bank is an Equal Opportunity Employer and offers a complete competitive compensation package including, Health Insurance, 401(k), Life Insurance, and vacation. You may pick up applications at any one of our locations or you may submit resumes to hr@escbank.com

**A Picture is worth a Thousand Words!**




This spring special is a great value for a limited period of time. You can drive your item to the Register office or email a photo to classy@inyoregister.com Call us!
**(760) 873-3535**

**4 WEEKS only $25.00!***

*We can take the photo for you too! Just drive it to the Register office!*

- Add inyoregister.com & Mammoth Times for $5.00
- Send your photos to: classy@inyoregister.com
- 5 Lines (approx. 30 words)
- Bold Headline
- Color Photo
- Box/Border
- Bold Phone Number
- Put Your Ad on Facebook! $5
- Non-refundable; cancel anytime

**760-873-3535**

VISA MasterCard Discover Novus

*Private Party ads only*

**ESIA IS HIRING**

ESIA IS HIRING SEASONAL
**PART TIME SALES ASSOCIATES**
for all of our beautiful locations; Mammoth Lakes Visitor Center, Mono Basin Visitor Center, Eastern Sierra Visitor Center in Lone Pine, and the Ancient Bristlecone Visitor Center at Shulman Grove. The ideal candidate has retail experience and a passion for the Eastern Sierra outdoors! Responsible for learning product base, cashiering, inventory, and customer service. Also responsible for assisting the bookstore manager with a range of duties including stocking, opening, closing, etc.

Please send your letter of interest and a resume to
Heidi Eldridge at heidi@esiaonline.org
Call Heidi with questions at 760-784-1667

**GET ONBOARD THE COOLEST SUMMER JOB IN MAMMOTH**

**DRIVE FOR ESTA**



- Training Available
- Full & Part-Time Shifts
- Commute Assistance

Call Eastern Sierra Transit at 760.924.3184
or check out our website www.estransit.com
to learn more about this opportunity

EASTERN SIERRA TRANSIT

## 045 HELP WANTED

**NOW HIRING**

**COUNTER SALES/CASHIER**
Positions Available, full time

**SANITATION / MAINTENANCE**
Position Available, part time to start

PAY BASED ON EXPERIENCE

Please apply at:
**ERICK SCHAT'S BAKKERY**
**763 N. Main St., Bishop**

No Phone Calls Please

**INYO COUNTY SUPERINTENDENT OF SCHOOLS**
**Notice of Classified Vacancy**

**INSTRUCTIONAL AIDE**
(One-on-One Aide, Special Education Department)

SALARY: Range 11 of Classified Salary Schedule $13.43 - $14.82 per hour

HOURS: 4 hours per day - 5 days per week Monday - Friday

LOCATION: Bishop, CA

DEADLINE: Untill filled

DESCRIPTION: The Instructional Aide assists the teacher in caring for specific students' needs and assisting the teacher in individual or group instruction and performing other duties as assigned. Types of duties the instructional aide will provide to a student with special needs include potty training, hand-over-hand activities, etc.

REQUIREMENTS: Must have a high school diploma or equivalent and experience with special needs students. Criminal Records clearance and successful results on a pre-employment medical exam prior to start date.

Apply online via www.edjoin.org

For more information, please call Marlene Dietrich at 760-878-2426 ext. 2222.

EQUAL OPPORTUNITY EMPLOYER

## 045 HELP WANTED

**FRONT DESK AGENTS**
Bishop Creekside Inn, is now hiring Front Desk Agents. Start, continue or grow your hospitality career with Creekside Inn. Starting wage $12 Hour, increase based on performance within 60 days. This is a Full Time position with Health Insurance. Apply in person or send your resume to jessica@thebishopcreeksideinn.com

**COUNTY OF INYO**
**DEPARTMENT OF HEALTH AND HUMAN SERVICES**
Is currently accepting applications to fill the following Countywide positions, with deadline dates as listed:

**DIRECTOR OF HEALTH & HUMAN SERVICES**
Salary - $110,000 - $132,000/year
Closing Date - OPEN UNTIL FILLED

**HEALTH & HUMAN SERVICES SPECIALIST I (TEMPORARY)**
Salary - $14.75/hour - up to 40 hours per week with no County benefits
Term - Position may not exceed six months
Closing Date -OPEN UNTIL FILLED

**ADMINISTRATIVE ANALYST I OR II**
Salary -
Level I - $4188-$5088
Level II- $4391-$5341
Closing Date -March 31, 2017

**REGISTERED NURSE OR PUBLIC HEALTH NURSE (FULL-TIME OR PART-TIME)**
Closing Date -OPEN UNTIL FILLED

**ADDICTIONS COUNSELOR I or II**
Salary -
Counselor I - $3232-$3927
Counselor II- $3471-$4216
Closing Date -OPEN UNTIL FILLED

The above monthly salaries are paid over 26 pay periods annually.

For more information, complete job descriptions and an Inyo County application form, visit www.inyo-county.us . Must apply on Inyo County application form. EEO/ADA.

## 045 HELP WANTED

**THE COUNTY OF INYO**
Currently accepting applications to fill the following Countywide positions, with deadline dates as listed:

**FIELD ASSISTANT (SEASONAL)**
Department - Agriculture - Mosquito Control
Salary - $14.75/hour - 40 hours per week
Term of Season - April through September, 2017
Closing Date - March 23, 2017

**PARK & CAMPGROUND MAINTENANCE HELPER (SEASONAL)**
Department - Parks
Salary - $14.75/hour - 40 hours per week
Term of Season - April through October, 2017
Closing Date - March 23, 2017

**EQUIPMENT OPERATOR I OR II**
Department - Road
Salary - Level I - $3310-$4027
Level II- $3471-$4216
Closing Date - March 31, 2017

**FIELD PROGRAM MANAGER**
Department - Agriculture
Salary - $4601-$5589
Closing Date - OPEN UNTIL FILLED

**ASSISTANT CIVIL ENGINEER**
Department - Public Works
Salary - $4709-$5728
Closing Date - OPEN UNTIL FILLED

**AUDITOR-APPRAISER**
Department - Assessor
Salary - $5303-$6445
Closing Date - OPEN UNTIL FILLED

**PLANNING DIRECTOR**
Department - Planning
Salary - Up to $10,000 mo.
Closing Date - OPEN UNTIL FILLED

**ASSOCIATE PLANNER**
Department - Planning
Salary - $4826-$5865
Closing Date - OPEN UNTIL FILLED

All of the above monthly salaries are paid over 26 annual pay periods.

For more information, complete job descriptions and an Inyo County application form, visit www.inyo-county.us , or contact the Personnel Office at 760-878-0377. Must apply on Inyo County application form. EEO/ADA.

## 045 HELP WANTED

**P/T HOUSEKEEPING**
To apply, stop by front desk for application at 636 N. Main, Bishop. No phone calls please.

Caltrans - District 9
CALTRANS
**MAINTENANCE MECHANIC**

A Maintenance Mechanic position is now open at Caltrans, District Office, in Bishop. This is a full-time position performing building maintenance tasks.

Applicants must be either a current State employee, or be on the existing exam list for Maintenance Mechanic.

For further information call Jody Eddings at 760-872-0791 or see job JC-56232 at www.jobs.ca.gov. The final filing date for this job is March 24, 2017.

## 090 FURNITURE

**TOP QUALITY FURNITURE** - All Excellent Condition $1,500 for all - Natuzzi set includes white leather sofa $450, 2 swivel rockers $250 ea and 2 ottomans $100 ea - solid elm 4 drawer dresser $125 - 2 large solid wood end tables or nightstands $130 set - curved/bent glass sofa and end tables $350 set. Call **(760) 937-0205** jlynt8@gmail.com



**SAUDER COMPUTER ARMOIRE**
Oak finish. Features printer shelf, keyboard tray, letter size file drawer, adjustable shelves. Measures 71.5"H x 23"D x 41.5"W. $45.
**760-938-2058**

## 090 FURNITURE

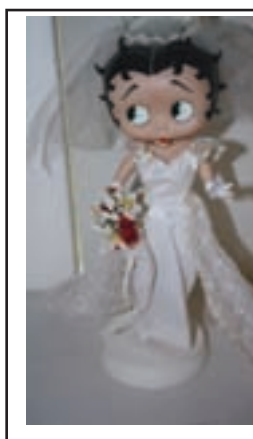


**LG DRYER**
Brand new, steam/gas dryer by LG. $600. Call Binky
**760-920-5901**



**RUSTIC OAK DINING SET**
BEAUTIFUL RUSTIC SOLID oak table with 4 side chairs, 2 arm chairs and 2 benches. Seats 12. Includes 2 removable leaves. Like new. Paid $1900. Asking $1350 OBO.
**760-872-3523**

## 105 MISCELLANEOUS

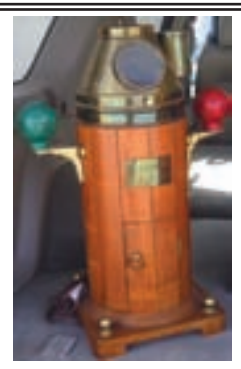


**BETTY BOOP "PLENDOR IN WHITE"**
New In original box, 12"tall. Beautiful, porcelain, superior quality, richly detailed. Great Christmas gift! $85.
**702-265-4342**

## 105 MISCELLANEOUS



**HISTORIC PHOTOS WANTED**
Downtown Bishop that show commercial buildings between 1920 and 1975 for history project. Do not need originals, a good photocopy or scanned copy is sufficient.I have several from Laws and Eastern Sierra Museum, interested in others. Will pay. Please contact:
**historicbishop@gmail.com**



**MARITIME SHIP'S BINNACLE COMPASS**
Exact replica of binnacle compass found on sea going vessels. Front brass plate reads, "Standard Compass". Stands 24" tall, wood and brass with working compass. Light inside of small door at bottom of solid wood base, corded on and off switch. In excellent condition. $50.
**760-937-0439**

**Need a new BOSS?**
Get One!
In the
**EASTERN SIERRA CLASSIFIEDS**
**873-3535**




## 105 MISCELLANEOUS



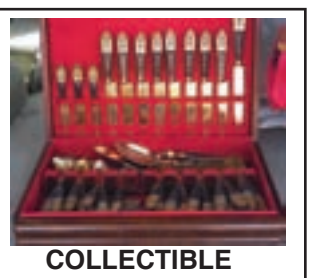
**PRECIOUS MOMENTS**
**ANGIE, THE ANGEL OF MERCY**
13 Porcelain, new in original box, $50. Great Christmas gift!
**702-265-4342**



**PRINCE WILLIAM**
Doll stands 17 tall, dated 4/29/11, No. 1527, Superior quality and detail. new in box with Certificate of Authenticity. Great Christmas gift! $100.
**702-265-4342**



**PRINCESS KATE**
Doll stands 17 tall, dated 4/29/11, No. 5600, new in box with Certificate of Authenticity. Beautiful doll, superior quality and detail. Great Christmas gift! $100.
**702-265-4342**



**COLLECTIBLE BRONZE FLATWARE SET**



**THAILAND**
144 Pc. bronze flatware set includes forks, knives, spoons, salad forks and large serving pieces. All pieces stamped SIAM on back. Includes orig. solid wood, felt lined box. $50.
**760-937-0439**

## 145 LIVESTOCK

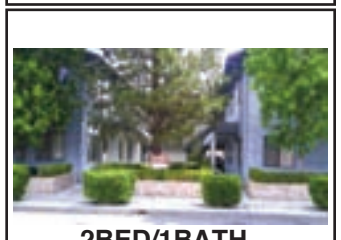


**ROAN MARE FOR SALE**
10 Year old bay roan mare. Show and trail experience, has led mules. Fun to ride. $8,500. Call Pat
**760-933-2309**

## 155 APTS. UNFURNISHED



**DOWNTOWN BISHOP**
Quiet, clean, laundry facilities, no smoking, no pets.
1 Bed /1 Bath $650 + $500 deposit
2 Bed /1 Bath $850 + $700 deposit
2 Bed /1 Bath $875 + $700 deposit
Call for more info.
**760-873-3280**



**2BED/1BATH**
Fulton St., Bishop. Upstairs, small balcony, own storage unit, carport, laundry faciities. $900/mo. + $900 deposit. Avail. now.
**760-872-3746**



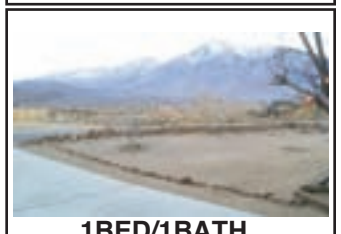
**LARGE 1BED /1BATH**
680-A W. ELM, BISHOP. Stove/fridge, washer/dryer, swamp cooler, storage room. No pets. $800/mo. + deposit.
**760-872-6194**

LARGE 1BED/1.5BATH - BISHOP Stove, fridge, washer & dryer, pellet stove, A/C, new flooring, storage unit. No smoking, no pets. $850/mo. 760-937-5920

## 170 HOUSES UNFURNISHED



**BIG PINE - 2BED/1BATH**
Main St., Finished basement w/refrigerator, washer/dryer, kerosene heat, evap. cooler. Water, sewer, trash & landscaping incl. Year lease, non smoking. $1250/mo. + $1250 dep.
**760-938-2868**



**1BED/1BATH MUSTANG MESA**
1 Bedroom/1 bath house, unfurnished or furnished; living room and front porch have incredible views of the Sierra Nevada and Round Valley. Gas, electric, trash, water, sewer, satellite TV service and gardener incl. $1,200/mo. unfurnished, no pets.
**760-937-3473**

**N. TUMBLEWEED** - 2 Bed/2Ba mobile with garage, large fenced yard, appliances incl., small pet on approval $1250/mo.
**SHEPARD LANE** - 2 Bed/1Ba, with storage shed $1200/mo.
**www.rentbishop.com.** De La Rosa Property Mgmt. 760-872-3188

## 175 MOBILE HOMES FOR RENT

251 S. WARREN - 2BED/1BATH mobile with storage $850/mo. www.rentbishop.com DeLaRosa Property Mgmt. 760-872-3188

The Inyo Register
For Home Delivery call
873-3535

## 175 MOBILE HOMES FOR RENT



**3BED/2BATH**
Newly remodeled, triplewide. Appliances incl. washer/dryer. Nice yard, planters, fenced, great location. In Lone Pine. Yard care incl. Must see. $1300/mo. Call for application.
**661-364-6180**

## 185 BUS. PROPERTY FOR RENT

162 W. LINE St. - Large commercial unit + office, storage space avail. $800/mo. www.rentbishop.com DeLaRosa Property Mgmt. 760-872-3188

## 205 ACREAGE & LOTS

**LAND FOR LEASE**
280 Acres of private property with fencing, corrals and chutes. Available for summer grazing with several springs, large meadows and shade tree access. Watterson Meadows off of Benton Crossing Road. Contact John at 760-937-5166 or John@johnmartindalehomes.com

## 220 HOUSES FOR SALE



**3BED/2-1/4 BATH**
WEST Bishop, on approx. 1/2 acre, pond, running stream and raised garden beds in extra large fenced backyard, double garage, all appliances incl, hardwood floors throughout, original Earth Stove, 2 brand new extra large storage Tuff Shed/Barn, propane heat, swamp cooler. Bright and spacious. Must see! $550,000.
**760-920-2672**

## 275 AUTOS



**2005 CHEVY TAHOE**
4 Door. Auto trans, power brakes. Runs great, moving, must sell. 93K miles. New brakes, battery and tail lights. Good tires. $7500 or best offer.
**760-920-0769**

## 280 TRUCKS



**2004 TOYOTA TACOMA**
Reg. Cab, Man. 5 spd trans, 4 cyl, A/C, AM/FM/Cass/CD, 232K mi, cruise ctrl, incl. rack, shell, $5000, Call or text:
**760-920-0046**

## 310 PROFESSIONAL SERVICES

HIGHSIERRA NUTRITIONAL WELLNESS
**PROVIDING NUTRITIONAL COUNSELING AND PERSONALIZED MEAL PLANS**
Remotely and in person. Whether you are looking to:

- Lose Weight
- Manage a Chronic Illness or Disease
- Change your Food Habits
- Eat for Sports Performance
- Have a complete Diet Overhaul

I can help you achieve optimal nutrition and meet your health goals.

**www.HighSierraNutritionalWellness.com**

## SUDOKU

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | | 2 | | | 3 | | | 4 |
| | 4 | 5 | | | 6 | | | |
| | 7 | | 8 | 2 | | | | 1 |
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| 2 | | 3 | | | | 8 | | 7 |
| | 1 | | | 7 | | 2 | | |
| 9 | | | | 8 | 7 | | 3 | |
| | | | 5 | | | 9 | 7 | |
| 4 | | | 2 | | | 6 | | 8 |

Medium

**Fun By The Numbers**

Like puzzles? Then you'll love sudoku. This mind-bending puzzle will have you hooked from the moment you square off, so sharpen your pencil and put your sudoku savvy to the test!

***Answers will appear in Thursday's classified section of***
The Inyo Register

**Here's How It Works:**
Sudoku puzzles are formatted as a 9x9 grid, broken down into nine 3x3 boxes. To solve a sudoku, the numbers 1 through 9 must fill each row, column and box. Each number can appear only once in each row, column and box. You can figure out the order in which the numbers will appear by using the numeric clues already provided in the boxes. The more numbers you name, the easier it gets to solve the puzzle!

## 320 PUBLIC NOTICES

**NOTICE OF SALE**
In accordance with the provisions of the California Uniform Commercial Code, there being due and unpaid storage for which the GLENDWOOD MOBILE HOME, LLC, is entitled to a lien as Warehouseman on the goods hereinafter described, and due notice having been given to parties known to claim an interest therein, and the time specified in such notice for payment of such charges having expired, notice is hereby given that these goods will be sold at public auction in Inyo County at 1455 Matlick Lane, Bishop, California 93514, on March 30, 2017, at 10:00 A.M.
The property to be sold consists of a certain 1971 Townehouse mobilehome, Decal No. LBB5706, Serial No. 7117U, 7117X and including any "household goods" contained within, owned by Patrick Horn, Anna Horn, Hezikiah Horn and/or Shirley Ann Lee. The storage due is $6,972.40, plus additional daily storage charges of $16.50 actual utilities consumed, and other incidental processing or transportation charges incurred after January 24, 2017, including, without limitation, attorneys' fees and costs of publication.
Dated this 28th day of February 2017 at Santa Ana, California.
By: S/ VIVIENNE J. ALSTON
Alston, Alston & Diebold
Authorized Agents for GLENWOOD MOBILE HOME, LLC
3/14, 3/21/17
**CNS-2982345#**
**INYO REGISTER**
(IR 3/14, 3/21/17, #12763)

NOTICE OF PUBLIC HEARING
ON THE COUNTY OF INYO'S
ELECTION TO BECOME
A GROUNDWATER
SUSTAINABILITY AGENCY

NOTICE IS HEARBY GIVEN that pursuant to California Water Code section 10723(b) and California Government Code section 6066, the Board of Supervisors of the County of Inyo shall hold a public hearing on March 21, 2017, at 1:30 p.m. at the Board of Supervisors Room, County Administrative Center, 224 North Edwards St., Independence, California, 93526. The Board will consider and determine at the public hearing whether the County shall file notice with the California Department of Water Resources to become a Groundwater Sustainability Agency for a portion of the Owens Valley Groundwater Basin (designated as basin 6-12.01 in California Department of Water Resources Bulletin 118 Interim Update 2016, California's Groundwater) pursuant to the Sustainable Groundwater Management Act of 2014. Written comments may be submitted prior to the hearing by mail to: Inyo County Board of Supervisors, PO Drawer N, Independence, CA 93526; by hand delivery to: Board Clerk, 224 North Edwards, Independence, CA 93526; or via e-mail to: dellis@inyocounty.us. The Board shall also consider oral or written comments received during the hearing, but the Board Chair may limit oral comments to a reasonable length.
(IR 3/2, 3/4, 3/7, 3/9, 3/11, 3/14, 3/16, 3/18, 3/21/17, #12740)

**OVCDC REQUEST FOR PROPOSALS 17-18-06**
**Lone Pine Tutoring/After School Program Provider**

The Owens Valley Career Development Center is soliciting bids (quotes) from responsible qualified vendors/independent contractors to provide an after school and evening tutoring and healthy activities program to the Lone Pine Paiute/Shoshone Tribal TANF eligible community in Lone Pine, California to begin July 1, 2017.

For full Request for Proposals please visit www.ovcdc.com

Bids will be received by OVCDC until 5:00 pm, PST, April 14, 2017 at the office of OVCDC Finance, P.O. Box 847, Bishop, CA 93515 or 432 North Barlow Lane, Bishop CA 93514. This RFP will remain open until awarded if sufficient qualified proposals are not received by April 14, 2017. For further information and to request a bid packet please contact the Purchasing/Contracts Administrator by telephone at 760-873-5107 Ext 275 or email contracts@ovcdc.com
(IR 3/21, 3/23, 3/25, 3/28, 3/30, 4/1/17, #12769)

**OVCDC REQUEST FOR PROPOSALS**
**17-18-01, 02, 03, 04 & 05**
**OVCDC Indigenous Language Program Services**

OVCDC is seeking proposals from qualified vendors to provide services as an Indigenous Language Instructor - Fluent Speaker (17-18-01); an Indigenous Language Instructor II (17-18-02); an Indigenous Language Instructor I (17-18-03; an Indigenous Language Linguist (17-18-04) or an Indigenous Language Media Technician (17-18-05).

For full Request for Proposals please visit www.ovcdc.com

Bids will be received by OVCDC until 5:00 pm, PST, April 14, 2017 in order for contracts to be awarded for services beginning July 1, 2017. Proposals will be submitted at the office of OVCDC Finance, P.O. Box 847, Bishop, CA 93515 or 432 North Barlow Lane, Bishop CA 93514. The RFP's will remain open year round for services which may begin after July 1, 2017. For further information and to request a bid packet please contact the Purchasing/Contracts Administrator by telephone at 760-873-5107 Ext 275 or email contracts@ovcdc.com
(IR 3/16, 3/18, 3/21/17, #12766)

**WE MOVE ITEMS FAST**
THE EASTERN SIERRA CLASSIFIEDS
873-3535

## 320 PUBLIC NOTICES

**NOTICE TO BIDDERS**

NOTICE IS HEREBY GIVEN that County of Inyo Administrative Offices will receive sealed bids until 3:00 P.M. (PDT) on March 14, 2017 at 163 May St Bishop, Ca 93514.

**BID NO: MP 2017 02**
PURCHASE OF (1) ONE 2016 OR NEWER 4 DOOR COMPACT UTILITY 4X4

Complete specifications, proposal instructions, conditions and proposal (bid) forms can be obtained at the Inyo County Motor Pool, 163 May St, Bishop, CA or by calling (760) 873-5577.
(IR 3/16, 3/18, 3/21/17, #12766)

## 320 PUBLIC NOTICES

**NOTICE TO BIDDERS**

NOTICE IS HEREBY GIVEN that the Inyo County Board Clerk will receive sealed bids until 3:30 P.M. (PDT)
on Wednesday, April 05, 2017 for: Owens Valley Mosquito Abatement Program

**Bid No. 2017-02**
**Two (2) each All-Terrain Vehicles**

Complete specifications, proposal instructions, conditions and proposal (bid) forms can be obtained at the Inyo County Administrative Center, (Purchasing), 224 N. Edwards St. Independence, CA 93526 or by calling Emma Bills, Assistant Purchasing Agent at 760-878-0293.
(IR 3/18, 3/21/17, #12774)

VINTAGE SKI WORLD
World's largest seller of art and artifacts of skiing. NEW shipment just arrived!
View website: vintageskiworld.com
(970) 963-9025
rallen@vintageskiworld.com

## 320 PUBLIC NOTICES

**NOTICE OF PUBLIC HEARING**
EASTERN SIERRA AREA AGENCY ON AGING

The Eastern Sierra Area Agency on Aging (ESAAA) invites public comment at a public hearing during the ESAAA Advisory Council meeting regarding Aging Services in Inyo and Mono Counties. The Annual Plan Update addresses service needs of persons age 60+ and certain disabled adults in Inyo and Mono Counties. This ESAAA Public Meeting is to be held:

**Wednesday, April 26, 2017**
**10:00 a.m.**
Bishop Care Center
151 Pioneer Lane
Bishop, CA 93514

(IR 3/18, 3/21, 3/23, 3/25, 3/28, 3/30, 4/1, 4/4, 4/6, 4/8, 4/11, 4/13, 4/15, 4/18. 4/20, 4/22, 4/25/17, #12773)

## 320 PUBLIC NOTICES

FORT INDEPENDENCE INDIAN RESERVATION

REQUEST FOR PROPOSALS

The Fort Independence Indian Reservation is requesting two (2) separate proposals for Tribal Construction & Grading Projects on the Fort Independence Indian Reservation. The Fort Independence Tribe and its Housing Department/CBDO are seeking proposals from qualified firms or persons to construct four (4) pre-fabricated homes on the Fort Independence Reservation. The Tribe is also seeking proposals from qualified firms or persons to grade four (4) home sites on the Fort Independence Reservation. The Scopes of Work for these two (2) projects will be available to the public by contacting the Tribe's Administration Offices and requesting a copy of the RFP's for these projects.

IMPORTANT NOTE: A bidder's site survey conference will be held on Wednesday, March 8th, 2017 at 1:00 pm at the Tribal Administrative Offices and parties attending the conference will be able to survey the project sites. Additional site visits may be scheduled by appointment only. The Tribe urges persons or firms interested in bidding on these projects to attend the conference.

Qualified contractors are invited to submit proposals for one (1) or both of the projects listed above. Please address proposals directly to Carl Dahlberg, Tribal Administrator. You may submit your proposal or proposals in person or mail them directly to the following address: 131 N. Highway 395, Independence, CA 93526, Proposals may also be submitted through email to: carl@fortindependence.com. The Fort Independence Tribe will begin accepting proposals on February 22, 2017. All proposals must be received by March 22, 2017 at 3:00 P.M. For questions please call the Tribal Offices at: 760-878-5160 or the Tribal Administrator's direct line at: 760-878-5151.
(IR 2/23, 2/25, 2/26, 3/2, 3/4, 3/7, 3/9, 3/11, 3/14, 3/16, 3/18, 3/21, #12732)

## 320 PUBLIC NOTICES

**NOTICE OF PETITION TO ADMINISTER ESTATE OF PATRICIA ANN MITCHELL**
**Case Number: SICVPB-17-60572**

To all heirs, beneficiaries, creditors, contingent creditors, and persons who may otherwise be interested in the will or estate, or both, of **PATRICIA ANN MITCHELL; PATRICIA A. MITCHELL; PATRICIA MITCHELL**

**A Petition for Probate** has been filed by **Laura J. Baird** in the Superior Court of California, County of **Inyo.**

The Petition for Probate requests that **Laura J. Baird** be appointed as personal representative to administer the estate of the decedent.

The petition requests the decedent's will and codicils, if any, be admitted to probate. The will and any codicils are available for examination in the file kept by the court.

The petition requests the authority to administer the estate under the Independent Administration of Estates Act. (This authority will allow the personal representative to take many actions without obtaining court approval. Before taking certain very important actions, however, the personal representative will be required to give notice to interested persons unless they have waived notice or consented to the proposed action.) The independent administration authority will be granted unless an interested person files an objection to the petition and shows good cause why the court should not grant the authority.
**A hearing on the petition will be held in this court as follows:**
Date: **Dec. 8, 2016**
Time: **1:00pm - Dept. 1**
ADDRESS OF COURT:
Superior Court of California, County of Inyo
168 North Edwards Street
Post Office Box
Independence, CA 93526
Independence Branch
**If you object** to the granting of the petition, you should appear at the hearing and state your objections or file written objections with the court before the hearing. Your appearance may be in person or by your attorney.
**If you are a creditor or a contingent creditor of the deceased**, you must file your claim with the court and mail a copy to the personal representative appointed by the court within four months from the date of first issuance of letters as provided in Probate Code section 9100. The time for filing claims will not expire before four months from the hearing date noticed above.
**You may examine the file kept by the court.** If you are a person interested in the estate, you may file with the court a *Request for Special Notice* (form DE-154) of the filing of an inventory and appraisal of estate assets or of any petition or account as provided in Probate Code section 1250. A *Request for Special Notice* form is available from the court clerk.
ATTORNEY FOR PETITIONER:
**Peter E. Tracy**
**Law Office of Peter E. Tracy**
**106 S. Main Street, #200**
**(P.O. Box 485)**
**Bishop, CA 93515**
Telephone: **760-872-1101**
(IR 3/14, 3/16, 3/21/17, #12764)

# Putting on shoes and socks

***Dear Annie***: Is there a right order and a wrong order for putting on one's shoes and socks? I find that on most days, I put on both socks and then both shoes. The other day, I put on one sock and one shoe and then the other sock and other shoe. I remember a scene on the old TV show "All in the Family" in which Archie Bunker and Meathead were getting ready to go out. Archie noticed that Meathead had put on one sock and one shoe, and Archie asked him what he was doing. Why didn't he put on both socks first and then the shoes? "I like to take care of one foot at a time," Meathead says. It was really funny. (The clip is available on YouTube, titled "Archie Bunker – A Sock And A Sock And A Shoe And A Shoe!")

But I am wondering whether any polling company has ever done a survey of how people put on their shoes and socks.

*– Curious in Klamath Falls*

***Dear Curious***: Don't know of any survey, but I suspect that most people dress in the order Archie does. In my view, as long as each shoe ends up on its correct foot, you're doing all right. However, if any of my readers feel strongly about the one-sock-one-shoe method, I'd love to hear from you.

***Dear Annie***: I've wanted to write to you for a long time. I want to tell you my story. I am a 52-year-old man. I have never married and have never even been in a serious relationship. In my late teens, I was put in the position of being caretaker to two family members who were unable to take care of themselves.

When I was in my 20s, I made two attempts at looking for love, and both times ended with my getting hurt very badly. After that, I realized I had too much baggage to ever appeal to a woman, so I stopped looking and settled in to my role as family caretaker. The years – and the decades – went by.

About four years ago, both family members whom I was caring for died within only a few months of each other, and I am alone. I have thought about looking for love again, but I don't even know how to go about it anymore.

So I am resigned to being alone for the rest of my life. I have been in and out of therapy over the years and been on and off antidepressants. Nothing has really helped. I have gotten involved with a couple of community groups over the years but haven't really made any close friends.



ANNIE LANE

I guess I'm not really writing for advice; it's too late for that. I am writing to tell people to try not to be so judgmental about the socially incompetent guy over there who often keeps to himself. You don't know his story, and he might be really nice if you took the time to get to know him.

*– Lonesome*

***Dear Lonesome***: I am so sorry for the loss of your loved ones. Bless you for taking care of them for so long. I'm sure they appreciated it. But the fact is that it's not too late for advice unless you want it to be. So I'm giving you some anyway.

You are only 52 years old. You still have decades of life that can be full of love if you so choose. Don't look for someone to blame for your current state. Instead, focus on the present and what you can do now. Sign up for online dating sites, and don't let the sting of one rejection – or even 10 – paralyze you. There is a woman who will love the way you're "different."

*Send your questions for Annie Lane to dearannie@creators.com. To find out more about Annie Lane and read features by other Creators Syndicate columnists and cartoonists, visit the Creators Syndicate website at www.creators.com.*

# COMMUNITY CALENDAR

*The Inyo Register runs calender items for free events at no charge. Events requiring paid admission will be charged a nominal fee to use this service. Call Cynthia Sampietro at (760) 873-3535 for more information or email her at classy@inyoregister.com. Due to space limitations, we can only guarantee one run per item. All submissions are subject to editing.*

## Ongoing

**CAT/KITTEN ADOPTION MONTH**

The Inyo County Animal Shelter on County Road in Big Pine is sponsoring an adoption special for cats and kittens. During the month of March, the county is waiving the usual $40 spay/neuter deposit and asking adopters to pay $10 for their adoption fee. Shelter hours are Tuesday-Friday **10 a.m.-3 p.m.**; and Saturday and Sunday, **11 a.m.-4 p.m.** For more information, call (760) 938-2715.

**EASTER CANDY AT NIH GIFT SHOP**

The Northern Inyo Hospital gift shop has received a large shipment of Easter candy, many verities and assortments. Store hours are **noon-4 p.m.** Monday through Friday. For more information, call Nona Jones, (760) 872-6662.

## Tuesday, March 21

**COUNTY BOARD OF SUPERVISORS**

The Inyo County Board of Supervisors will meet at **10 a.m.** at the County Administrative Center in Independence.

**ROTARY CLUB OF BISHOP**

The Rotary Club of Bishop meets every Tuesday at **noon** at Astorga's Mexican Restaurant at 2206 N. Sierra Highway. The program will be Matt and Maria Kemp to give an overview of the "health" and history of cattle ranching in the valley Visitors are always welcome. Lunch is $12. Call DeEtte Johnston for information, (760) 873-4958.

**BIG PINE FIRE PROTECTION DISTRICT**

The Big Pine Fire Protection District Board of Commissioners will meet at **6:30 p.m.** at the Big Pine Fire House.

## Wednesday, March 22

**BISHOP SUNRISE ROTARY CLUB**

Bishop Sunrise Rotary Club meets at **7:11 a.m.** at the Northern Inyo Hospital Board Room Annex, 2957 Birch St., Bishop.

**NIH AUXILIARY**

Northern Inyo Hospital Auxiliary will have a workshop at **10 a.m.** at 2957 Birch St. All are welcome to join in making items for the next holiday boutique in November. The NIH Auxiliary is a volunteer organization that raises funds to purchase life saving equipment for the hospital. For more information, call Shirley Stone at (760) 872-1914.

**DAVID GRIER AT ICA**

David Grier, who is widely acclaimed as one of the world's foremost flatpicking guitarists, will be playing at **7 p.m.** at the Inyo Council for the Arts, 137 S. Main St., Bishop.

## Thursday, March 23

**BISHOP LIONS CLUB**

The Bishop Lions Club meets every Thursday, except holidays, at **noon** at the Tri-County Fairgrounds Patio Building. Lunch is served and then the community projects are discussed. Everybody is welcome.

**YOGA CLASSES**

The Imagination Lab hosts yoga classes led by Sabine Ellis every Thursday from **noon-1 p.m.** The Imagination Lab is located at 621 W. Line Street, Ste. 204.

**BINGO AT SENIOR CENTER**

AARP is offering Bingo at **12:45 p.m.** at the Bishop Senior Center behind the City Park. Everyone age 18 and older is welcome to attend. For more information, call (760) 873-5839.

**IMACA BOARD MEETING**

The Inyo Mono Advocates for Community Action Board of Directors regular meeting has been scheduled for **2 p.m.** at the IMACA main office, upstairs meeting room, located at 137 E. South Street in Bishop. For more information, call (760) 873-8557 or send email to snelligan@imaca.net or stop by the IMACA office, 137 E. South St., Bishop, or visit the IMACA website, www.imaca.net.

**WEIGHT WATCHERS**

Weight Watchers meets at **5:30 p.m.** at St. Timothy's Anglican Church every Thursday. The church is located at 700 Hobson St., Bishop.

**UNITED WE RIDE**

United We Ride will meet at **6 p.m.** in the conference room at the Pizza Factory in Bishop. All riders are welcome. For more information, call Dale Renfro, (760) 873-7632.

**TAKING OFF POUNDS SENSIBLY**

TOPS weight-loss program meets every Thursday at **6 p.m.** at the Highlands Adult Clubhouse. Community members can reach their weight-loss goals by providing the tools, information, support and accountability to succeed. TOPS is open to men, women and teens.

**LECTURE SERIES**

The White Mountain Research Center is pleased to host a free public lecture at **7 p.m.** Michael Delacorte, a professor with the Department of Anthropology, and Bridget Wall, staff archaeologist, at CA State University Sacramento, will present a talk titled "The Geology of Prehistoric Human Behavior. " Seating is limited. WMRC is located at 3000 E. Line St. in Bishop. For more information, call: (760) 873-4344.

## Friday, March 24

**ARCHAEOLOGY PROJECTS**

Archaeology projects at Manzanar will run through March 29. Volunteers are needed to assist Manzanar National Historic Site with historic preservation projects. Volunteers can spend a day outside learning, working and preserving. Projects include raking, digging, removing brush and vegetation, painting rocks, mixing and placing concrete. Space is limited, RSVP, (760) 878-2194, ext. 3312 or email katherine_busch@partner.nps.gov.

**'MARY POPPINS'**

"Mary Poppins," the Broadway musical, will be presented by Playhouse 395 at **7 p.m.** "Mary Poppins" is an enchanting mixture of irresistible story, unforgettable songs, breathtaking dance numbers and astonishing stagecraft.

## Saturday, March 25

**WILDFLOWER ADVENTURE**

The Native Plant society will hold a wildflower tour March 25-26, Saturday-Sunday. Meet at **9 a.m.** at Panamint Springs on State Route 190 in Panamint Valley, about one hour east of Lone Pine. Camping Saturday night will probably be primitive (no water, no toilets, no tables). Easy to moderate walking. Trip will end on Sunday about 3 p.m. The tour will be led by Mark Bagley, who is a consulting botanist with more than 30 years experience in the Mojave Desert and has led many wildflower trips to Death Valley. For more information, visit bristleconecnps.org or call Mark Bagley at (760) 920-2211.

**'MARY POPPINS'**

"Mary Poppins," the Broadway musical, will be presented by Playhouse 395 at **7 p.m.** "Mary Poppins" is an enchanting mixture of irresistible story, unforgettable songs, breathtaking dance numbers and astonishing stagecraft.

## Sunday, March 26

**VFW BREAKFAST**

The Veterans of Foreign Wars Post No. 8988 will be serving a breakfast from **8-11 a.m**. at the post, 484 Short St. The menu will include ham steak, creamy cheesy scrambled eggs, homemade country potatoes, toast, orange juice, coffee, tea and hot chocolate for $9. Children younger than 12 are half priced. Free delivery also is available. For more information, call (760) 873-5770 or (760) 920-0106.

**EASTSIDE WRITING CIRCLE**

Eastside Writing Circle meets from **1:30-2:30 p.m.** at The Imagination Lab at 621 W. Line Street, No. 204, across the street from Dwayne's Friendly Pharmacy in Bishop. There are no fees or dues and all ages and skill levels and drop-ins are welcome. Contact Marilyn (760) 920-8013, marilynbphilip@gmail.com for more information.

## Monday, March 27

**BISHOP CITY COUNCIL**

The Bishop City Council will meet at **6 p.m.** in the Council Chambers at City Hall, 301 W. Line St. The meeting will be streamed live on Channel 12 or online at cityofbishop.com.

# HOROSCOPES BY HOLIDAY



HOLIDAY MATHIS

The fresh hope and youthful vigor of the Aries sun fills this day with possibilities. The moon in aspiring Capricorn adds motivation to the mix. It will be important to distinguish between *ambition*, which is the desire for great gain, and *greed*, in which those gains come at the expense of others.

**ARIES (March 21-April 19)**. Nature is stronger than man. Then again, man is a part of nature. You'll prove the mightiness of the human spirit in some way today as you go up against the big forces and win.

**TAURUS (April 20-May 20)**. After periods of high exertion you need time to relax and recover. If you don't consciously and regularly schedule this, you'll miss it and burn out later. Take care of your health and happiness now by making a plan.

**GEMINI (May 21-June 21)**. In order to better achieve the group goal, people must feel safe enough speak up about what's working and what's not. If everyone is too afraid to challenge or change the way things are going, the outcome will suffer.

**CANCER (June 22-July 22)**. There will be flashy, glamorous and dramatic situations to get involved in today, but should you? You won't be sorry if you instead choose your company the same way you choose your shoes – for comfort and long wear.

**LEO (July 23-Aug. 22)**. Maybe you shouldn't tell everyone about the extensive effort you put into getting to a certain result. Your payoff will come when the others figure out that they can't easily duplicate what you just pulled off.

**VIRGO (Aug. 23-Sept. 22)**. You won't get the sale, promotion or attention necessary to move forward unless people know what you're doing and why. So don't be shy today; publicize your work.

**LIBRA (Sept. 23-Oct. 23)**. Your social talents will be put to good use now. You'll connect people who can do one another good. You'll set a tone where people feel comfortable enough to contribute.

**SCORPIO (Oct. 24-Nov. 21)**. There's nothing wrong with wanting appreciation and love. It doesn't make you automatically needy just because you have the very basic human drive to be valued. Be suspicious of anyone who tries to make you feel otherwise.

**SAGITTARIUS (Nov. 22-Dec. 21)**. You may not agree right now with what you did back there, but you made the best decision you could make based on the information you had at the time. Knowing more, you'll do it differently today.

**CAPRICORN (Dec. 22-Jan. 19)**. You've been wronged – probably just a misunderstanding – and you'll work it out. Being too conciliatory would be a mistake. Don't mute your own interests more than is good for the relationship going forward.

**AQUARIUS (Jan. 20-Feb. 18)**. The day has exciting potential for you as you follow a fascinating lead. Where high standards meet with prepossessing features, a strong attraction will develop.

**PISCES (Feb. 19-March 20)**. Mistakes teach us how to be more flexible in the future. They also make us compassionate. Accept yourself and move on. You're becoming stronger and more able every day.

**TODAY'S BIRTHDAY (March 21)**. Get organized now, because you'll soon take your talents to a wider audience. Travel will be involved. You might be surprised who finds you enchanting in April. Family connections will parlay into business wins in May. In June, while tending to responsibility, a dream will come true. Capricorn and Libra adore you. Your lucky numbers are: 12, 2, 40, 9 and 31.

**FORECAST FOR THE WEEK AHEAD**: Once upon a time, before January was the start of the year and before Lunar New Year was the start of the year, for many ancient civilizations, the passage of the chariot sun into Aries was the true signal to reset the calendar and start new. The sun in the sign of the lamb balanced out the day and night and got the season off to a promising start. Historically, this is a time of year when humans considered it their duty to keep the gods happy. Content gods, it was believed, don't punish humankind with such things as earthquakes and volcanoes. Keeping the gods fed, well-loved and highly honored was a deal that ancient people made with nature that seemed to work in favor of humans, except when it didn't.

Are you superstitious? This is the week when your beliefs could very well become self-fulfilling prophecies. So if you have a tendency to indulge the occasional irrational assumption, you might as well skew this in your favor by believing that the universe is colluding to please and benefit you. While you're at it, consider creating and executing rituals that reinforce the idea.

*To find out more about Holiday Mathis and read her past columns, visit the Creators Syndicate Web page at www.creators.com.*

# Today's Crossword Puzzle

## *Previous Puzzle Solved*

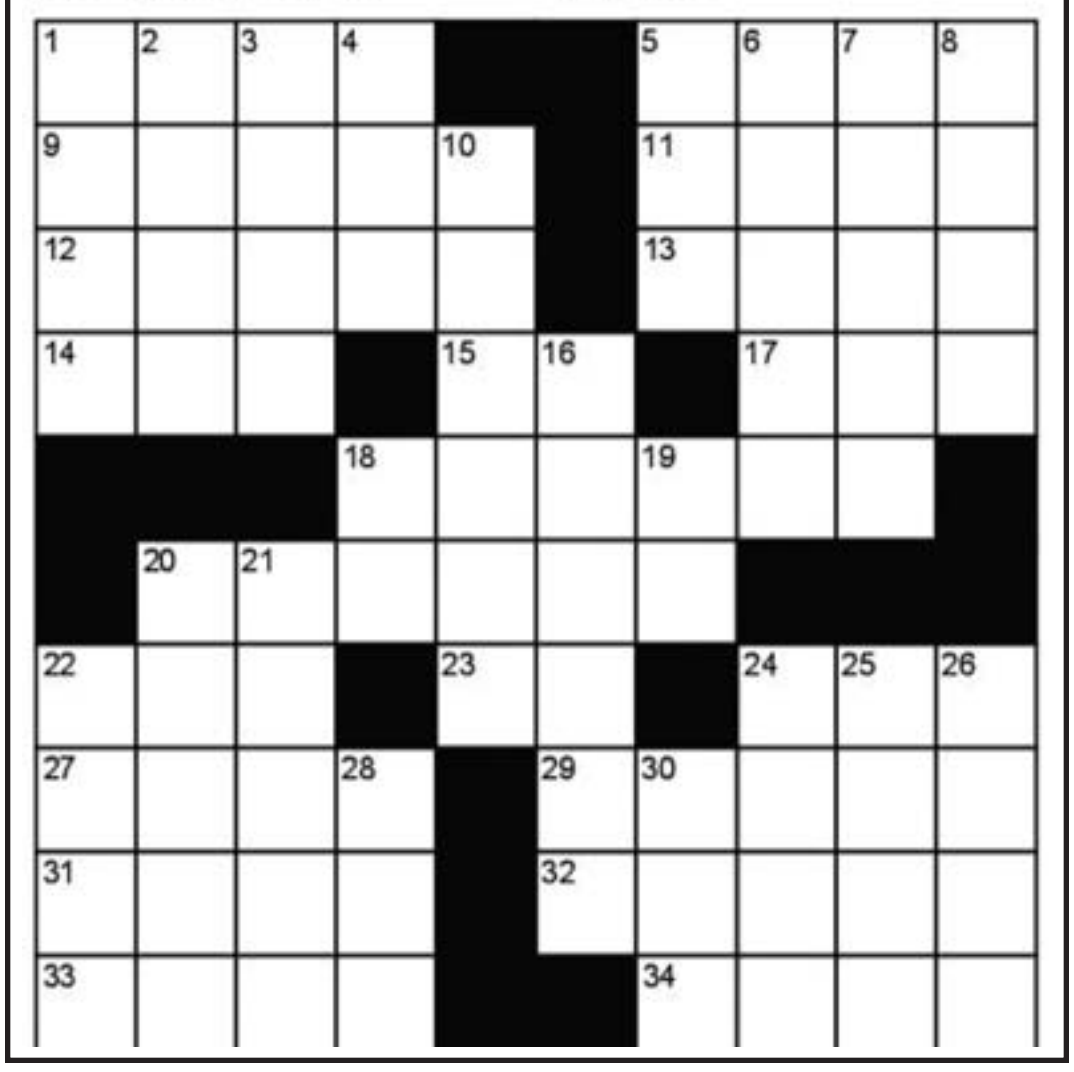
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| A | R | N | I | C | A | | E | K | E |
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| U | R | C | H | I | N | S | | | |
| S | E | A | | E | S | C | O | R | T |
| U | P | T | O | N | | H | O | A | R |
| A | L | E | R | T | | E | Z | R | A |
| L | Y | R | E | | | W | E | E | P |

**ACROSS**

1. Glen
5. Persia
9. Bye
11. Remake
12. Tears
13. Sodium
14. North northeast
15. Nova Scotia (abbr.)
17. Palter
18. Make numb
20. Dolt
22. Hold
23. South Dakota
24. Throw
27. Cincinnati baseball team
29. Type of glue
31. Radar target
32. Set to zero
33. Bide
34. Heredity component

**DOWN**

1. Exclamation
2. Paradise
3. Waiting place
4. Headed
5. Tax agency
6. Bourn
7. Improvise a speech
8. Memo
10. "__ and World Report"
16. More subtly ridiculing
18. Bachelor of Music
19. 2002 Winter Olympics locale
20. Inhabited
21. Asian nation
22. Globes
24. Mislay
25. Wagon pullers
26. Computer memory unit
28. Observe secretly
30. Dowel

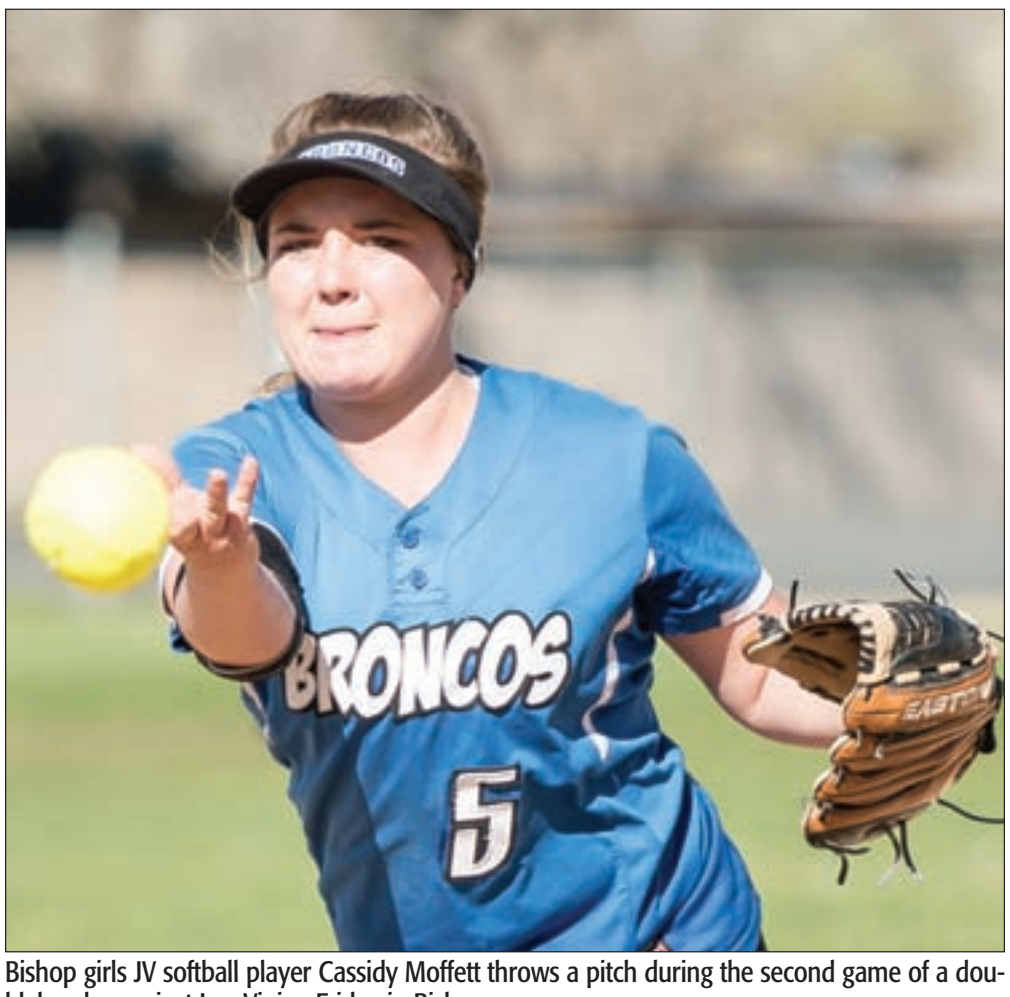




# Swing time

Hana Hogan, Bishop Union High School junior varsity softball player, swings at the ball during the second game of a doubleheader against Lee Vining Friday in Bishop. Bishop defeated Lee Vining in both games 18-7 and 21-12.

**Photos by Mike Chacanaca**




Bishop girls JV softball player Cassidy Moffett throws a pitch during the second game of a doubleheader against Lee Vining Friday in Bishop.

# Lone Pine softball, baseball have mixed results against Desert Christian

Register Staff

The Lone Pine girls varsity softball team defeated Desert Christian Friday by a final score of Lone Pine 13, Desert Christian 6.

Lady Eagles Juliann Jones pitched for 8 strike outs and allowed 1 hit in 5 1/2 innings. Celia Ray pitched 1 1/2 innings allowing 5 hits.

At bat, Lady Eagles Becca Tsosie was 1-5; Celia Ray 2-4; Daisy Gutierrez 2-4; Jones 2-4, 2B, RBI; Mariah Button 2-5, 2B, 3 RBIs; Taylor Corona 1-4, RBI; Shelby Chavez 3-4, 2B, RBI; Berenice Gutierrez 2-4, RBI; Sarah Daughtry 1-4.

Liz Jones, Lady Eagles head coach acknowledged some outstanding outfield plays by Lady Eagles Taylor Corona and Shelby Chavez.

The Lady Eagles next game is against Mammoth at 3:15 p.m. Tuesday in Lone Pine and Saturday the Lady Eagles face Desert Christian at noon in a home game at the Lone Pine Sports Complex.

**Lone Pine baseball**

The Lone Pine Golden Eagles varsity baseball team lost to Desert Christian Friday by a final score of Desert Christian 13, Lone Pine 3.

Michael Button, Lone Pine baseball coach, described the game starting off well for the Eagles, scoring three runs in the first inning.

Going into the third inning, the teams were tied, 3-3. Lone Pine made a couple of errors, allowing Desert Christian to pull ahead.

Button said Kristopher Nelson and Benji Luna for their pitching, saying that he sees big things in the future for them both.

"We are a young team with lots of talent," Button said. "(It's a) rebuilding season for these fine young men."

# NCAA basketball scores March 17, 18

**Friday, March 17**

Oklahoma State - 91
Michigan - 92

Seton Hall - 71
Arkansas - 77

Jacksonville State - 63
Louisville - 78

TX Southern - 64
North Carolina - 103

UC Davis - 62
Kansas - 100

Troy - 65
Duke - 87

Michigan State - 78
Miami FL - 58

Kent State - 80
UCLA - 97

NM State - 73
Baylor - 91

Iona - 77
Oregon - 93

USC - 66
SMU - 65

Rhode Island - 84
Creighton - 72

Wichita State - 64
Dayton - 58

Kansas State - 61
Cincinnati - 75

Marquette - 73
South Carolina - 93

Northern KY - 70
Kentucky - 79

**Sunday, March 19**

Notre Dame - 71
West Virginia - 83

Northwestern - 73
Gonzaga - 79

Middle Tennessee - 65
Butler - 74

Virginia - 39
Florida - 65

Wisconsin - 65
Villanova - 62

Xavier - 91
Florida State - 66

Saint Mary's - 60
Arizona - 69

Iowa State - 76
Purdue - 80




## WANT TO GET YOUR PICTURE IN THE PAPER? HERE'S HOW!

# EASTERN SIERRA Selfie CHALLENGE #17



**Our Next EASTERN SIERRA SELFIES page will be on Tuesday, March 28, 2017**

To participate in this challenge, send us a Selfie taken of you:

- **With a Shamrock**
- **Eating a Burger**
- **With a Flower**

- **Deadline for Eastern Sierra Selfies is Sunday, March 26 by 5 p.m.**
- Send Selfie photos to: comp@inyoregister.com
- Photos must be tasteful, must include first and last names of everyone in the photos and please include ages of children under 18 years of age.
- Photos **WILL NOT** be published if they are not in good taste, do not meet the challenges given, if they are not in focus or without identification.

**You don't need to get all 3, any one will get you on the page!**

**Good Luck and Have Fun!**

# Catch of the Week!



Bruce Warner, 5, of Lone Pine, holds the trout that he caught during the Early Opener Trout Derby at Diaz Lake March 4. Pictured with Bruce is his grandfather Allen Warner.

**Photo by Mike Chacanaca**

*Do you have a Catch of the Week photo you want to share with us? Simply email editor@inyoregister.com*

*CATCH OF THE WEEK IS SPONSORED BY:*



(HTTP://WWW.LATIMES.COM/)




**Pipe age:** **8%** less than 50 years old **5%** between 50 and 75 **74%** between 75 and 100 **6%** more than 100 **6%** age unavailable

Search for leaks in Los Angeles or Find me Areas with most leaks

Know of a leak that isn't on the map? Let us know here. (https://docs.google.com/forms/d/1kp4uV5XnLBRueZQztGCxZMzbAPIwcvWotYt-pUlWygk/viewform?edit_requested=true)

# L.A.’s aging water pipes; a $1-billion dilemma

**By BEN POSTON (HTTP://WWW.LATIMES.COM/LA-BIO-BEN-POSTON-STAFF.HTML) and MATT STEVENS (HTTP://WWW.LATIMES.COM/LA-BIO-MATT-STEVENS-STAFF.HTML)**

FEB. 16, 2015

ADVERTISEMENT

The water main break that flooded Nowita Place in 2013 wasn't the kind of spectacle that brought TV cameras. Water sprayed a foot in the air through a hole in the buckled asphalt, leaving residents in the Venice neighborhood without water service for hours.

But the break fit an increasingly common pattern for L.A.'s aging waterworks: The pipe was more than 80 years old. It was rusted out. And it was buried in corrosive soil.

About one-fifth of the city's water pipes were installed before 1931 and nearly all will reach the end of their useful lives in the next 15 years. They are responsible for close to half of all water main leaks, and replacing them is a looming, $1-billion problem for the city.

"We must do something about our infrastructure and we must make the necessary investment," said H. David Nahai, former head of the Department of Water and Power. "If we don't act now, we'll simply pay more later."

The DWP has a $1.3-billion plan to replace 435 miles of deteriorating pipe in the next 10 years, but difficult questions remain about how the

## By the numbers

**6,730** — Miles of pipe in the DWP water main network

**435** — Miles of deteriorated water mains that DWP wants to replace, about 6.5% of the network

**$1.34 billion** — Cost to replace at-risk water mains by 2025

**$44 million** — Annual average amount DWP has spent on pipe replacement in the last eight fiscal years

**$135 million** — Annual spending needed to reach 10-year pipe replacement goal

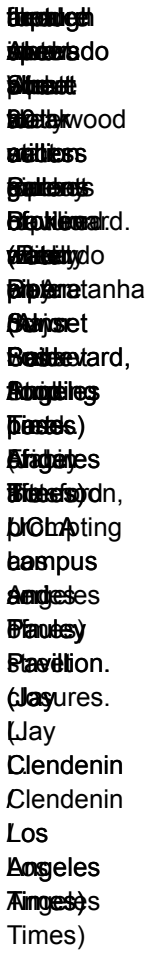
Source: Los Angeles Department of Water and Power

agency will find the money, how much it will inconvenience commuters and whether the utility can ever catch up with its aging infrastructure.

To reach its goal by 2025, the DWP would need to more than double the number of pipe miles it replaces annually and more than triple the average amount it spends on pipe replacement each year. Water officials said the department has already budgeted $78 million for water main replacement in the current fiscal year, a significant increase from its annual average.

Future funding for the plan will depend on a combination of higher water rates, bond sales and other department revenue. Getting city leaders to approve higher water rates that the agency says it needs could require political maneuvering as the DWP deals with a standoff between city leaders and two nonprofit trusts over $40 million the agency gave to the organizations. The department is also rebounding from a billing scandal in late 2013.

"Like the average rate-payer, I will have to be shown the case" for an increase, Mayor Eric Garcetti said, "but I'm interested in not burying my head on this problem."



(Jay Clendenin / Los Angeles Times)

As officials weigh rate increases, pipes continue to deteriorate and leak, spewing millions of gallons of water onto city streets amid one of California's worst droughts on record. And costs to repair and maintain the aging system mount, totaling more than $250 million over the last eight fiscal years.

More than a quarter-million pipes make up the DWP's 6,730-mile water main network. Since 2006, work crews have responded to about 13,000 leaks, about four a day across the city.

Some areas experienced more leaks than others — Hollywood Hills West, Mid-City and Hollywood accounted for the largest number of leaks in the city since 2010, agency data show.

## Leaks by area, 2010 to 2014

During the last eight fiscal years, the department spent an average of $44 million annually to replace about 21 miles of pipe per year.

Still, water officials estimate that about 8 billion gallons of water are lost each year to leaky pipes, firefighting, evaporation, theft and other unaccounted losses, though they emphasize that the leak rate has been in decline over the last decade, and is about half the industry average. But the lost water could supply almost 50,000 households for a year.

One small pipe in Woodland Hills leaked more than half a million gallons of water over the course of the year it took the DWP to find and fix it. A DWP spokeswoman said ambient noise made it difficult to find the leak with sound equipment. Workers drilled dozens of holes and dug out sections of the road to locate the leak, leaving uneven patches and a pothole filled with water, residents said.

"This thing was wasting water and we're in this severe drought," said Rick Russell, who visits his mother in the neighborhood. "It's kind of like a slap in the face."

Analyzing pipe infrastructure data, The Times found that pipe age, soil quality, water pressure and leak history are key factors that contribute to leaky water mains. DWP engineers weigh those factors when prioritizing pipes for replacement, assigning a letter grade to each water main based on its likelihood of failure and the potential consequences of a break. About 6% of the system earned grades of D and F, according to The Times' analysis.

Sources: Los Angeles Department of Water and Power, MapBox and OpenStreetMap.

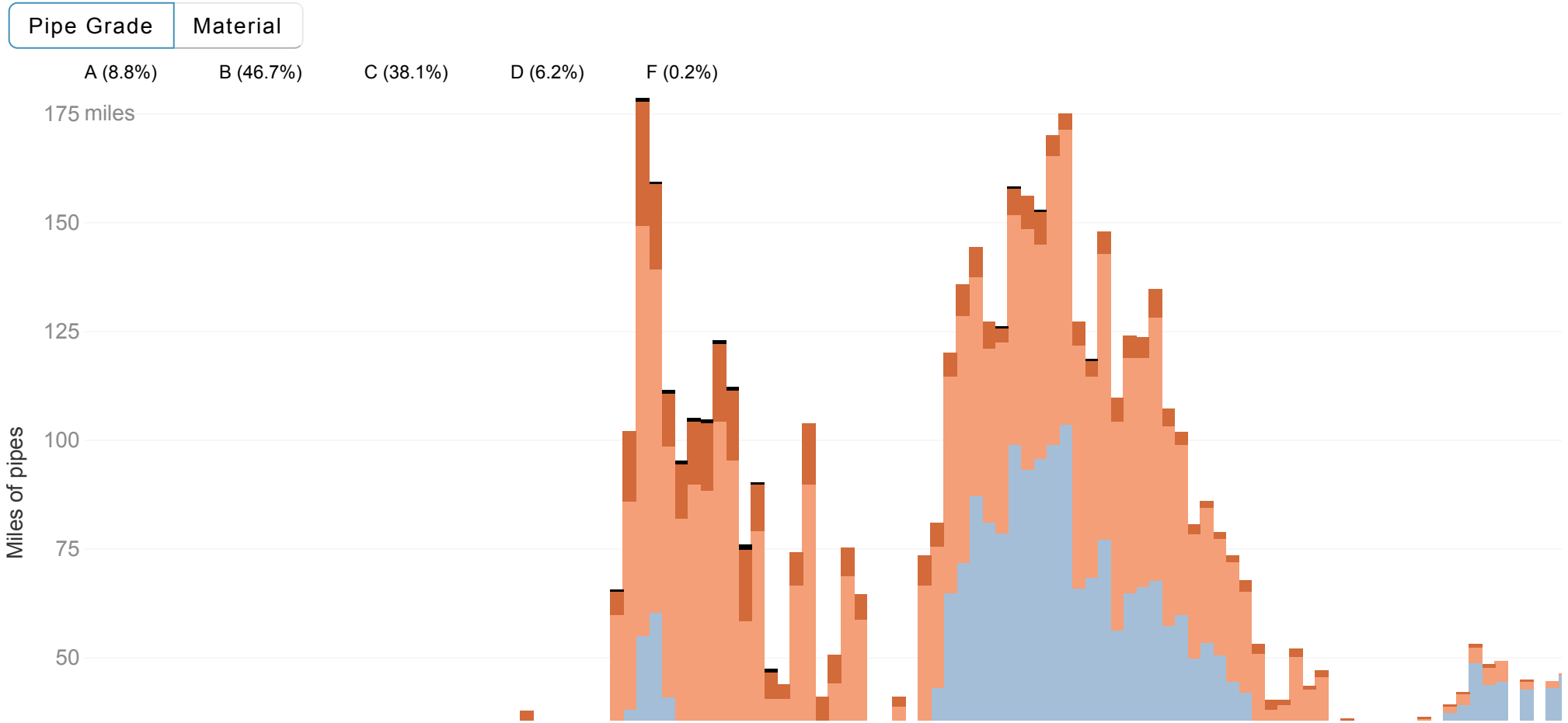
The department's 10-year plan is aimed at replacing pipes that have poor grades. Officials believe that they can replace all the pipes now ranked D and F by 2025.

More than 40% of the pipes graded D and F were installed in 1930 or earlier as Los Angeles' population boomed. The expansion of underground water mains in the city mirrored the growth in population above ground. Installation dropped off during the Great Depression and World War II, and surged during the baby boom, when the DWP installed more than 2,500 miles of water mains, department data show.

Those postwar pipes will approach the end of their useful life span in about 30 years.

## L.A.’s aging water mains

The DWP uses letter grades to prioritize water mains for replacement in the city’s 6,730-mile network.




Lucio Soibelman, a civil engineering professor at USC, reviewed the DWP's database of more than 260,000 water mains that The Times obtained through a California Public Records Act request. He found that older pipes in corrosive soils such as the sandy ground in Venice are the most likely to leak.

"These are the pipes that have to be replaced first," Soibelman said.

Those aren't the only factors, though. Water pressure and leak history are also important indicators of potential pipe failure, said Julie Spacht, the DWP's water executive managing engineer. Nearly 30% of the leaky pipes had more than one leak, the data show. Most of the at-risk water mains are being targeted for repair, The Times' review shows.

> **Because pipes are out of sight and out of mind, no one has really thought about how we're going to pay for this.**
>
> — Colin Chung, an asset management consultant

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Outdated engineering methods can also make a pipe more likely to fail. Cast iron mains installed before the 1930s often rusted from the inside out, causing leaks, officials said. DWP workers began lining new pipes in the mid-1930s with concrete. That change corresponds to a steep decline in leaks, The Times found.

Cities such as Portland, Ore., San Francisco and Seattle are also seeing old pipes come of age, according to infrastructure experts who praised the DWP for addressing the issue.

"This is not just an L.A. problem," said Colin Chung, an asset management consultant based in Irvine. "Because pipes are out of sight and out of mind, no one has really thought about how we're going to pay for this."

One of the biggest recent pipe failures occurred last summer on Sunset Boulevard when two trunk lines — arterial pipes with diameters larger than 20 inches — ruptured. One of the trunk lines was more than 90 years old and graded C when it failed. The other was more than 80 and graded D.

## Los Angeles DWP crews replace a water main

The broken pipes sent about 20 million gallons of water rushing into Westwood, rendering cars inoperable, warping the hardwood floor in UCLA's Pauley Pavilion and causing what school administrators estimated would be millions of dollars in damage.

Pipe repair costs totaled almost $900,000, DWP said.

After the blowout, Garcetti asked the DWP to present a plan to address the city's infrastructure. Garcetti said the agency's goal of replacing D- and F-rated pipes by 2025 is achievable using mostly bonds and cash from existing base rates.

He didn't rule out water rate increases, but that requires public meetings and political capital from the DWP Board of Commissioners, City Council and mayor, all of whom must approve an increase.

"We do need to pay for what we need to fix," Garcetti said.

Although the DWP's $1.3-billion plan would fix many of the current problem pipes, water officials said it doesn't address pipes that will deteriorate in coming years. Even the department conceded it is unlikely that it will ever entirely catch up.

Agency officials must also contend with quality-of-life realities for Los Angeles residents. Replacing several hundred miles of pipe could snarl traffic on roads that must be excavated. And the work will cause headaches for those who have to endure construction outside their homes.

The department's plan could also be hampered by constant regulation changes, water price fluctuations and evolving drought conditions, which some infrastructure experts said can make executing a massive long-term initiative nearly impossible.

But water officials said they need to act now.

"The goals we set are 'stretch'-type goals, but not unreasonable," Spacht said. "We're in a spot where we have an opportunity to take measures to keep us from being in a desperate situation in the future."



Leslie Pope says DWP crews have repaired four leaks on her street in Venice since 2010. (Bob Chamberlin / Los Angeles Times)

Leslie Pope and her husband, Doug Fischer, who live on Nowita Place in Venice, said they would pay higher water rates if it meant improved pipes. Since 2010, crews have repaired four leaks on their street and three on the next block.

The day the pipe split in front of her Craftsman bungalow, Pope and about 60 of her neighbors went without water most of the day, according to DWP records. Cones and a massive white truck blocked off the area as crews pumped out standing water. Workers ripped out and tossed aside chunks of asphalt, then dug a chest-deep hole that measured 12 feet square, the records show.

By the late afternoon, crews had removed and replaced seven feet of rusty pipe, records show.

"I love Venice," Fischer said. "But it's old and falling apart, and these things need to be taken care of."

***Contact The Reporters*** (mailto:ben.poston@latimes.com, matt.stevens@latimes.com)

Follow @bposton (http://twitter.com/@bposton) and @ByMattStevens (http://twitter.com/@ByMattStevens) on Twitter for updates on the city's infrastructure.

*Times staff writer Peter Jamison and researcher Kent Coloma contributed to this report.*

**Credits:** Interactive Map: Priya Krishnakumar. Interactive Chart and Digital Producer: Honest Charley Bodkin.

150 Comments powered by: (http://viafoura.com)

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**Gidzmobug** Rank 3307

And where has all the money gone from the property taxes? Or the DWP payments?

Maybe it's time to audit the city?

3 years ago ▲ 1 ▼ 1 Reply Share

**mog-ur** Rank 217

The 40 million sent to the IBEW boondoggle would make a nice dent in this... Add in the yearly transfer from the LADWP to the City, and the problem is solved! You wouldn't even need to touch the "training" scam costs...

3 years ago ▲ 2 ▼ 1 Reply Share

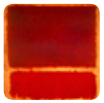
**Big Jim Slade** Rank 54

The answer is so obvious. We should use trains to deliver the water instead.

3 years ago

0 1 Reply Share

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**IHate TheLATimes** Rank 851

Why doesn't the LA Times ever report on the $250 million transferred from the DWP to the general fund each and every year. That's on top of the DWP's outrageous salaries, outrageous pensions, and the $150 million a year in "training" costs. The reporter who wrote this story would under normal conditions, be fired for negligence. But the LA Times is completely controlled by "Progressives" and there's nothing normal about that. It is in fact ahistorical.

There's more than enough money to redo... » more

3 years ago

2 1 Reply Share

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**gilrod2007** Rank 286

This could be a metaphor for crumbling infrastructure nationwide. Years of neglect, not even preventive maintenance. I've said before that I've seen large sections of exposed rebar in concrete bridges in another state and that was 30 years ago. They haven't been repaired or replaced. They can only be worse today. We could create millions of jobs by diverting a relatively small portion of the Pentagon budget, but to even suggest that is to be treated like someone who's insane.
We will pay a... » more

3 years ago

2 0 Reply Share

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**msblack** Rank 10

@gilrod2007

Former Governor Dukemejian solved our fiscal crisis after Proposition 13 by deferring infrastructure maintenance. Since that change, we haven't restored maintenance spending. The walls of Jericho are tumbling down.

3 years ago ▲ 1 ▼ 2 Reply Share

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**Big Jim Slade** Rank 54

The Pentagon's budget is now fourth on the list, much of due to the sequester. Perhaps you ought to go after the top three- Health Care, Pensions, and Interest on the Debt. That last one provides Americans with absolutely nothing in return.

"Interest payments on that debt represent a large and rapidly growing expense of the federal government. CBO's baseline shows net interest payments more than tripling under current law, climbing from $231 billion in 2014, or 1.3 percent of GDP, to $799... » more

3 years ago ▲ 0 ▼ 0 Reply Share

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**ATI rage xl** Rank 562

This reminds me of the "60 Minutes" about crumbling bridges in Pittsburgh. They could fall at any time but there's simply no money to fix them. Or those schools in Philly with no money for paper and pencils because the city is going bankrupt from pension costs. And those kids are actually dumb enough to picket to support their teachers.

3 years ago ▲ 3 ▼ 0 Reply Share

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**ATI rage xl** Rank 562

I assume the workers at the Dept. of Waste and Pensions won't mind if their kids want to go to UCLA and UC is raising tuition 25% to pay for pensions. Gov. Scott Walker is trying to cut the budget at the U. of Wisconsin 13%. That's very funny. I think I'll buy a roll of Brawny Paper Towels to support the Kochs, who got him elected.

3 years ago ▲ 1 ▼ 0 Reply Share



**msblack** Rank 10

So many comments whining about DWP compensation. Sigh. DWP rates are lower than Edison, PG&E, and SDG&E. And they pay their workers better. Where's the problem? Shareholders not sucking enough blood out of the economy for doing nothing?

3 years ago ▲ 0 ▼ 3 Reply Share

**mog-ur** Rank 217

@msblack: Imagine just how much lower they could be and all the money that would be available for infrastructure repair if the LADWP wasn't so mismanaged and beholden to the unions and their unsustainable pensions and other "benefits..." Unlike all the other entities you mentioned, LADWP is private, not public, and thus is SUPPOSED to have lower rates.

3 years ago ▲ 2 ▼ 1 Reply Share

**Valley & Pasadena** Rank 11111

@mog-ur The LADWP is a public utility. Largest (by water delivered) in the nation, and is treated differently from all the rest of the Los Angeles City Departments (goes back to the Owens Valley aqueduct) but it's not a private entity.

3 years ago ▲ 2 ▼ 0 Reply Share



**Skip Adam** Rank 1

WHAT IS THE ANUAL BUDGET FOR LADWP PENSIONS?

How many past employees are in the 100K Club?

We knew the answer in 2009 ..... What about today?

3 years ago ▲ 4 ▼ 1 Reply Share



**Skip Adam** Rank 1

Six-figure L.A. city pensions
May 21, 2009
Deaton, Ronald F ... Department of Water and Power ... $317,876
Salas, Frank ...Department of Water and Power ... $290,707
Lane, Kathryn E ... Department of Water and Power ... $217,843
Hokinson, Thomas C ... Department of Water and Power ... $207,891
Gewe, Gerald A ... Department of Water and Power ... $199,906
Mathis, Darrell G ... Department of Water and Power ... $195,989
Kawasaki, Lillian Y ... Department of Water and Power ... $181,848
Mccart... » more

3 years ago

▲ 3 ▼ 1 Reply Share

Show 1 older reply

**ATI rage xl** Rank 562

@msblack Well that's the problem--govt. service apparently means letting the pipes rust.

3 years ago

▲ 4 ▼ 0 Reply Share



**Skip Adam** Rank 1

@msblack

I have a Military pension ..... 20 years of people shooting at me and all i get is a measly 1200 a month ..... But you are right ..... it was my choice

3 years ago

▲ 4 ▼ 0 Reply Share

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Los Angeles Department of Water & Power

# Department of Water and Power
# City of Los Angeles

City of Los Angeles
4th Regional Investors Conference
March 19, 2018

Putting Customers First

www.ladwp.com

# LADWP Overview

- Largest municipal utility in the US
- 1.5 million power customers; 680,000 water customers
- Vertically integrated utility
- Owns more than 25% of state's transmission; not part of California ISO
- Reached 20% renewables in 2010; well-positioned to meet state-mandated level of 33% by 2020
- Diverse water resources; expanding local water supply
- Economically strong and diverse service territory
- Stable, broad customer base with steady growth
- Largest 10 customers provide 10.5%  of Power revenues and 6.5% of Water revenues
- Approved multi-year rate increases provide favorable rate restructuring



# Key Figures – FY 2017

- Sales:
  - Energy Sales: 24 million MWh
  - Water Sales: 196 million HCF
- Operating Revenue:
  - Energy: $3.7 billion
  - Water: $1.1 billion
- Total Liquidity as of December 31, 2017:
  - Power: $1.93 billion on hand including ~$458 million on deposit in a Debt Reduction Trust Fund and $100 million in Rate Stabilization Fund
  - Water: $503 million on hand including $50.2 million in Expense Stabilization Fund
- Combined $500 million revolving line of credit for both Water & Power Systems

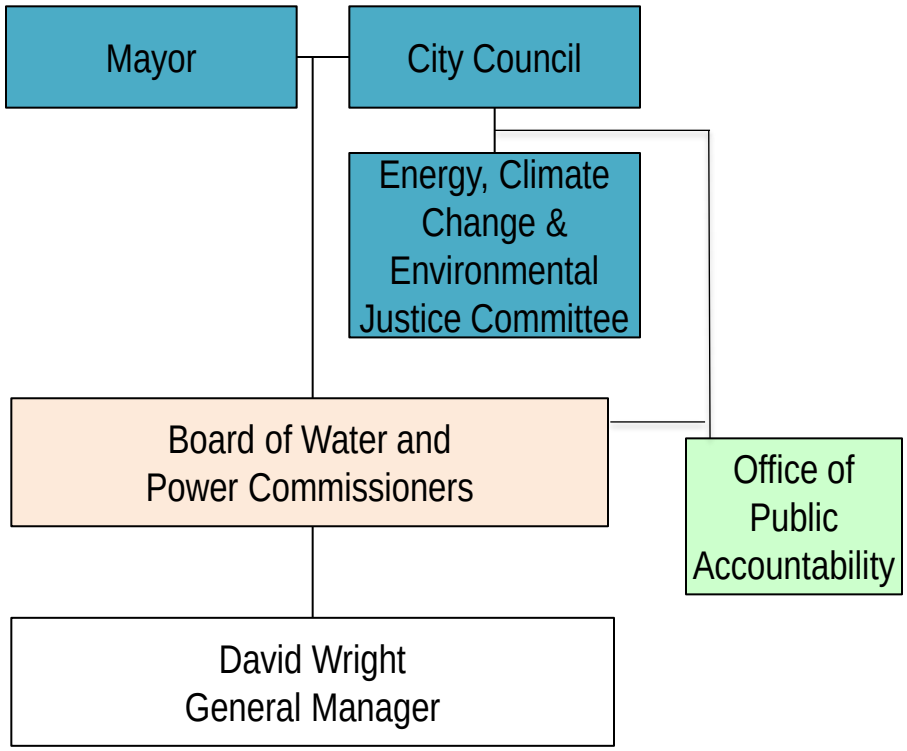






*Note: Power System Service Map*

# Existing LADWP Governance




**General Manager**
- Administers Department affairs and operations

**Energy, Climate Change and Environmental Justice Committee**
- City Council Committee with jurisdiction of matters concerning the Department

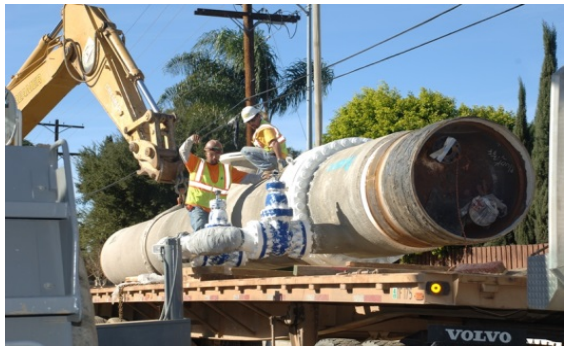
**City Council**
- Approves rate requests and selection of Board of Water & Power Commissioners and General Manager

**Board of Water and Power Commissioners**
- Five-member Board establishes policy for the Department. Members appointed by Mayor and confirmed by City Council for five-year terms

**Office of Public Accountability**
- Executive Director is appointed by a citizens committee, subject to confirmation by City Council and Mayor
- Provides public, independent analysis to the Board and City Council

# LADWP's Transformation

- Replace aging infrastructure
- Transition to 100% clean energy
- Protect from drought, expand local water supplies, groundwater cleanup and storage
- Electrify transportation sector
- Improve customer service, keep rates competitive
- Expand customer-facing automation








# Snapshot of Just a Few Challenges Ahead (Legal Mandates)

## Power

- State Mandated Green House Gas Reduction (AB 32, SB32 & AB197)
- Eliminate Once Through Cooling of all Coastal Power Plants (Clean Water Act – Rule 316b)
- South Coast Air Quality Management District Emission Reduction Mandates (NOx, SOx, PM, etc)
- Solar Incentive and FiT Programs (SB 1 & SB 1332)
- Divestiture of Coal Resources (SB 1368)
- Increase Renewable Resources (SB 350: 20% -2010 / 25% 2016 / 33% - 2020 / 50%-2030)
- Cost Effective Energy Storage (AB 2514 & AB 2227 & SB801)
- Minimize Risk of Catastrophic Wildfire (SB 1028)
- Federal Solar Tariff
- Bio Energy Projects (SB 859)
- City Council 100% Clean Energy Motion

## Water

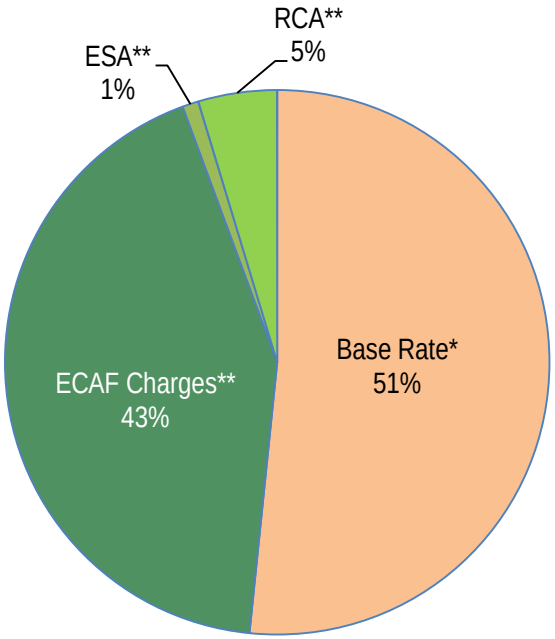
- Cover all Remaining Open Reservoirs (Long Term 2 Enhanced Surface Water Treatment Rule)
- Convert Chlorine to Chloramines (Stage 2 Disinfectants and Disinfection Byproducts Rule)
- Owens Lake Dust Mitigation (Clean Air Act)
- Mayor's Executive Directive No. 5

  -Reduce imported water purchases by 50% by 2025

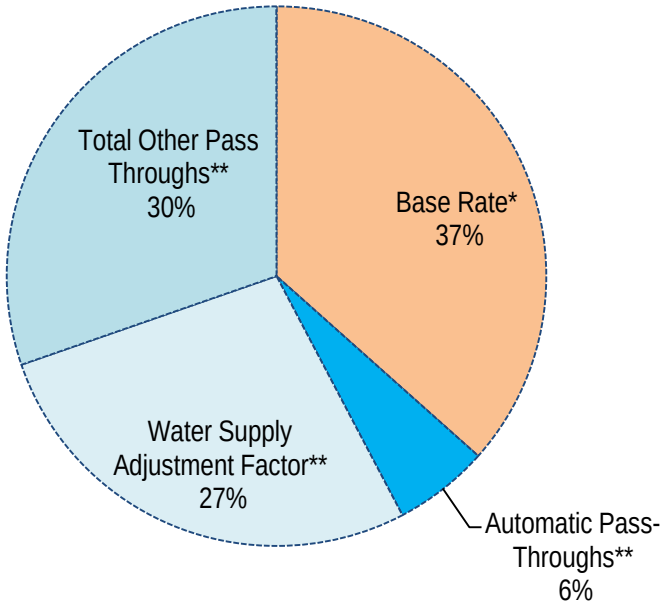
  -Expand local water sources to account for at least 50% by 2035

# Revenue Composition Under New Rate Structure

## Power System
### 49% Pass-Through

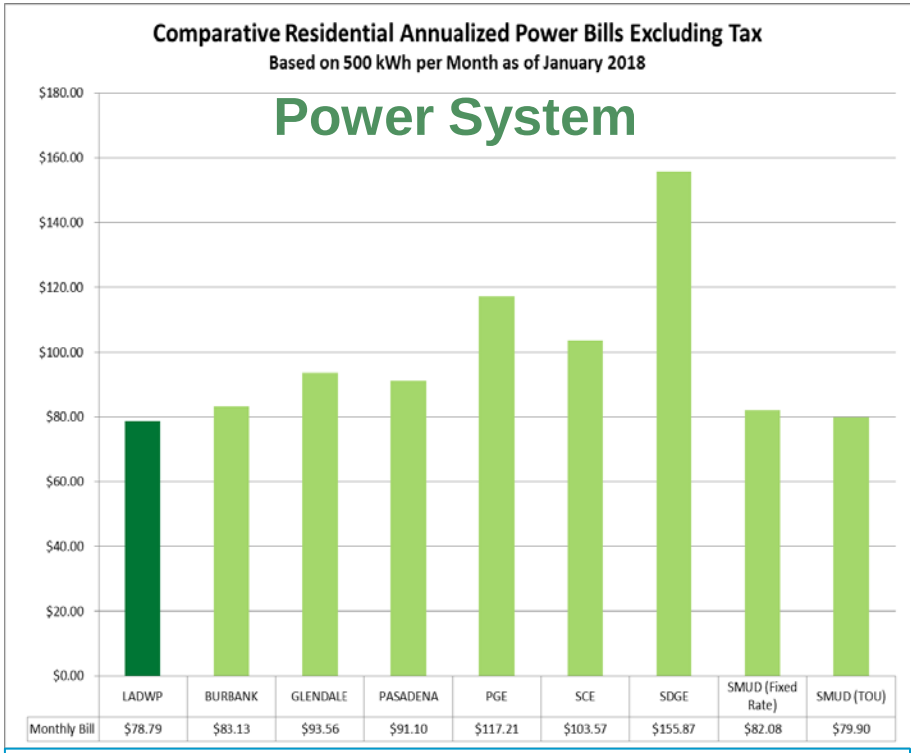



## Water System
### 63% Pass-Through

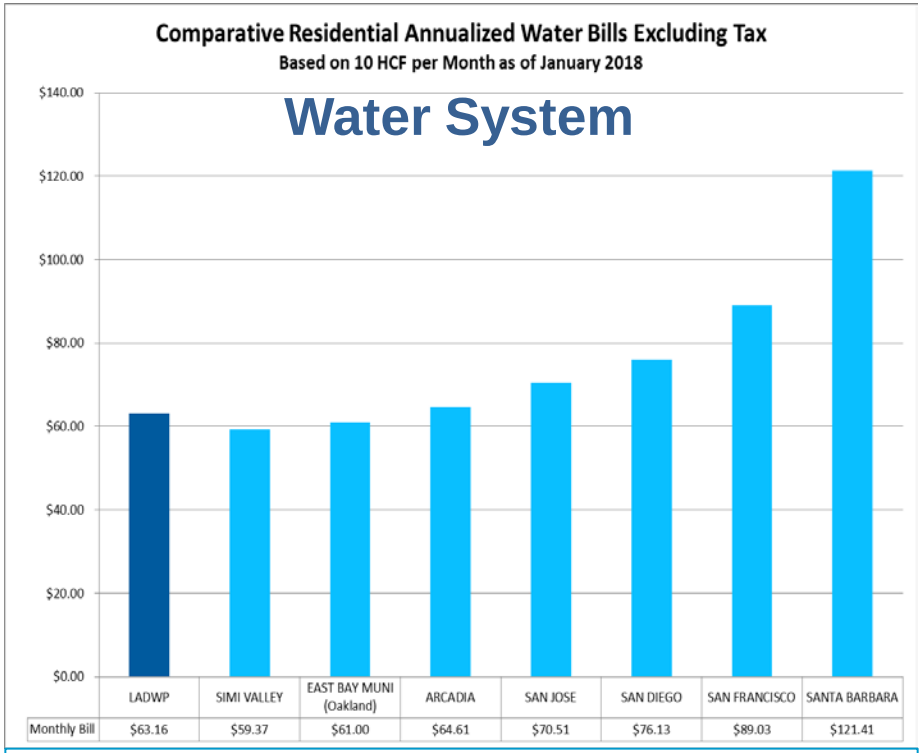



* Decoupled Base Revenue
** Pass-Through Costs

# Rates Remain Competitive: Residential




Sources: https://www.sce.com/wps/portal/home/regulatory/tariff-books/rates-pricing-choices;
http://www.sdge.com/rates-regulations/current-and-effective-tariffs/current-and-effective-tariffs;
http://www.burbankwaterandpower.com/electric/residential-electric-rates-and-charges;
http://www.glendaleca.gov/government/city-departments/glendale-water-and-power/rates;
http://cityofpasadena.net/waterandpower/electric-rates/ :
https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_SCHEDS_E-1.pdf
:https://www.smud.org/en/Rate-Information/Residential-Rates
Rates at other utilities subject to change




Sources: http://www.ebmud.com/customers/billing-questions/rates-and-charges/;
https://www.sandiego.gov/water/rates/rates;
http://www.gswater.com/simi-valley/download/rates_accountability/SI-1-R.pdf;
http://www.gswater.com/sanabriel/download/rates_accountability/R3-1-R.pdf;
https://sjwater.s3.amazonaws.com/files/documents/Schedule%201%20Jan%209%202018.pdf; http://sfwater.org/modules/showdocument.aspx?documentid=7742
https://www.santabarbaraca.gov/gov/depts/pw/resources/rates/wtrsewer/changes.asp
Rates at other utilities subject to change

Los Angeles Department of Water & Power

# Power System



# Diverse Generation Mix

***Diverse mix of resources, declining use of coal with net dependable capacity of 120% of peak demand***

**Department Owned Facilities[1]**

| Type of Fuel | Facilities | Net Dependable (MWs) | Net Dependable (%)[2] |
|---|---|---|---|
| Natural Gas | 4 | 3,319 | 42.4% |
| Large Hydro | 1 | 1,175 | 15.0% |
| Renewables | 39 | 285 | 3.6% |
| | | | |
| | | | |
| **Total** | **44** | **4,779** | **61.0%** |

**Jointly Owned Facilities and Contracted Capacity Rights[1]**

| Type of Fuel | Facilities | Net Dependable (MWs) | Net Dependable (%)[2] |
|---|---|---|---|
| Coal (IPP) | 1 | 1,202 | 15.3% |
| Natural Gas (Apex) | 1 | 480 | 6.1% |
| Hydro (Hoover) | 1 | 304 | 3.9% |
| Nuclear (PVNGS) | 1 | 380 | 4.8% |
| Renewables/DG | 32,329 | 693 | 8.9% |
| **Total** | **32,333** | **3,059** | **39.0%** |

- Net maximum plant capacity of 9,890 MWs and net dependable capacity of 7,794 MWs[1]
  - Peak demand of 6,502 MWs (August 31, 2017)
- Capacity allows minimal exposure to uncertain markets to meet customer demand
- Base load generation is fueled by various sources
- Extensive transmission network
  - The Department owns and operates in excess of 25% of the transmission facilities in the State (over 19,840 miles)
  - Department serves as operating agent for:
    - Pacific DC Intertie (co-owner)
    - Southern Transmission System (contract capacity rights)
    - Mead-Adelanto Transmission Project (co-owner), and
    - Certain Navajo-McCullough facilities (co-owner)

**LADWP Transmission System**





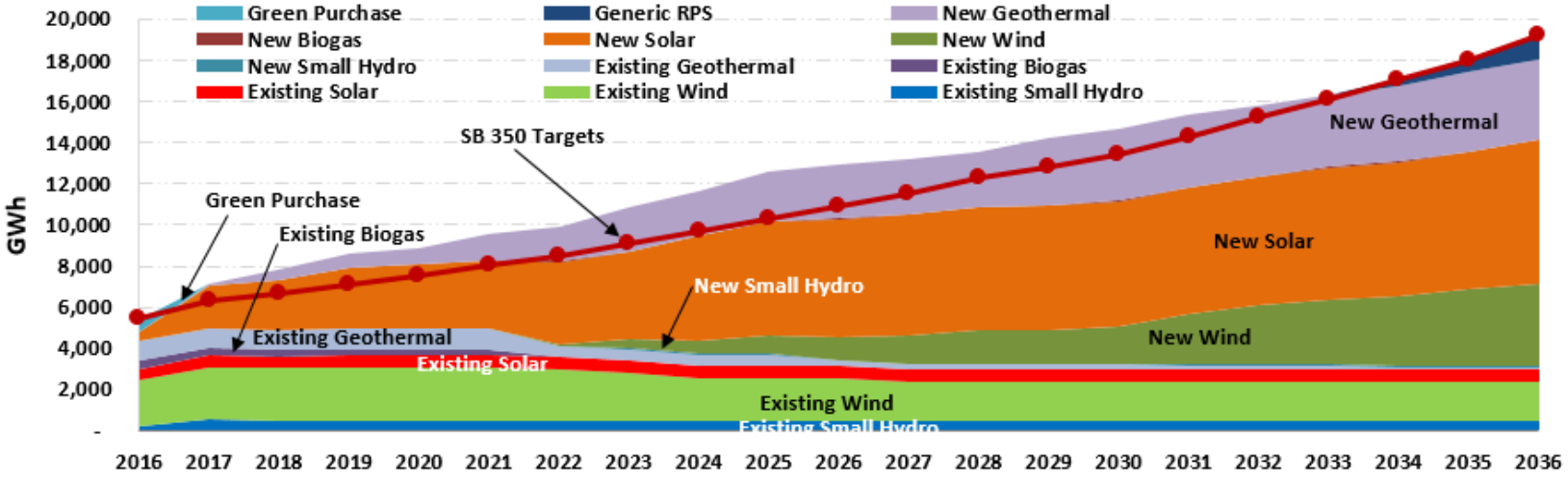

*1. As of January 31, 2018, excludes DWR 's 120 MW share of net maximum capacity and 44 MW share of net dependable capacity.*
*2. As a percentage of all facilities. May not add due to rounding.*

# Managing Regulatory Mandates

***Long-term planning has resulted in cost-effective strategies***

- **Renewable targets**: Strong existing base of renewables, supplying 29% of 2016 energy needs
  - Have met RPS targets to date
  - Approximately $1.0 billion capital spending anticipated over the next five years for Renewable Portfolio Standard
  - Expect to reach 33% Renewable Portfolio Standard by adding approximately 300 MW of new renewables by 2020 through a competitive selection process
- **Eliminating coal:** Either have divested from or have contracts in place to eliminate coal by 2026
  - The 2016 divestiture of the Department's interest in the Navajo plant reduced reliance on coal and cut greenhouse gas emissions
  - IPP, which currently contracts 44.6% of its capacity to LADWP, has amended its Power Sales Contract to replace its coal units with combined cycle natural gas units by July 2025
- **Modernizing Coastal Generation Fleet**: Eliminating once-through ocean (OTC) cooling
  - Repowering is currently on hold while LADWP conducts an OTC Study to provide a comprehensive reliability assessment to determine whether viable alternative hybrid clean energy solutions exist to maintain reliability

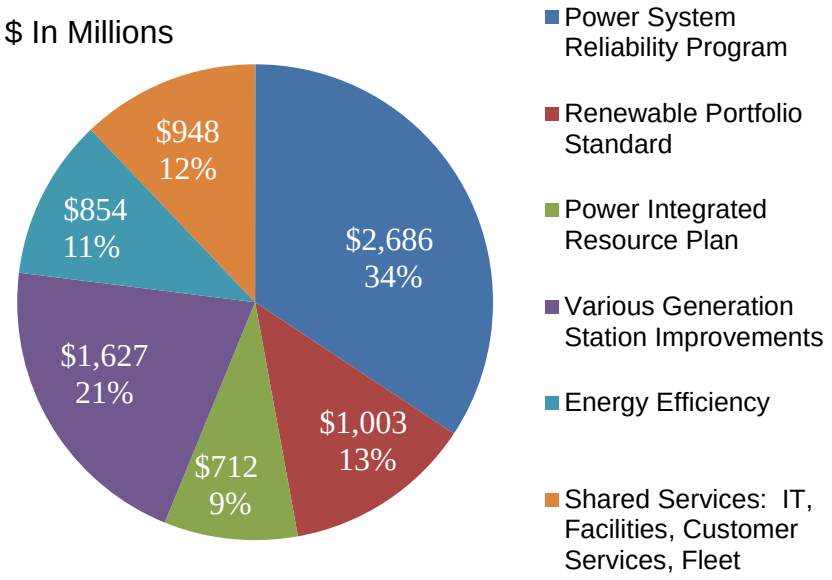
**Forecasted RPS Generation[1]**

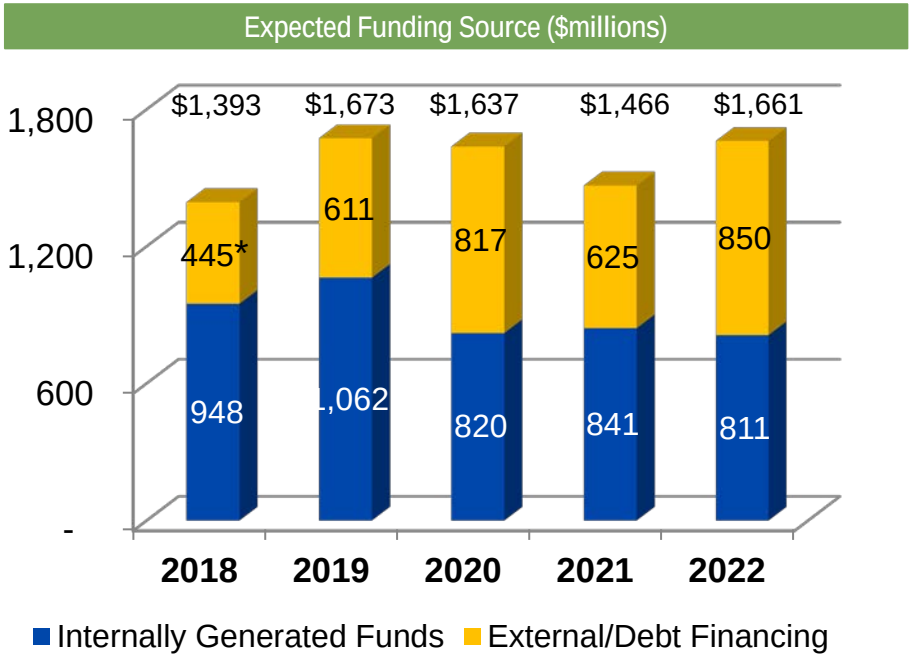





*1. Source: Los Angeles Department of Water and Power, 2016 Power Integrated Resource Plan (Appendix N)*

# Five-Year Capital Improvement Plan (CIP): $7.83 Billion




Driven by the Power IRP, developed in conjunction with strategic plan goals:

- Safe and reliable electric service
- Cost competitive
- Environmental stewardship

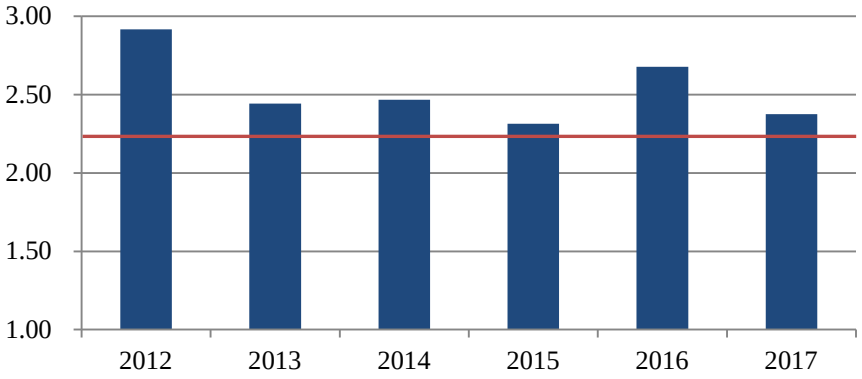
Of $7.8 billion five-year CIP, $4.5 billion (57%) is cash funded and $3.5 billion (43%) is debt funded

Board-adopted planning criteria targets maintaining debt-to-capitalization ratio of less than 68%

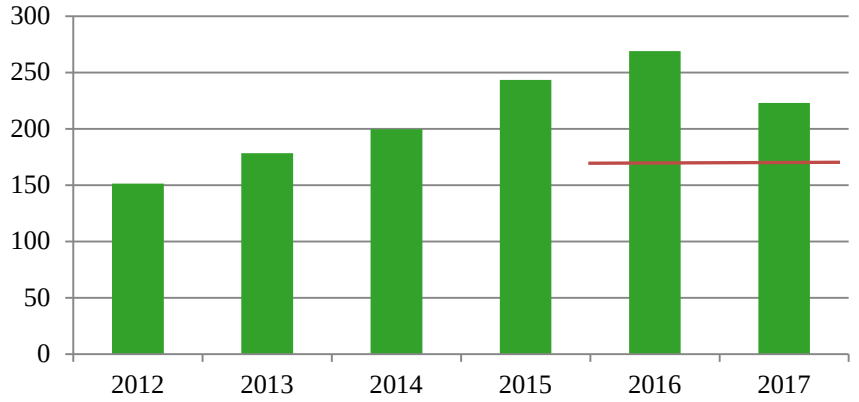
**Includes the Power 2017 Series C Revenue Bonds*

# Financial Overview – Power System
# Strong Operating Results & Financial Metrics

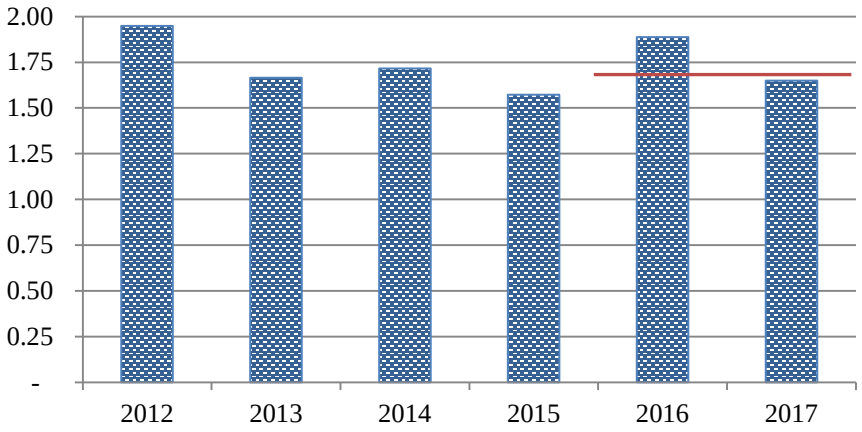
Debt Service Coverage (Min 2.25x)



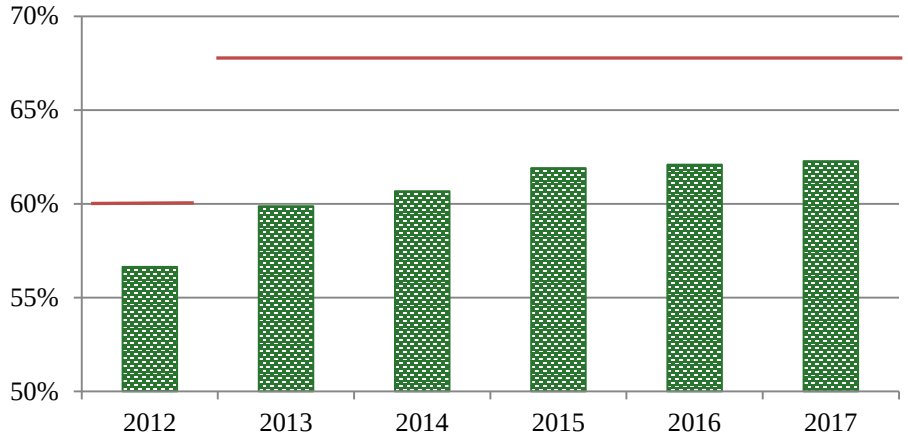

Days Cash on Hand (Min 170 days)*




Full Obligation Ratio (Min 1.7x)



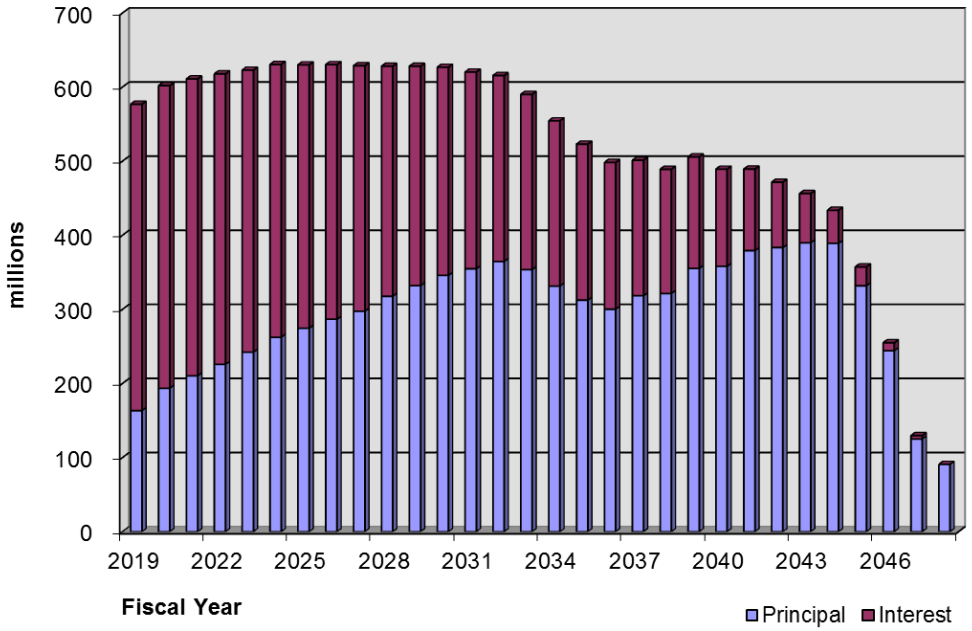

Debt to Capitalization Ratio (Max 68%)




*Prior to FY 2016, the Board Approved Financial Metric for Minimum Cash on Hand was $300 million.*

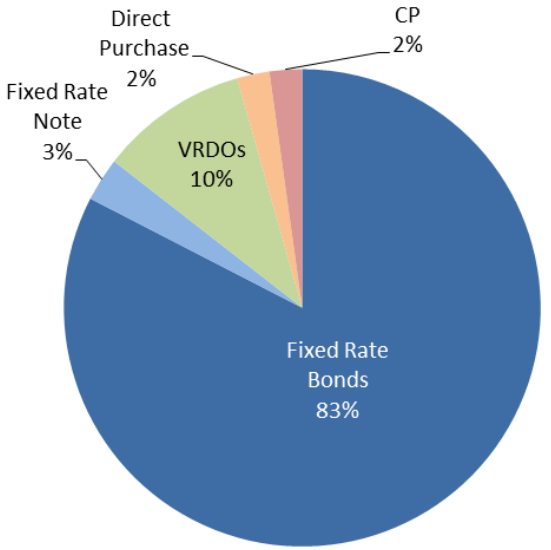
# Conservative Debt Profile

## Power System Debt Repayment Profile*




*Debt repayment profile excludes $200 million commercial paper.

## Debt Composition




- $9.074 billion outstanding (including $200 million CP) payable from the Power Revenue Fund
- 83% of debt portfolio is long-term, fixed-rate bonds.
- 17% is a combination of VRDOs supported by bank facilities with staggered maturities, direct purchase, commercial paper, and a fixed rate note.
- No interest rate swaps or auction rate securities;

## Power System Credit Ratings as of March 15, 2018

| *Bond Ratings* | Long-Term | Outlook |
|---|---|---|
| Standard & Poor's | AA | Stable |
| Moody's Investors Service | Aa2 | Stable |
| Fitch Ratings | AA | Stable |



*Note: Debt outstanding As of January 1, 2018. Excludes interest subsidy for BABs and CREBs/QECBs.*

Los Angeles Department of Water & Power



# Water System

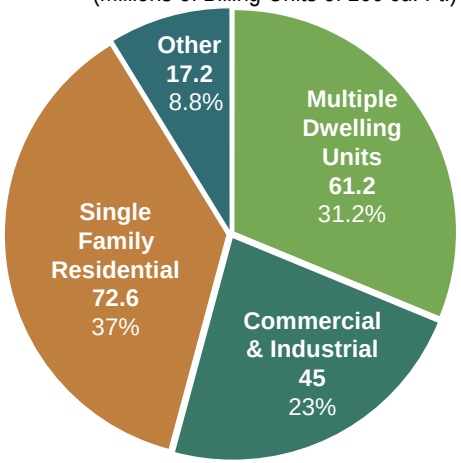
# LADWP Is Nation's 2nd Largest Municipal Water Utility

LADWP provides water service to the second most populous city in the U.S.
~4 million residents in 2017; 473 square miles

- Water System revenues of ~$1.12 billion in FY 2017
  - $418.0 million of operating income before depreciation
- Diverse and stable customer base
  - Broad-based economy
  - Top 25 non-governmental employers in LA County comprise about 6.4% of labor force
  - LA County per capita income is above national average
- Commitment to maintaining affordable rates

## Water System FYE 2017 Sales

(Millions of Billing Units of 100 cu. Ft.)




Total Sales FYE 2017: 196 M of billing units of 100 CF

## Water System Customers

*Average Number of Customers*

| Year Ending June 30 | 2017 | 2017 (%) |
|---|---|---|
| Single-Family Residential | 487,000 | 71.6% |
| Multiple Dwelling Units | 121,000 | 17.8% |
| Commercial and Industrial | 65,000 | 9.6% |
| Other | 7,000 | 1.0% |
| Total | 680,000 | 100.0% |

*Source: Department of Water and Power of the City of Los Angeles*

# Water System's Goals

## Commitment to Financial Stability

- Management & Board-adopted financial metrics
- Strong cash balances
- Consistently strong debt service coverage

## Maintain Competitive Rates

- Cost adjustment factors designed to recover certain costs
- Utilize rate increases as appropriate
- Commitment to maintaining affordable rates

## Maintain Diverse Mix of Water Sources

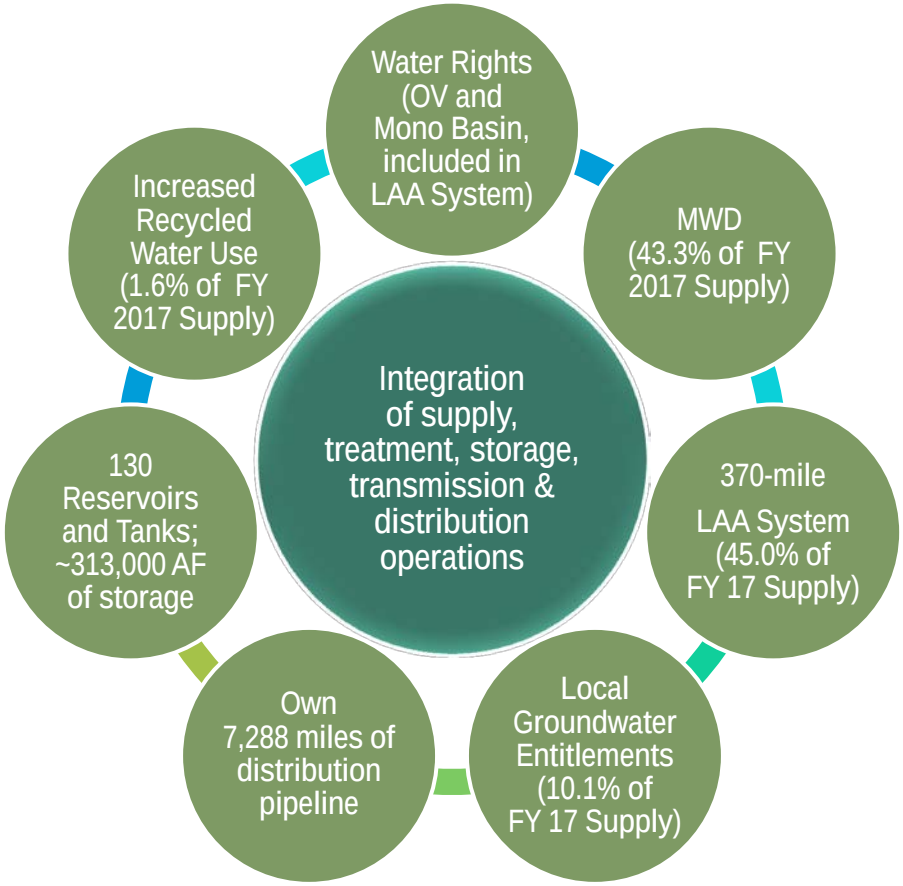
- Maintain sources from Los Angeles Aqueduct and Metropolitan Water District of Southern California
- Increased use of recycled water
- Clean-up and expand use of groundwater

## Sound Asset Management Principles

- Maintain and upgrade infrastructure
- Ensure future reliability

# Water System Draws From Diverse Water Resources Across the State



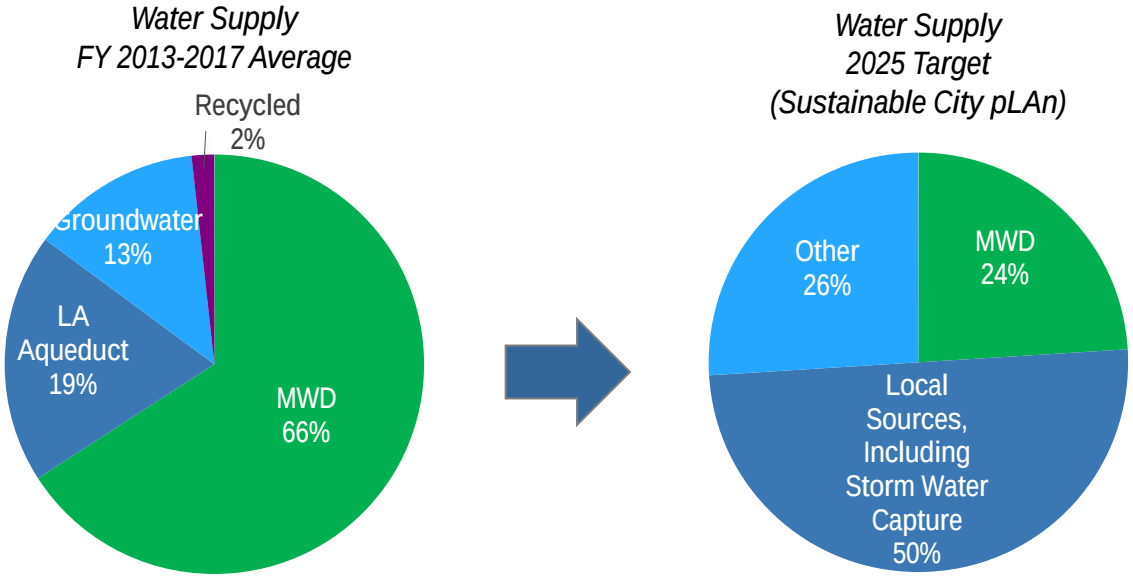




*Source: Supply data based on unaudited FYE 2017 results*

# Long-Term Strategy to Diversify Water Supply Mix

Groundwater clean-up and local water supply projects expected to reduce expensive MWD water purchases by 50%

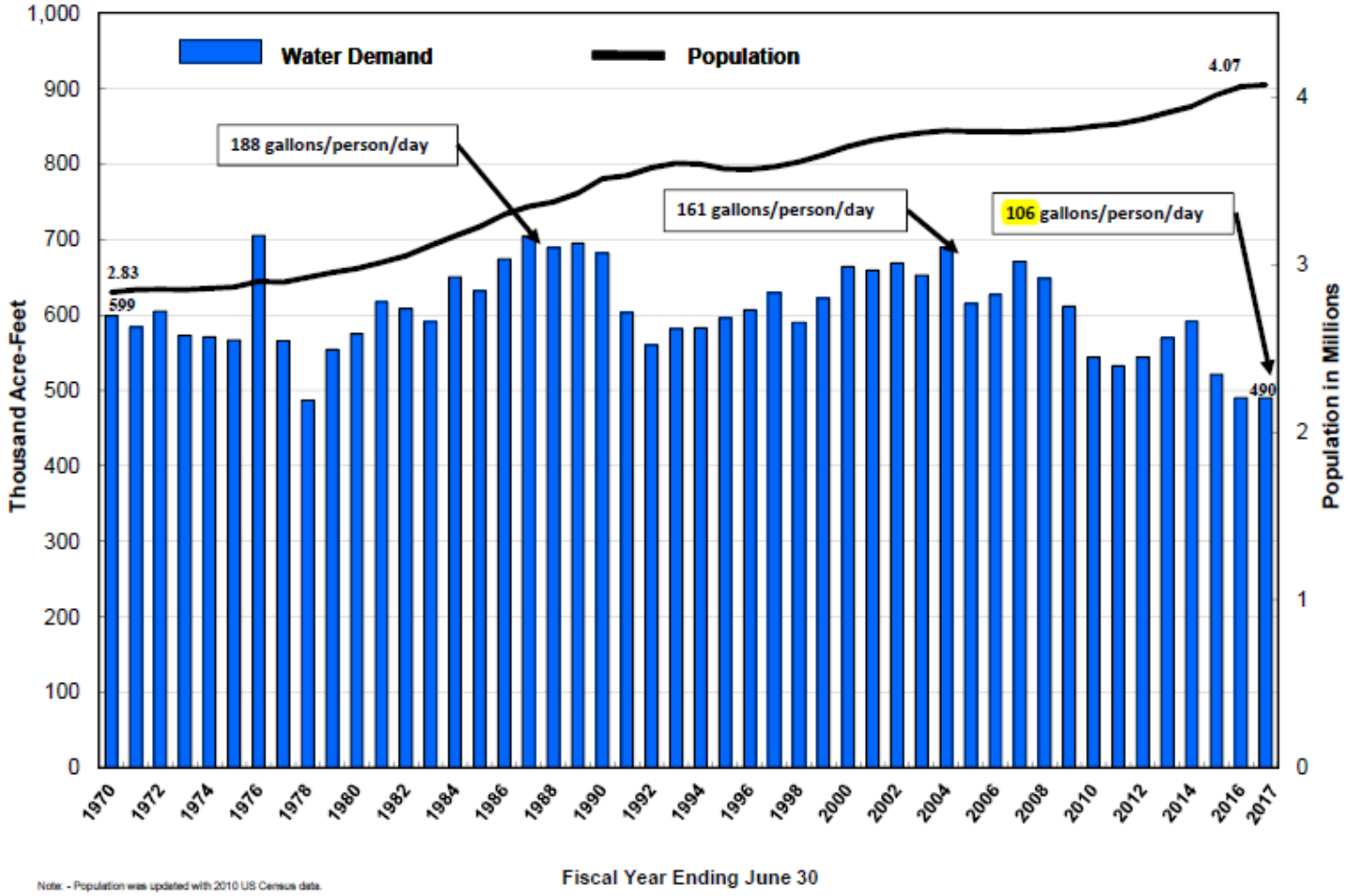
- Groundwater Clean-Up
- Stormwater Capture Master Plan
  - Master Plan completed in 2015
  - Additional 68,000 to 114,000 AFY captured over the next 20 years
- Recycled Water Projects
  - Augment water supply by 59,000 AFY by 2035




Source: Department of Water and Power of the City of Los Angeles

# Water Conservation

- Meeting Mayor's goals
- State conservation targets
- Long-term view of water use



# Focus on Infrastructure Replacement

LADWP has implemented an asset management program to address the long-term sustainability of its major facilities and infrastructure.

Focused on projects necessary to:

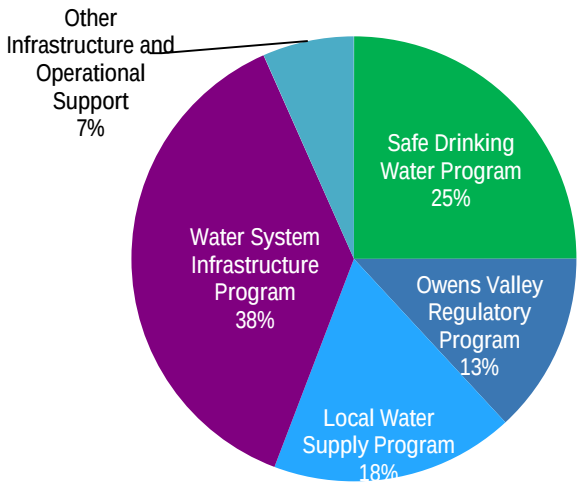
- ✓ *Protect existing water supplies*
- ✓ *Comply with increasing water quality standards*
- ✓ *Expand and upgrade the distribution system*
- ✓ *Develop new water resources*

Focused on diversifying funding sources:

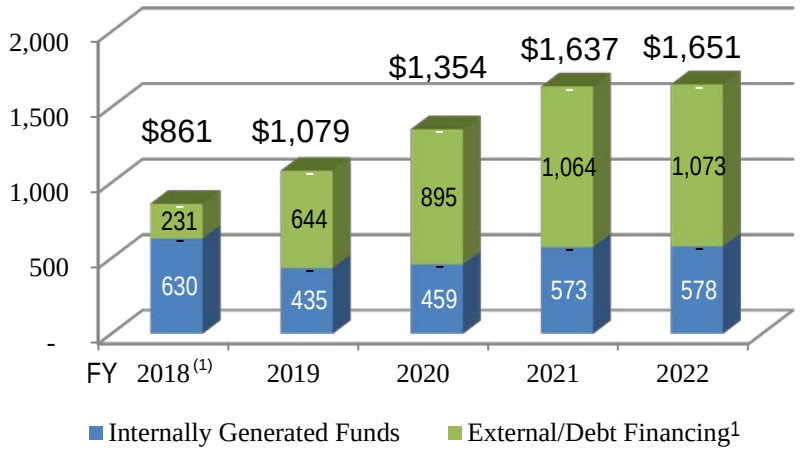
- ✓ *Internally generated funds*
- ✓ *Revenue bonds*
- ✓ *CA State Water Resources Control Board*

## Summary of Capital Improvements

### Major Components Include:

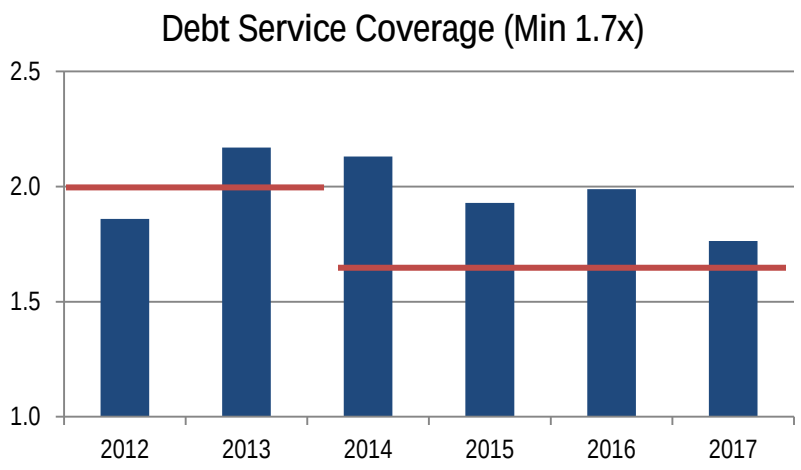


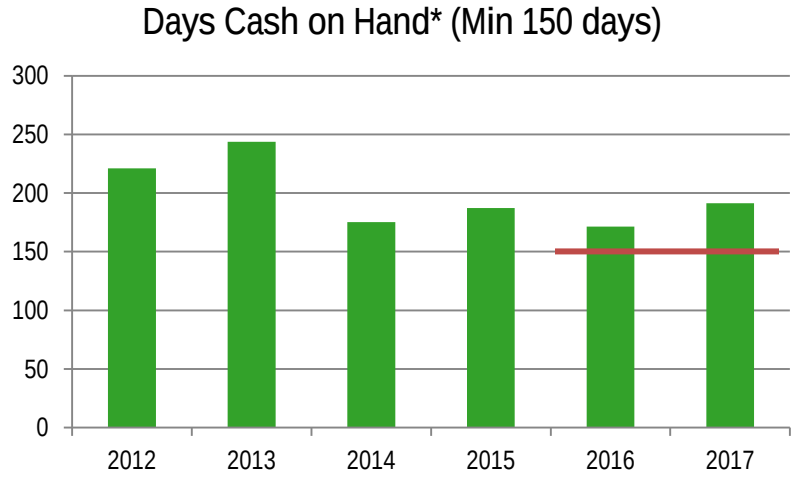

### Expected Funding Sources ($6.6 billion over 5 Years)

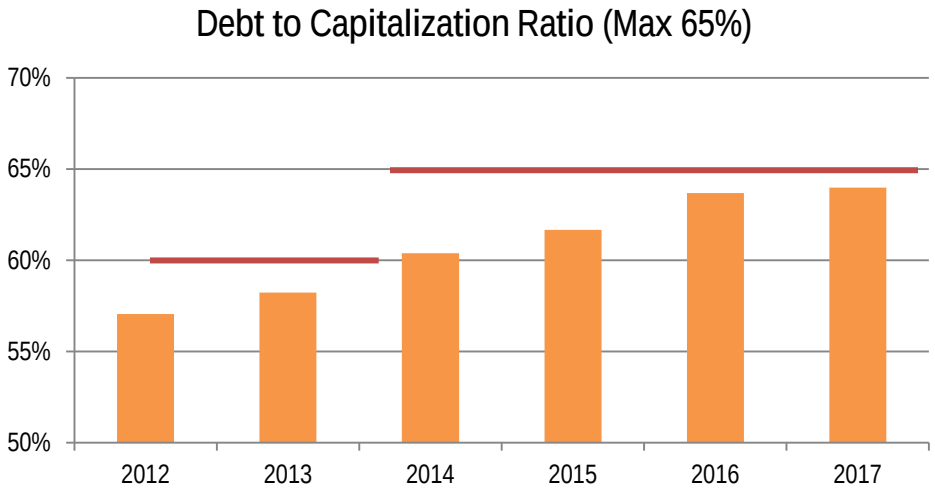



1. *Consists of a portion of the proceeds of the 2018 Series A Bonds, a portion of previously issued Bonds, proceeds of additional Water System Revenue Bonds, and proceeds of additional loans from the State Water Resources Control Board*

# Water System Financial Overview– Strong Operating Results & Financial Metrics



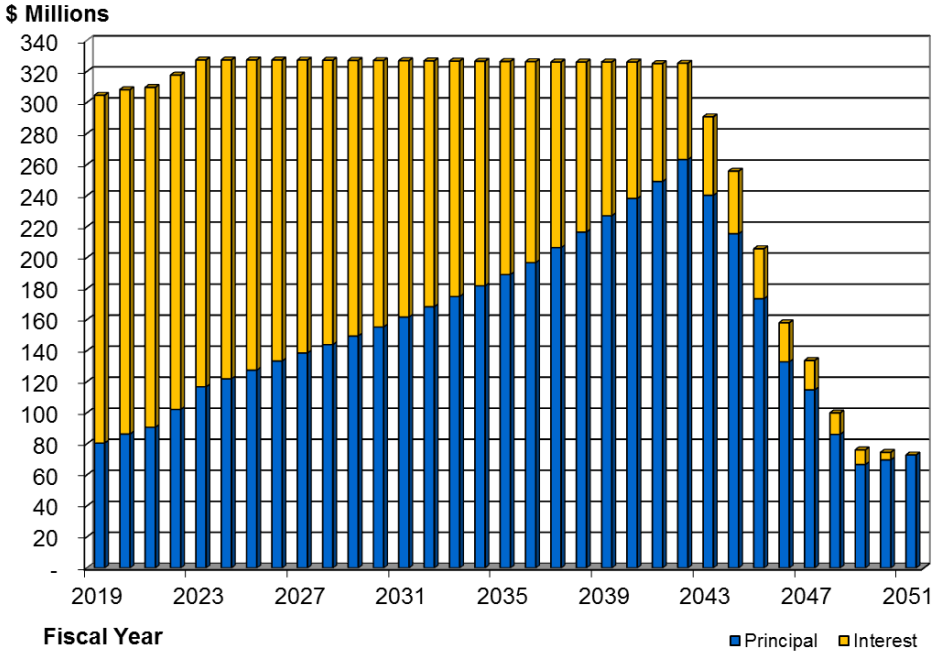






** Prior to FY2016 the Board Approved Financial Metric for Minimum cash balance was $200 million.*

# Water System Conservative Debt Profile

## Water System Debt Repayment Profile*



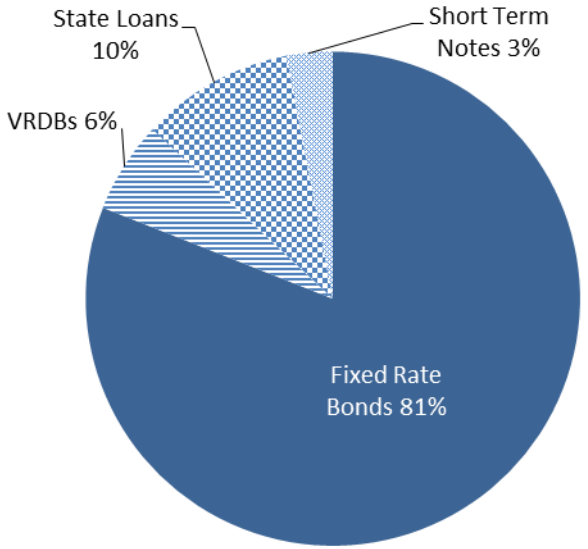

*Excludes $150 million Note from Revolving Credit Agreement

## Water System Credit Ratings as of March 15, 2018

| Bond Ratings | Long-Term | Outlook |
|---|---|---|
| Standard & Poor's | AA+ | Stable |
| Moody's Investors Service | Aa2 | Stable |
| Fitch Ratings | AA | Stable |

*Note: Debt outstanding as of January 1, 2018. Excludes interest subsidy for BABs.*

## Debt Composition




Total Debt: $5.245 Billion:

- Includes $150 million note from Revolving Credit Agreement and $544.8 million of State Loans.
- No interest rate swaps or auction rate securities; VRDB bank facilities extended with staggered expiration dates from 2019 through 2021.

# Bond Security Legal Protections

| | Power | Water |
|---|---|---|
| **Source of Payment:** Power and Water revenue funds are separate funds established by City Charter in the City Treasury under the control of Board of Commissioners. | ✓ | ✓ |
| **Rate Covenant.** Board sets rates and charges, subject to approval of City Council as mandated by City Charter, to provide revenues that together with other available funds shall be at least sufficient to pay debt service and operating and maintenance expenses. | ✓ | ✓ |
| **Additional Obligations.** Adjusted net Income for any 12 consecutive months within 18 consecutive months ending immediately prior to issuance of Additional Parity Obligations shall be at least 1.25 times the Maximum Annual Adjusted Debt Service on all Parity Obligations including proposed bonds. | ✓ | ✓ |
| **Transfer to the City.** May not exceed the net income of the prior fiscal year or increase Power System debt to total capitalization to exceed 75%. | ✓ | |

# LADWP Is Committed to Meeting Operational Needs and Financial Goals

- Diverse power and water sources
- Meet or exceed all regulatory commitments
  - Power:  RPS, carbon reduction, other environmental
  - Water:  quality, safety, sustainability, environmental
- Continue investing in Water and Power System reliability
- Maintain competitive retail rates and financial stability
- Improve customer service



# Upcoming Financing Transaction

Power System: Up to $415.7 M refunding transaction in March 2018*

- Serial bonds maturing from July 1, 2019 – 2038
- Par call in 2028
- Expected to price the week of March 26, 2018

*Preliminary Subject to change



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(https://www.larchmontbuzz.com/)

News from Larchmont Village, Hancock Park and the Greater Wilshire areas of Los Angeles.



WELCOME

Landis Gifts & Stationery (https://www.larchmontbuzz.com/linkout/3280707)

BUZZ BUSINESS GUIDE



# LADWP's Heat Wave Report

July 26, 2018 (https://www.larchmontbuzz.com/featured-stories-larchmont-village/ladwp-heat-wave-report/) Daniel Kegel (https://www.larchmontbuzz.com/author/dan-kegel/) Leave a comment (https://www.larchmontbuzz.com/featured-stories-larchmont-village/ladwp-heat-wave-report/#respond)




(https://www.larchmontbuzz.com/wp-content/uploads/2018/07/ladwp0718.jpg)

LADWP board meeting hearing report about heat wave response and preventative maintenance

At its monthly meeting on Tuesday, the LADWP board heard from general manager David Wright about the utility's reponse to the July 6-10 heatwave. (https://www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB659621&RevisionSelectionMethod=LatestReleased) Wright said that from July 5th to July 6th, the temperature in downtown LA jumped 20 degrees, to 108 degrees… and power use went through the roof, setting an all-time record of 6,256 MW for a July day. According to Mr. Wright, it was like nothing the LADWP had ever seen before.

| July 4 WED | July 5 THURS | July 6 FRI | July 7 SAT | July 8 SUN | July 9 MON |
|---|---|---|---|---|---|
| 82°/65° DTLA<br>86°/61° WSFV | 88°/65° DTLA<br>103°/62° WSFV | 108°/69° DTLA<br>117°/73° WSFV | 104°/79° DTLA<br>110°/83° WSFV | 98°/75° DTLA<br>102°/80° WSFV | 96°/74° DTLA<br>103°/76° WSFV |
| | | CUSTOMERS IMPACTED | | | |
| | | 4 PM: 4,000<br>9 PM: 46,000 | 1 AM: 46,000<br>8 AM: 34,000<br>3 PM: 32,000<br>10 PM: 37,000 | 10 AM: 29,350<br>6 PM: 26,500<br>11 PM: 25,000 | 10 AM: 7,100<br>4:30 PM: 1,900 |
| | | CUSTOMERS RESTORED | | | |
| | | | 8 AM: 14,500<br>3 PM: 16,500<br>10 PM: 20,000 | 10 AM: 51,000<br>6 PM: 57,000 | 9 AM: 76,000<br>10 AM: 80,000<br>4 PM: 114,000 |

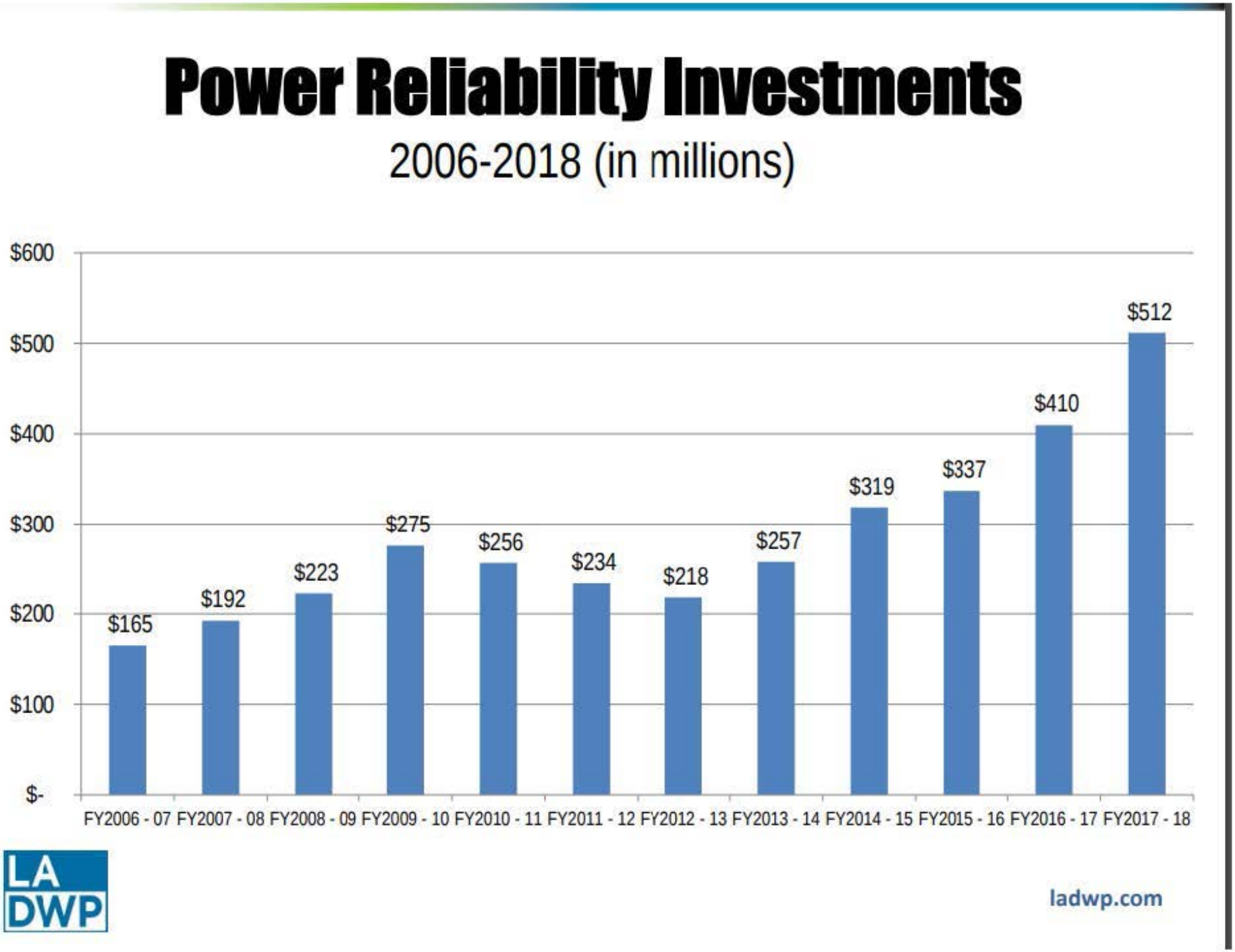
Chart of July 6-9 2018 heat wave temperatures and customers without power

The heat snap was unusual not only in its suddenness, Wright said, but also in where the outages happened; instead of overground transformers failing in the Valley, the biggest problems were due to old underground transmission lines in Koreatown, Beverly Glen, Hollywood Hills, Windsor Square, Mid-Wilshire, and Sherman Oaks. That's significant because underground line failures are a lot harder to locate and fix, which partly explains why it took so long some areas to get power back.



Damaged underground cable being replaced by LADWP

This suggests the DWP has caught up on replacing old transformers, and may want to make replacing old underground cables more of a priority when planning future preventative maintenance. Speaking of which, Mr. Wright showed how much the utility is spending each year to proactively replace old equipment before it fails; a 2016 rate increase dedicated to improving reliability helped speed up preventative work. The backlog of deferred maintenance is large, and even with the 2016 rate increase, may take over ten years to clear.




LADWP Power Reliability spending, 2016-2018

In his presentation, Wright also mentioned a number of other actions the utility is taking to improve future reliability. They're hiring more linemen, working to improve retention of trained linemen (who are prone to be poached by other utilities at the annual Lineman Rodeo (http://www.lalinemanrodeo.com/)), and use longer planned outages as needed to complete critical improvements. They also hope to have a text messaging alert system in place later this year, and are working on a communications system which will help alert the utility to outages even before customers notice a problem.

Finally, Wright mentioned that http://ladwp.com/outages (http://ladwp.com/outages) is the place customers should go to get updates on current outages. The page shows which outages have crews assigned or working at the moment. (It recently started showing a warning from Google Maps, though; I hope they get that sorted soon. Probably involves giving Google a credit card number…)

The meeting also featured an update (https://www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB659424&RevisionSelectionMethod=LatestReleased) on the LADWP's efforts to join the Western Energy Imbalance Market (https://www.westerneim.com/), which will let LADWP trade power with other utilities to meet minute-to-minute needs. This effort was approved in 2017 and is now scheduled to go online in 2020. It's expected to reduce costs (https://www.westerneim.com/Documents/ISO-EIMBenefitsReportQ1_2018.pdf) and greenhouse gas emissions a bit, and provide another option for quickly responding to generator or transmission line failures. The EIM provides many of the benefits of the proposed expansion of CalISO into a regional grid (https://cityclerk.lacity.org/lacityclerkconnect/index.cfm?fa=ccfi.viewrecord&cfnumber=18-0002-S80) without the drawbacks; for instance, utilities can stop participating in the EIM at any time without penalty.

The board also heard the June monthly update (https://www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB659427&RevisionSelectionMethod=LatestReleased) on power system status; of the 975 outages in June, 75 were caused by Mylar balloons. (There's one more thing you can do to prevent outages: don't buy Mylar birthday balloons!)

And last but not least, there was an update (https://www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB659428&RevisionSelectionMethod=LatestReleased) on renewable energy progress. For instance, the 90 MW Springbok 3 solar farm is now scheduled to enter service in April 2019, and the 10 MWh Beacon Solar battery is energized and expected to enter full service next month; both will reduce LADWP's greenhouse emissions. The battery will help smooth out fluctuations, which not only helps grid stability, but also increases the amount of renewable energy that can fit on the transmission system (https://www.utilitydive.com/news/los-angeles-muni-speeds-deployment-of-20-mw-battery-storage-project/503019/).

For more information, see also the LADWP board's agenda page (https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-whoweare/a-wwa-boardofcommissioners) and meeting archives. (http://ladwp.granicus.com/ViewPublisher.php?view_id=2&&_afrLoop=963163878561896)



## About Daniel Kegel (https://www.larchmontbuzz.com/author/dan-kegel/)

Dan Kegel is a software engineer and a member of the Greater Wilshire Neighborhood Council's Sustainability Committee. He also volunteers with Citizens' Climate Lobby Los Angeles and is an occasional contributor to the Buzz.

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← Windsor Square Resident Serves on Board of 114 year-old Children's Bureau (https://www.larchmontbuzz.com/featured-stories-larchmont-village/windsor-square-resident-serves-on-board-of-childrens-bureau-celebrates-114-years/)

# Los Angeles County Asthma Profile

modified on: Thursday, 01 September 2016

**In Los Angeles County, approximately 1,221,000 children and adults have been diagnosed with asthma.**

Scroll down to browse the full County Profile. Or, download a printer-friendly PDF.

## COUNTY PROFILE INDICATORS


- Lifetime Asthma Prevalence
- Active Asthma Prevalence
- Work-Related Asthma
- Asthma Management Plans
- Asthma Risk Factors
- Emergency Department Visits
- Asthma Hospitalizations
- Asthma Deaths
- Outdoor Air Quality[15]
- Notes


| County Population | | | County Population | |
|---|---|---|---|---|
| **Age** | **Population** | **%** | **Race/Ethnicity[1]** | **%** |
| **0-4** | 670,558 | 6.7 | **Asian/PI** | 13.9 |
| **5-17** | 1,651,655 | 16.5 | **Black** | 7.9 |
| **18-64** | 6,497,777 | 64.8 | **Hispanic** | 49.5 |
| **65+** | 1,205,588 | 12.0 | **White** | 26.5 |
| **Total** | **10,025,579** | | **Other** | 2.2 |

DATASOURCE:California Department of Finance, 2014 (2013 release)

## LIFETIME ASTHMA PREVALENCE,[2] 2011-2012

**Percent with Lifetime Asthma (95% Confidence Interval[3])**

| | Age | Los Angeles County | California |
|---|---|---|---|
| **Children** | **0-4** | -- | 9.7 (7.2-12.3) |
| | **5-17** | 15.6 (12.3-19.0) | 17.1 (15.5-18.7) |
| **Adults** | **18-64** | 12.4 (11.2-13.6) | 14.0 (13.4-14.7) |
| | **65+** | 10.4 (8.6-12.1) | 12.0 (11.1-12.8) |
| **Totals:** | **0-17** | **14.5 (11.5-17.5)** | **15.4 (14.0-16.7)** |
| | **18+** | **12.1 (11.1-13.1)** | **13.7 (13.1-14.3)** |
| | **All Ages** | **12.7 (11.6-13.7)** | **14.1 (13.6-14.6)** |

datasource: California Health Interview Survey (CHIS), 2014

## ACTIVE ASTHMA PREVALENCE,[4] 2014

**Percent with Active Asthma (95% Confidence Interval[3])**

| | Age | Los Angeles County | California |
|---|---|---|---|
| **Children** | **0-4** | 0.2 (0.0-0.4) | 6.3 (4.6-8.0) |
| | **5-17** | 10.2 (5.7-14.8) | 11.6 (10.2-13.0) |
| **Adults** | **18-64** | 6.2 (4.6-7.9) | 7.6 (7.1-8.1) |
| | **65+** | 7.1 (4.0-10.2) | 8.2 (7.5-8.9) |
| **Totals:** | **0-17** | **7.3 (4.0-10.5)** | **10.1 (9.0-11.3)** |
| | **18+** | **6.4 (4.9-7.9)** | **7.7 (7.3-8.2)** |
| | **All Ages** | **7.8 (6.9-8.7)** | **8.3 (7.9-8.7)** |

datasource: California Health Interview Survey (CHIS), 2014

## WORK-RELATED ASTHMA[5]

Studies show that asthma is commonly caused or triggered by workplace exposures, but work-related asthma (http://www.cdph.ca.gov/programs/ohsep/Pages/Asthma.aspx) is under-recognized and under-diagnosed. Research confirms that 15-30% of current adult asthma was initiated by work exposures, meaning that **an estimated 71,400-142,800 adults in Los Angeles County have asthma caused by work.**[6]

datasource: CHIS, 2014

## ASTHMA MANAGEMENT PLANS

National guidelines recommend that health care providers give all patients with asthma a written self-management plan. **In Los Angeles County, 84.4% (95% CI 80.2-88.7) of people with asthma have NOT received a written asthma management plan from a health care provider.**

datasource: CHIS, 2014

## ASTHMA RISK FACTORS, 2014

**Los Angeles County Risk Factors**

| Risk Factor | Percent (95% Confidence Interval) |
|---|---|
| **Percent of adults who are current smokers** | 13.2 (12.0-14.3) |
| **Percent of adults and children exposed to second-hand smoke in the home** | 6.7 (6.0-7.4) |
| **Percent of adults who are obese[7] (BMI>=30)** | 24.7 (23.3-26.1) |
| **Percent of people below the Federal Poverty Level** | 15.4 (NA) |
| **Unemployment Rate** | 11.6 (NA) |

datasource: CHIS, 2011-2012

## ASTHMA DEATHS,[9] 2008-2010

**Number of Deaths Due to Asthma (N) and Age-Adjusted Rate[9] (per 1,000,000 residents)**

| | | Los Angeles County | | California | |
|---|---|---|---|---|---|
| | **Age** | **N** | **Rate** | **N** | **Rate** |
| **Children** | **0-17** | 14 | 1.7 | 57 | 1.9 |
| **Adults** | **18+** | 318 | 14.3 | 1,198 | 14.3 |
| **Totals** | **All Ages** | **332** | **11.0** | **1,255** | **11.1** |

datasource: California Death Statistical Master Files, 2008-2010

## ASTHMA EMERGENCY DEPARTMENT VISITS,[10] 2014

**Number of ED Visits Due to Asthma (N) and Age-Adjusted Rate[11] (per 10,000 residents)**

| | | Los Angeles County | | California | |
|---|---|---|---|---|---|
| | **Age** | **N** | **Rate** | **N** | **Rate** |
| **Children** | **0-4** | 7,079 | 106.9 | 26,268 | 103.4 |
| | **5-17** | 13,688 | 83.4 | 47,613 | 72.4 |
| **Adults** | **18-64** | 25,597 | 39.3 | 95,689 | 39.2 |
| | **65+** | 4,573 | 38.3 | 17,374 | 36.1 |
| **Totals:** | **0-17** | **20,767** | **89.7** | **73,881** | **80.7** |
| | **18+** | **30,170** | **39.1** | **113,063** | **38.6** |
| | **All Ages** | **50,937** | **52.2** | **186,944** | **49.5** |

datasource: Office of Statewide Health Planning and Development (OSHPD), 2014

**Expected Source of Payment for Asthma ED Visits**

| Payment Source | Los Angeles County | California |
|---|---|---|
| **Medicare** | 10.97% | 13.29% |
| **Medi-Cal** | 50.06% | 48.56% |
| **Private** | 26.86% | 26.32% |
| **Other** | 12.10% | 11.84% |

datasource: Office of Statewide Health Planning and Development (OSHPD), 2014

## ASTHMA HOSPITALIZATIONS,[12] 2014

**Number of Hospitalizations Due to Asthma (N) and Age-Adjusted Rate[11] (per 10,000 residents)**

| | | Los Angeles County | | California | |
|---|---|---|---|---|---|
| | **Age** | **N** | **Rate** | **N** | **Rate** |
| **Children** | **0-4** | 1,333 | 20.0 | 4,994 | 19.6 |
| | **5-17** | 1,534 | 9.4 | 5,037 | 7.7 |
| **Adults** | **18-64** | 3,876 | 5.7 | 12,134 | 4.7 |
| | **65+** | 2,447 | 20.7 | 7,208 | 15.2 |
| **Totals:** | **0-17** | **2,867** | **12.2** | **10,031** | **10.9** |
| | **18+** | **6,323** | **8.3** | **19,342** | **6.5** |
| | **All Ages** | **9,190** | **9.3** | **29,373** | **7.6** |

datasource: Office of Statewide Health Planning and Development (OSHPD), 2014

**Average Charges[13] Per Asthma Hospitalization**

| | Age | Los Angeles County | California |
|---|---|---|---|
| **Children** | **0-17** | $23,254.06 | $27,127.04 |
| **Adults** | **18+** | $42,843.40 | $46,783.17 |
| **Total** | **All Ages** | $36,535.98 | $39,860.44 |

datasource: Office of Statewide Health Planning and Development (OSHPD), 2014

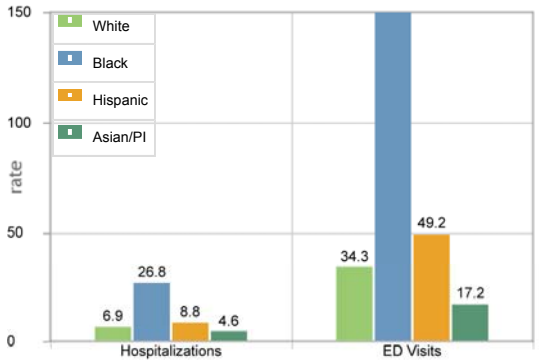
**Expected Source of Payment for Asthma Hospitalizations**

| Payment Source | Los Angeles County | California |
|---|---|---|
| **Medicare** | 28.78% | 28.24% |
| **Medi-Cal** | 48.28% | 46.46% |
| **Private** | 18.99% | 20.34% |
| **Other** | 3.95% | 4.96% |

datasource: Office of Statewide Health Planning and Development (OSHPD), 2014

## ASTHMA DISPARITIES

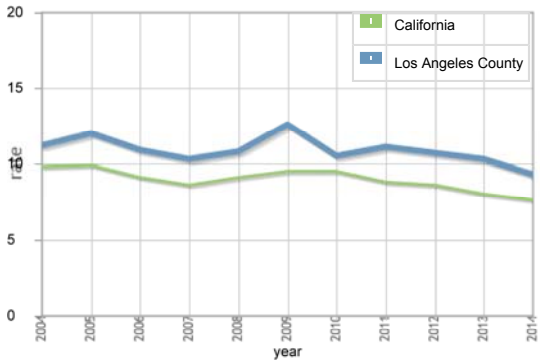
**Age-Adjusted Asthma Hospitalizations and ED Visits per 10,000 Los Angeles County Residents by Race/Ethnicity, 2014**




Data Source: datasource: Office of Statewide Health Planning and Development (OSHPD), 2014

## HOSPITALIZATION RATES OVER TIME

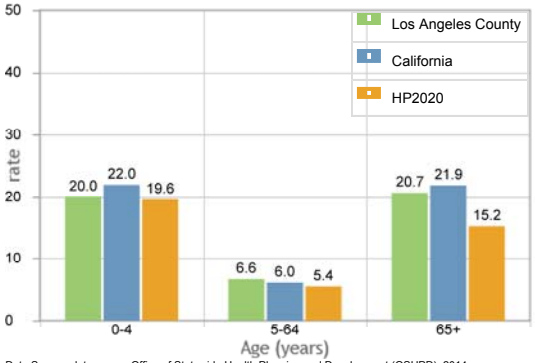
**Age-Adjusted Asthma Hospitalizations per 10,000 Residents, Los Angeles County and California, 2004-2014**




Data Source: datasource: Office of Statewide Health Planning and Development (OSHPD) , 2004- 2014.

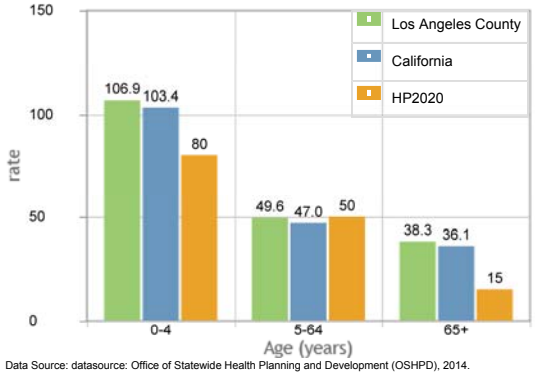
## HEALTHY PEOPLE 2010[14]

**Asthma Hospitalizations per 10,000 Residents by Age, Compared to HP2020 Targets, California and Los Angeles County, 2014**




Data Source: datasource: Office of Statewide Health Planning and Development (OSHPD), 2014 .

**Asthma ED Visits per 10,000 Residents by Age, Compared to HP2020 Targets, California and Los Angeles County, 2014**




Data Source: datasource: Office of Statewide Health Planning and Development (OSHPD), 2014.

## NOTES

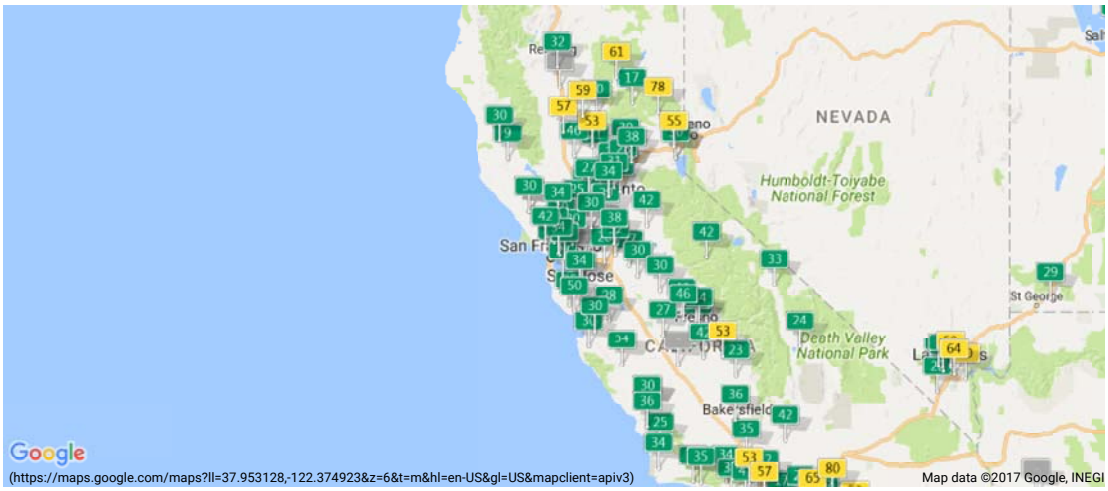
*Estimates marked with an asterisk (*) have large confidence intervals, interpret with caution. Estimates marked with a dash (-) are statistically unstable, so are unreported.

1. PI = Pacific Islander; Please see technical notes for more information on race/ethnicity categorizations.
2. Lifetime asthma prevalence is the proportion of people in the population who have ever been diagnosed with asthma by a health provider.
3. The 95% confidence interval (CI) is a range that expresses a level of certainty about an estimate based on the margin of error.
   The 95% CI means that we are 95 percent confident that this range contains the true population percent. A narrow CI means that there is less variability in the estimate and/or there is a larger sample size. A wide CI indicates more variability and/or a smaller sample size.
4. Active asthma prevalence is the proportion of people in the population who have ever been diagnosed with asthma by a health provider and report that they still have asthma and/or report that they had an episode or attack within the past 12 months.
5. Work-related asthma is asthma that is caused or triggered by conditions or substances in the workplace.
6. Balmes J, Becklake M, Blanc P, et al. Environmental and Occupational Health Assembly, American Thoracic Society. American Thoracic Society Statement: Occupational Contribution to the Burden of Airway Disease. Am J Respir Crit Care Med. 2003;167:787-797; Lutzker L, Rafferty A, Brunner W, et al. Prevalence of Work-related Asthma in Michigan, Minnesota, and Oregon. Journal of Asthma. 2010;47:156-161.
7. Obesity is defined as a body mass index (BMI) of 30 or greater.
8. Data Sources for Asthma Risk Factors: Smoking — CHIS, 2009; Obesity — CHIS, 2009; Poverty Level — American Community Survey, 2007-2009; Unemployment Rate — State of California Employment Development Department, 2009
9. An asthma death is a death where asthma was indicated as the underlying cause on the death certificate. The rate of asthma deaths is the number of deaths per 1,000,000 residents, age-adjusted to the 2000 U.S. population.
10. An asthma ED visit is an admission to a licensed ED in California with the primary diagnosis of asthma. The rate of asthma ED visits is the number of visits per 10,000 residents, age-adjusted to the 2000 U.S. population.
11. Population denominators for rates are from the California Department of Finance. All rates are age-adjusted to the 2000 U.S. population. Age-adjusted rates are modified to eliminate the effect of different age distributions in different populations. Rates based on numbers <20 are not reported.
12. An asthma hospitalization is a discharge from a licensed acute care hospital in California with the primary diagnosis of asthma. The rate of asthma hospitalizations is the number of hospitalizations per 10,000 residents, age-adjusted to the 2000 U.S. population.
13. Charges for asthma hospitalizations are the only type of data available to assess the costs of asthma in California counties. However, there are many other costs associated with asthma, including other types of health care utilization, medications, and indirect costs due to factors such as school and work missed.
14. Healthy People 2010 (HP2010) is a set of national benchmarks for a wide range of health topics, including asthma. For more information on HP2010, visit www.healthypeople.gov (/www.healthypeople.gov).
15. Outdoor air quality data—including exposures such as PM2.5, PM10, ozone, and traffic pollution—can be found online through the California Environmental Health Tracking Program's Air Quality Data Query (http://www.ehib.org/page.jsp?page_key=80) or on the California Air Resources Board (http://www.arb.ca.gov/aqd/aqdpage.htm) website.

**Further details about the data presented in this report can be found in the accompanying Technical Notes document.**

## AIR QUALITY MAP

- Plots markers based on the composite AQI calculated with the US EPA standard.




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SIEMENS



# The Magazine




The greater L.A. area has more than 40,000 kilometers of maintained roads, highways, and freeways.

Los Angeles

## An infrastructure blueprint for L.A.’s future

Los Angeles is one of the world's most vibrant urban centers and an economic powerhouse. But civic leaders worry that much of its infrastructure is aging and inadequate. Working with Siemens, the Los Angeles Area Chamber of Commerce has produced a landmark blueprint for 21st-century infrastructure.

The sprawling greater metropolitan area of Los Angeles is home to over 18 million people. Its airport is the second-busiest in the USA and the fifth-busiest in the world. An endless procession of container ships steam into its ports, the largest port complex in the Western Hemisphere. Cars, trucks, and buses crowd its legendary tangle of freeways.

Like all major cities, L.A. is a machine of unimaginable complexity – a vast infrastructure for energy, water, transportation, and communication that is constantly in need of renewal. In recent years, civic leaders have begun to worry that the infrastructure is not keeping pace with the demands of the new century – including intensifying global competition, environmental concerns, energy sustainability, rapid technological advances, and growing populations.



The port complex of Los Angeles, visited daily by an endless procession of container ships, is the largest in the Western Hemisphere.

Teaming up with consultants from Siemens, the L.A. Area Chamber of Commerce created A Blueprint for a 21st Century Los Angeles Infrastructure, a document that lays out the challenges L.A. faces and highlights initiatives from cities around the world that serve as models for solutions.

**An urban scorecard**

The Chamber of Commerce turned to Siemens not only for its technical expertise, but also because of its worldwide reach. "In L.A., we've had a tendency to compare ourselves with other big cities in the USA, particularly New York and Chicago," says Gary L. Toebben, President and CEO of the L.A. Area Chamber of Commerce. "But increasingly we're competing in a global economy."

For that reason, the Blueprint begins by looking at how L.A.'s infrastructure compares to those of other major metropolitan areas around the world – including New York, Chicago, Houston, London, Rio de Janeiro, Seoul, Paris, and Moscow. The key metrics include:

- Electricity consumption
- Livability (based on the Economist Intelligence Unit ratings)
- Traffic congestion
- Air quality
- Renewable energy
- Water consumption

The analysis reveals several significant challenges. Public transportation in L.A. falls short of many other major metropolitan areas. The city's natural geography and love affair with automobiles means air quality remains a major challenge. Providing enough water for a growing population in this naturally arid region is also a significant issue.

**Models for success**

The Blueprint goes on to evaluate solutions that have been successfully deployed around the world. Public transit serves as a case in point. L.A. ranks third among the four USA cities analyzed in the report. Long commute times in the metropolitan area are a growing drain on productivity and quality of life.

London offers a model for what can be done, through small policy changes as well as large infrastructure projects. The British capital passed a "congestion charge" on passenger cars entering Central London. The money generated has been used, in part, to replace old buses with hybrid buses. London has also embarked on the ambitious Crossrail project, which promises to increase the capacity of existing Underground lines and connect outer boroughs of the city. Experts estimate that Crossrail will add £42 billion to the UK economy.

> *The more we plan the commitments we need to make in infrastructure, and the more we work together to implement these projects, the more value we'll get from our investment.*
>
> *Gary L. Toebben, President and CEO, Los Angeles Area Chamber of Commerce*

Water poses another critical infrastructure challenge. In this naturally arid part of the world, droughts are a fact of life. Global climate change may lead to longer and more intense periods of drought. Aging water pipes, many more than 90 years old, pose a serious risk of leakage and service disruptions.

The report points to several promising solutions. One is a desalination plant in Perth, Australia powered by renewable wind energy that provides 20 percent of the city's potable water. Another is a wastewater treatment plant in Higashinada, Japan, that generates energy in the form of biogas from wastewater to power the plant, along with a small fleet of alternative energy vehicles.

**Meeting the challenge**

An impressive number of infrastructure projects are already underway in the City of Angels. The region's transportation authority is investing US$40 billion in rail, rapid buses, and other transit improvements, which together represent the largest public works project in the US.

Meanwhile, Los Angeles Airport (LAX) recently created an Airport Resource Coordination Center that enables a small team to track virtually everything going on at the airport, inside the terminals, on the runways, and even on the roads leading to the airport. The goal is to improve the experience of the millions of passengers who pass through LAX every year.




LAX is one of the world's most important international airports, making the city of Los Angeles a key transportation hub.

Looking to the future, the Blueprint recommends the creation of a detailed and comprehensive infrastructure plan for the City and County of Los Angeles. It also calls for new mechanisms and policies to facilitate private-public collaboration, including streamlined permitting and approval, updated and simplified environmental regulations, and new mechanisms for funding and financing infrastructure projects.

L.A. isn't alone. The McKinsey Global Institute estimates that the US will have to invest US$150 billion per year until 2020 to meet infrastructure needs, with most of those investments dedicated to air, freight, and passenger transport. Cities around the world face similar challenges. "The more we plan the commitments we need to make in infrastructure, and the more we work together to implement these projects, the more value we'll get from our investment," says Toebben. "The future of L.A. as a global economic engine depends on it."

*Peter Jaret, journalist based in Los Angeles.*
*Picture credits: Mario Wagner*

4 July 2016

Bold new plans for the City of Angels

Read more: City metrics



Contact us

magazine@siemens.com

HOLLY L. WOLCOTT
CITY CLERK
———
GREGORY R. ALLISON
EXECUTIVE OFFICER

When making inquiries relative to this matter, please refer to the Council File No.: 11-0573

City of Los Angeles
CALIFORNIA

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MAYOR

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CITY CLERK

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SHANNON HOPPES
DIVISION MANAGER

CLERK.LACITY.ORG

# OFFICIAL ACTION OF THE LOS ANGELES CITY COUNCIL

April 6, 2015

**Council File No.:** 11-0573

**Council Meeting Date:** April 01, 2015

**Agenda Item No.:** 44

**Agenda Description:** The City Council shall recess to Closed Session, pursuant to Government Code Section 54956.9(d)(1), to confer with its legal counsel relative to the cases entitled Mark Willits, et al. v. City of Los Angeles, United States District Court Case No. CV10-05782 CBM (RZx), Pineda, et al. v. City of Los Angeles; Los Angeles Superior Court Case No. BC403327, Griffen, et al. v. City of Los Angeles; Los Angeles Superior Court Case No. BC457403, Saundra Carter, et al. v. City of Los Angeles; Los Angeles Superior Court

**Council Action:** MOTION (KREKORIAN - WESSON) - ADOPTED IN OPEN SESSION - FORTHWITH

**Council Vote:**

| | |
|---|---|
| ABSENT | BOB BLUMENFIELD |
| YES | MIKE BONIN |
| ABSENT | JOE BUSCAINO |
| YES | GILBERT A. CEDILLO |
| ABSENT | MITCHELL ENGLANDER |
| YES | FELIPE FUENTES |
| YES | JOSE HUIZAR |
| YES | PAUL KORETZ |
| YES | PAUL KREKORIAN |
| ABSENT | TOM LABONGE |
| YES | NURY MARTINEZ |
| ABSENT | MITCH O'FARRELL |
| YES | BERNARD C PARKS |
| YES | CURREN D. PRICE |
| YES | HERB WESSON |

HOLLY L. WOLCOTT
CITY CLERK

# Developing a New Methodology for Analyzing Potential Displacement


## University of California, Berkeley

**Principal Investigator:**
**Karen Chapple**

**Co-Principal Investigators:**
**Paul Waddell**
**Daniel Chatman**

With Miriam Zuk

## University of California, Los Angeles

**Principal Investigator:**
**Anastasia Loukaitou-Sideris**

**Co-Principal Investigator:**
**Paul Ong**

With Silvia R. Gonzalez, Chhandara Pech, and Karolina Gorska



*Prepared for the California Air Resources Board and the California Environmental Protection Agency*
*By the University of California, Berkeley and the University of California, Los Angeles*

ARB Agreement No. 13-310
March 24, 2017

*The statements and conclusions in this Report are those of the contractor and not necessarily those of the California Air Resources Board. The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as actual or implied endorsement of such products.*

# Acknowledgements

This Report was submitted in fulfillment of ARB Agreement No. 13-310 by the University of California, Berkeley under the partial sponsorship of the California Air Resources.
Board. Work was completed as of 10/9/15.

**Chapter 2 and 5:**

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**Chapter 3:**

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# Abstract

In 2008, California passed Senate Bill 375, requiring metropolitan planning organizations to develop Sustainable Communities Strategies as part of their regional transportation planning process. While the implementation of these strategies has the potential for environmental and economic benefits, there are also potential negative social equity impacts, as rising land costs in infill development areas may result in the displacement of low-income residents. This report examines the relationship between fixed-rail transit neighborhoods and displacement in Los Angeles and the San Francisco Bay Area, modeling patterns of neighborhood change in relation to transit-oriented development, or TOD. Overall, we find that TOD has a significant impact on the stability of the surrounding neighborhood, leading to increases in housing costs that change the composition of the area, including the loss of low-income households. We found mixed evidence as to whether gentrification and displacement in rail station areas would cause an increase in auto usage and vehicle miles traveled (VMT). The report also examines the effectiveness of anti-displacement strategies. The results can be adapted into existing regional models (PECAS and UrbanSim) to analyze different investment scenarios. The project includes an off-model tool that will help practitioners identify the potential risk of displacement.

# Executive Summary

## Background

To comply with state climate change legislation, regions across California are pursuing more compact, transit-oriented development as a key strategy to achieve greenhouse gas reductions through their sustainable communities strategy (SCS). Concern has been raised that such development and investment patterns may result in heightened property values and the displacement of low income households. This report examines the relationship between fixed-rail transit in neighborhoods and gentrification and displacement in California, specifically in the Los Angeles and San Francisco metro areas.

## Objectives and Methods

This report examines the relationship between fixed-rail transit neighborhoods and displacement in California by modeling past patterns of neighborhood change in relation to transit-related investment (also called transit-oriented development, or TOD). It identifies anti-displacement strategies in use and examines their effectiveness in different neighborhood contexts. The report also analyzes the relationship between displacement and travel behavior, including mode choice and vehicle miles traveled (VMT). It develops an off-model tool to examine gentrification and displacement around TODs and explores the feasibility of using the UrbanSim and PECAS modeling tools to predict likely displacement outcomes around TODs.

We use a mixture of quantitative and qualitative data and methods to compensate for the inadequacy of existing secondary datasets, supplementing neighborhood-level census data with parcel-level and address-based data while also conducting extensive key informant interviews.

## Results

Fixed-rail transit has a significant impact on the stability of the surrounding neighborhood. In transit neighborhoods, housing costs tend to increase, changing the demographic composition of the area and resulting in the loss of low-income households. We find that low-income households both near and farther away from rail stations have lower VMT than high-income households, but that higher-income households either reduce their driving more in response to being near rail, or that there is no difference in VMT impacts between income categories when considered at a regional level. Our findings generally confirm earlier research on gentrification and displacement, but extend previous work by explicitly linking transit investment to gentrification and displacement, and investigating how income and proximity to transit influence VMT.
Implications for board. The study results have implications for how ARB monitors and supports affordable housing goals via SB 375.

## Conclusions

We find a significant and positive relationship between TOD and gentrification, particularly in downtown areas and core cities, and in some cases the loss of affordable housing or low-income households as well. Yet, the timeframe of impacts, as well as the role of intervening variables, is less clear and warrants additional research. Given the lack of appropriate data, it is hard to predict how households will alter their VMT with displacement, for instance as high-income households replace

low-income households near transit. More research is needed to understand the dynamic impacts that occur as residents adjust their travel behavior in new locations. Finally, the effectiveness of policy solutions varies by context, and it is unclear whether any of the existing approaches are sufficient to address displacement in the core neighborhoods where it is most prevalent. More research is needed to develop responsive policy tools, as well as to understand better the trade-offs between anti-displacement and VMT reduction goals. Despite these remaining concerns, it is not too soon to begin incorporating these results into existing regional models (PECAS and UrbanSim) to analyze different investment scenarios and market conditions. We also recommend that practitioners begin to use our off-model tool to help identify the potential risk of displacement.

# Introduction

The impetus for this study lies in state climate change legislation. Recognizing the role good planning can play in achieving our AB32 goals, California passed Senate Bill 375, requiring the California Air Resources Board (ARB) to set regional greenhouse gas reduction targets for passenger vehicles. The bill also requires metropolitan planning organizations (MPOs) to develop Sustainable Communities Strategies (SCSs) as part of their regional transportation planning process to illustrate how integrated land use, transportation, and housing planning will achieve these targets. Regions are pursuing more compact, transit-oriented development as a key strategy to achieve these reductions.

While the implementation of these strategies has the potential to bring environmental, health, and economic benefits, planning for SCSs across the state has raised awareness of the potential social equity effects of land-use-based greenhouse gas reduction strategies. Locals are likely to benefit from improved mobility, neighborhood revitalization, reduced transportation costs, and other amenities that spill over from the new development (Cervero et al. 2004). However, more disadvantaged communities may fail to benefit, if the new development does not bring appropriate housing and job opportunities, or if there is gentrification that displaces low-income and minority residents (Pollack, Bluestone, and Billingham 2010, Chapple 2009). Specifically, there is concern that new transit investment and development may increase housing costs, forcing low-income communities, often of color, to move to more affordable locations, preventing these communities from sharing in the benefits of this type of development. Replacing low-income households in transit-oriented developments with higher-income residents more likely to own a car may reshape travel behavior, including vehicle-miles traveled (VMT).

This report examines the relationship between fixed-rail transit neighborhoods and displacement in California, modeling past patterns of neighborhood change in relation to transit-related investment (also called transit-oriented development, or TOD).[i] After establishing the relationship between TOD and displacement, the report identifies anti-displacement strategies in use and examines their effectiveness in different neighborhood contexts. The report also analyzes the relationship between displacement and travel behavior, including mode choice and VMT. We find that low-income households both near and farther away from rail stations have lower VMT than high-income households, but that higher-income households either reduce their driving more in response to being near rail, or that there is no difference in VMT impacts between income categories. When gentrification is accompanied by densification, these results imply it will reduce regional VMT on net. However, when displacement is significant enough and population density declines, regional VMT is expected to increase.

The results of this analysis form the basis of a predictive model that can be adapted into existing regional models (PECAS and UrbanSim) to analyze different investment scenarios and market conditions. We also produce an off-model tool that will help practitioners quantify the potential magnitude of displacement.

In total, this study produces the strongest evidence to date of the relationship between TOD and displacement. Surprisingly little research has addressed the relationship between transit neighborhoods and social equity, outside of an advocacy literature has focused largely on the importance of affordable housing near transit stations to reduce transportation cost burdens for low-income households (CTOD 2004; Great Communities Collaborative 2007; CHPC 2013). One reason for the relative lack of research on equity issues related to transit neighborhoods is the

challenge of operationalizing displacement, due to lack of appropriate data. Further, most studies neglect to examine the role of private or public investment in spurring gentrification, examining it as a purely demographic phenomenon, i.e., the influx of higher-income households into low-income neighborhoods. They also generally fail to examine the possibility that rather than rent increases pushing households out, the key displacement mechanism is rent increases preventing minority households from moving in. Studies typically investigate only a 10-year period; however, given the length of time it takes to plan, fund, and build transportation improvements, examining a longer period of time may be more appropriate.

Several innovations distinguish our approach from previous and related work. First, we use a mixture of quantitative and qualitative data and methods to compensate for the inadequacy of existing secondary datasets, supplementing neighborhood-level census data with parcel-level and address-based data on property transactions, building permits, building characteristics, and affordable housing subsidies, along with field observations. We develop the neighborhood change models in close collaboration with regional agency officials, with the idea that they will begin to integrate displacement effects into their regional models. Second, the report complements the neighborhood change analysis with an extensive inventory and key informant interviews to identify policies supporting transit neighborhoods and mitigating displacement. Finally, using data from household travel surveys, we link neighborhood types and displacement to VMT.

This report focuses on the San Francisco Bay Area and Los Angeles County. Though both regions have experienced significant levels of transit investment, they have different development trajectories. Much of the Bay Area's transit development occurred with the development of the BART system in the 1970s and 1980s, while Los Angeles developed fixed rail much more recently. Moreover, urban form and land markets function very differently in the two places, and the San Francisco region remains a stronger real estate market than most of Los Angeles County. As a result, in the analysis of neighborhood change, we take slightly different analytic approaches in the two regions. While both models analyze gentrification and loss of affordable housing, the San Francisco model adds an analysis of the displacement of low-income households. However, the newness of transit development in Los Angeles, as well as its weaker housing market (outside of Downtown), may make it most comparable to the many other areas of California with new rail systems.

The remainder of this report is organized by analytic tasks, as follows. Chapter 1 provides an in-depth review of the literature to date on neighborhood change, gentrification, public investment, displacement, urban simulation models, and change assessment tools. Chapter 2 analyzes historic patterns of neighborhood change in both regions in both transit and other neighborhoods. Different sections describe the construction of the neighborhood and parcel-level databases; the typologies of transit neighborhoods and displacement; the models of neighborhood mobility, displacement, and change; and the groundtruthing of our findings (through neighborhood observation). Chapter 3 describes how the UrbanSim and PECAS models can incorporate displacement, through adding anti-displacement policies and incorporating housing affordability into real estate development models. It also provides a methodology to assess displacement "off-model," i.e., in an Excel tool readily accessible by practitioners. Chapter 4 analyzes the VMT and auto ownership impacts of displacement; and Chapter 5 examines strategies to minimize displacement from transit investment and TOD. A conclusion summarizes the major findings of each task.

[i] We define TOD here broadly to include any form of development, from new construction to rehabilitation of older structures, within a half-mile radius of a fixed-rail transit station. We use the term TOD interchangeably with "transit neighborhood."

# Chapter 1: Literature Review of Gentrification, Displacement, and the Role of Public Investment

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## Acronyms Used in This Chapter

- ACS (American Community Survey)
- BRT (Bus Rapid Transit)
- CCI (Center for Community Innovation)
- HOV (High-Occupancy-Vehicle)
- HUD (Department of Housing and Urban Development)
- LISC (Local Initiative Support Corporation)
- NYCHVS (New York City Housing and Vacancy Survey)
- PSID (Panel Survey of Income)
- PSRC (Puget Sound Regional Council)
- TOD (Transit-Oriented Districts/Development)

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A significant body of work examines neighborhood change, gentrification, and displacement. This chapter assesses this research, beginning with accounts of neighborhood change from the Chicago School in the 1920s. After summarizing research that examines trends in economic and racial segregation, the chapter turns to the literature on neighborhood decline and ascent, with a focus on the state of knowledge about gentrification and the role of public investment. The heart of the chapter addresses the literature on displacement, describing the methodologies used to understood displacement – and how they fall short. The next section addresses how neighborhood change dynamics differ in strong versus weak markets. After an assessment of how urban simulation models treat neighborhood change, the chapter concludes with a description of the rise of early warning systems for gentrification and displacement.

# Chapter 1 Introduction

The ever-changing economies, demographics, and morphologies of the metropolitan areas of the United States have fostered opportunity for some and hardship for others. These differential experiences "land" in place, and specifically in neighborhoods. Generally, three dynamic processes can be identified as important determinants of neighborhood change: movement of people, public policies and investments, and flows of private capital. These influences are by no means mutually exclusive. In fact, they are very much mutually dependent, and they each are mediated by conceptions of race, class, place, and scale. How scholars approach the study of neighborhood change and the relative emphasis that they place on these three influences shapes the questions asked and attendant interventions proposed.

These catalysts result in a range of transformations—physical, demographic, political, economic—along upward, downward, or flat trajectories. In urban studies and policy, scholars have devoted volumes to analyzing neighborhood decline and subsequent revitalization at the hands of government, market, and individual interventions. One particular category of neighborhood change is gentrification, definitions and impacts of which have been debated for at least 50 years. Central to these debates is confronting and documenting the differential impacts on incumbent and new residents, and questioning who bears the burden and who reaps the benefits of changes. Few studies have addressed the role of public investment, and more specifically transit investment, in gentrification. Moreover, little has been written about how transit investment may spur neighborhood disinvestment and decline. Yet, at a time when so many United States regions are considering how best to accommodate future growth via public investment, developing a better understanding of its relationship with neighborhood change is critical to crafting more effective public policy.

This literature review will document the vast bodies of scholarship that have sought to examine these issues. First, we contextualize the concept and study of neighborhood change. Second, we delve into the literature on neighborhood decline and ascent (gentrification). The third section examines the role of public investment, specifically transit investment, on neighborhood change. Next, we examine the range of studies that have tried to define and measure one of gentrification's most pronounced negative impacts: displacement. After describing the evolution of urban simulation models and their ability to incorporate racial and income transition, we conclude with an examination of gentrification and displacement assessment tools.

# Historical Perspectives on Neighborhoods and Change

eighborhoods have been changing since the beginning of time—people move in and out, buildings are built and destroyed, infrastructure and amenities are added and removed, properties are transferred, and so on  Despite the constancy of change, our current paradigms for understanding and studying neighborhoods and change stem from the early 20th century when urban America experienced dramatic change due to rapid industrialization, extensive flows of immigrants from Europe, and mass migration of African-Americans from the rural south. In this time of great transition, emergent social problems, and heightened middle class anxiety about the ills of urban society, new ideas were formulated to understand urban growth, neighborhood change, and attendant tensions.

We review these ideas here because they continue to be prominent in today's scholarship and current understandings about neighborhoods and change. Three key ideas that took shape were: 1) the primacy of neighborhood as the unit of analysis in studying the city; 2) specific concepts of the substantive nature of neighborhoods, including: theories of a social ecology, cycles of equilibrium to disequilibrium, ideas of social disorganization, and assimilation; and 3) attention to race and ethnicity and their association with persistent neighborhood poverty.

While today the notion of the "neighborhood" is one that practitioners, scholars, and laypersons alike take for granted, its definitions vary, and not all assign equal importance to its role in social processes. The neighborhood has come to be understood as the physical building block of the city for both "social and political organization" (Sampson 2011, 53), conflating physical and non-physical attributes. Early scholars hypothesized that cities' physical elements like size and density, as well as their heterogeneous demographics, influenced the mechanisms and processes of neighborhood change (Park 1936; Park 1925; Wirth 1938). Theorists suggested that  there were natural areas in the city for specific types of land uses and people, such as the concentric zone model with a central business district at the center, transitional zones of light industrial and offices next, followed by worker housing, and finally newer housing for the middle class in the outer ring (Burgess 1925).

These ideas about neighborhoods and urban morphology presented a deterministic model in which neighborhoods were considered a closed ecosystem, and neighborhood change had a natural tendency toward social equilibrium. New residents—distinguished by ethnicity and class—would enter the ecosystem and disrupt the equilibrium. Competition for space followed, and neighborhood succession occurred when less dominant populations were forced to relocate. The dominant groups that stayed established a new equilibrium. In these conceptualizations of neighborhood change, competition for space drove locational decisions of different groups in a natural and inevitable way. Observed deviant behavior was thought to be a natural reaction to urbanization; new arrivals to the city fostered social disorganization, which would return to equilibrium once the immigrants assimilated (Park 1936; Park 1925; Wirth 1938).

This "ecological" model also naturalized segregation. New arrivals to the city—specifically the "poor, the vicious, the criminal"—would separate themselves from the "dominant moral order" (Park 1925, 43) into segregated neighborhoods to live among people with a similar moral code of conduct. Like disorganization, this "voluntary segregation would eventually break down as acculturation brought assimilation" (Hall 2002, 372). These concepts set the foundation for subsequent study and policy premised on notions of marginality in which immigrants, African-Americans, and low-income people were assumed to operate based on logics divergent from

mainstream, middle-class society, and of assimilation as a key mechanism to mitigate social disorganization.

Although early researchers were most concerned with immigrant influx and increasing ethnic diversity among white populations, others—notably black sociologists—observed that neighborhoods with burgeoning African-American populations seemed to experience neighborhood succession differently than the model of naturalized assimilation would predict. Unlike white ethnic immigrant in-movers to Chicago, the African-American population was involuntarily contained in specific neighborhoods (DuBois 2003).

These approaches to neighborhoods and neighborhood change have been widely adopted in today's policy and research agendas, perhaps understandably, since about half of all United States metropolitan areas conform to the concentric zone model (Dwyer 2010). Yet, these early ideas have their weaknesses. The deterministic and ecological theories naturalize the transition process and leave very little room for politics. The conflation of geographic units (neighborhoods) with social and political units masks other processes in cities. Public institutions also remain notably absent in these early theories, and these approaches fail to take into account larger city and regional forces that influence neighborhood-level change. Subsequent research has improved upon these weaknesses by de-naturalizing market phenomena, incorporating the role of public sector actors and public policy, and by embedding neighborhood in other macro- and meso-scale processes (Goetz 2013; Jargowsky 1997).

**Finding: Influential early models of neighborhood change present processes of succession and segregation as inevitable, underemphasizing the role of the state.**

# Trends in Mobility and Neighborhood Segregation

Despite the emphasis that urban models place on change, what is perhaps most startling about this literature is how slowly neighborhood change happens. Analysis of change over time suggests that neighborhoods are surprisingly stable (Wei and Knox 2014). Over individual decades, the change that researchers are discussing amounts to a few percentage points; neighborhood transformation takes decades to complete. And, in fact, overall, Americans have become significantly more rooted over time; just 12% of United States residents moved in 2008, the lowest rate since 1948 and probably long before (C. S. Fischer 2010). Sociologist Claude Fischer credits growing security, as well as technology, for the shift, but adds: "Americans as a whole are moving less and less. But where the remaining movers—both those forced by poverty and those liberated by affluence—are moving is reinforcing the economic and, increasingly, the cultural separations among us" (Fischer 2013). For many at the lower end of the economic spectrum, stability means imprisonment: even though many families have left, researchers estimate that some 70% of families in today's impoverished neighborhoods were living there in the 1970s as well (Sharkey 2012).

Questions of urban morphology and neighborhood change have continued to capture academic and popular imagination because of the perceived and real impacts of neighborhoods on residents. Scholars writing on the "geographies of opportunity" (Briggs 2005) argue that the spatial relationships between high-quality housing, jobs, and schools structure social mobility. Patterns of urban development in the United States have resulted in uneven geographies of opportunity, in which low-income households and people of color experience limited access to affordable housing, high quality schools, and good-paying jobs. A range of studies have found that living in poor neighborhoods negatively impacts residents, particularly young people, who are more likely than

their counterparts in wealthier neighborhoods to participate in and be victims of criminal activity, experience teen pregnancy, drop out of high school, and perform poorly in school, among a multitude of other negative outcomes (Crane 1991; Ellen and Turner 1997; Galster 2010; P. A. Jargowsky 1997; Jencks et al. 1990; Ludwig et al. 2001; Sampson, Morenoff, and Gannon-Rowley 2002; Sharkey 2013). However, geographic proximity does not affect opportunity in the same way for all variables; living next door to a toxic waste site may impact life chances more than living next to a major employer (Chapple 2014).

## Economic Segregation

Economic segregation has increased steadily since the 1970s, with a brief respite in the 1990s, and is related closely to racial segregation (i.e., income segregation is growing more rapidly among black families than white) (Fischer et al. 2004; Fry and Taylor 2015; P. Jargowsky 2001; Lichter, Parisi, and Taquino 2012; Reardon and Bischoff 2011; Watson 2009; Yang and Jargowsky 2006). Increases are particularly pronounced in more affluent neighborhoods: between 1980 and 2010, the share of upper-income households living in majority upper-income tracts doubled from 9 to 18 percent, compared to an increase from 23 to 25 percent in segregation of lower-income households living in majority lower-income tracts (Fry and Taylor 2012).

The sorting of the rich and poor is even more pronounced between jurisdictions than between neighborhoods in the same city (Reardon and Bischoff 2011). Over time, the poor are increasingly concentrated in high-poverty places, while the non-poor shift to non-poor cities (Lichter, Parisi, and Taquino 2012). Upper-income households in metropolitan areas like Houston or Dallas are much more likely to segregate themselves than those in denser older regions like Boston or Philadelphia or Chicago (Fry and Taylor 2012). This suggests that segregation is related to metropolitan structure and suburbanization. The concentric zone model is particularly strongly associated with the segregation of the affluent (Dwyer 2010). In other words, in metropolitan areas where the affluent are most separated from the poor, they are living on land further from the center.

Metropolitan areas that conform to the concentric zone model (for example, places like Chicago, Los Angeles, and Philadelphia) tend to be larger and more densely populated, often with a higher degree of both affluence and inequality, a larger African-American population, and a greater share of population in the suburbs. In the remaining metropolitan areas, there is greater integration between the affluent and the poor (Dwyer 2010). In these places, such as Seattle, Charleston, and Boulder, the rich concentrate in the urban core, allowing more opportunity for interaction with the poor. Growing racial/ethnic diversity may be reshaping some of these areas, with suburban immigrant enclaves creating more fragmented, checkerboard patterns of segregation (Coulton et al. 1996).

Public choice theorists, most prominently Charles Tiebout (1956), have long understood economic segregation to result from the preference of consumers for distinct baskets of public goods (e.g., schools, parks, and the like); local jurisdictions provide these services at different levels, attracting residents of similar economic means (Peterson 1981). However, the causality here is unclear: government policies shape free markets and preferences, as well as respond to them. Thus, transportation policies favoring the automobile, discrimination and redlining in early federal home ownership policies, mortgage interest tax deductions for homeowners, and other urban policies have actively shaped or reinforced patterns of racial and economic segregation, while severely constraining choices for disadvantaged groups (Dreier, Mollenkopf, and Swanstrom 2004).

But we also now understand that neighborhood income segregation within metropolitan areas is influenced mostly by income inequality, in particular, higher compensation in the top quintile and the lack of jobs for the bottom quintile (Reardon and Bischoff 2011; Watson 2009). Income inequality leads to income segregation because higher incomes, supported by housing policy, allow certain households to sort themselves according to their preferences – and control local political processes that continue exclusion (Reardon and Bischoff 2011). Other explanatory factors include disinvestment in urban areas, suburban investment and land use patterns, and the practices generally of government and mortgage underwriters (Hirsch 1983; Levy, McDade, and Dumlao Bertumen 2011). Nonetheless, were income inequality to stop rising, the number of segregated neighborhoods would decline (Reardon and Bischoff 2011, Watson 2009).

**Finding: Neighborhoods change slowly, but over time are becoming more segregated by income, due in part to macro-level increases in income inequality.**

## Racial Transition and Succession

In the United States, income segregation is highly correlated with racial/ethnic segregation, which has a long history. As many scholars have documented, African-American segregation peaked in 1960 and 1970, and has declined since then (Logan 2013; Vigdor 2013). The growth of Asian and Hispanic populations in the last several decades has led to more diverse, multi-ethnic neighborhoods. Ellen and coauthors (2012) find both the increase of previously white neighborhoods that became integrated through the growth of non-white populations, as well as a smaller but accelerating number of previously non-white neighborhoods that became integrated through the growth of white populations. It is important to note two countervailing trends, however. First, while the number of integrated neighborhoods increased from 1990 to 2010, the large majority of non-integrated neighborhoods remained so over each decade. Furthermore, African-American-white segregation has persisted in major metropolitan areas, especially in the Northeast and Midwest, and a large share of minorities still live in neighborhoods with virtually no white residents (Logan 2013). Second, a significant number of integrated neighborhoods reverted to non-integration during each decade, though the stability of integration increased after 2000. These findings of increasing integration over time, persistence of non-integration in a majority of neighborhoods, and instability of some integrated neighborhoods are corroborated by a number of other researchers (Farrell and Lee 2011; Quercia and Galster 2000; Chipman et al. 2012; Sampson and Sharkey 2008; Logan and Zhang 2010).

Looking at the neighborhood and metropolitan correlates of these demographic shifts, Ellen et al. (2012) find a number of interesting patterns. Focusing on a case pertinent to the study of gentrification – the integration of African-American neighborhoods by white in-movers – the authors find that neighborhoods that become integrated start off with lower income and rates of homeownership and higher rates of poverty than those that remain non-integrated. Additionally, these neighborhoods are more likely to be located in central cities of metropolitan areas with growing populations. Looking at rates of transition to integration by racial and ethnic category, the researchers contradict previous work (Logan and Zhang 2010; Reibel and Regelson 2011; Lee and Wood 1991) by finding that multi-racial or multiethnic neighborhoods integrate with white in-movers at a relatively infrequent rate. This contradiction may be explained, however, by the lack of nuance employed by the various authors in categorizing race and ethnicities, as various subgroups can display markedly different residential movement patterns (Charles 2003).

Several main theories have been put forward to account for both the persistence and change of neighborhood racial compositions over time. With respect to the integration of formerly white neighborhoods, a primary mechanism described by Charles (2003) is that of "spatial assimilation," which argues that as the gap between socioeconomic status of racial and ethnic groups narrows, so too does their spatial segregation. While this mechanism may help explain the integration of Hispanic and Asian households into previously white neighborhoods, it does not help explain the experience of African-American households (Charles 2003). For these groups, a theory of "place stratification" is a better fit, incorporating discriminatory institutions that limit residential movement of African-Americans into white neighborhoods and factors such as, biased residential preferences among non-Hispanic whites and discriminatory practices in the real estate market (Charles 2003; Krysan et al. 2009; Turner et al. 2013).

The converse neighborhood process, the transition from integration back to segregation, has been explained by economists through theories of neighborhood "tipping," which hold that as the neighborhood proportion of non-white racial and ethnic groups increases past a certain threshold, a rapid out-migration of other (white) groups will ensue (Schelling 1971; Charles 2000; Bruch and Mare 2006). The precise threshold at which neighborhoods "tip" varies according to a number of metropolitan-level attributes, and researchers have found that places with small non-white populations, high levels of discrimination, large homicide rates, and a history of racial riots tip at lower thresholds than other places (Quercia and Galster 2000; Card, Mas, and Rothstein 2008).

A number of other macro-level and institutional influences have been attached to racial transition. For instance, rates of macro-level population movement are seen to have a substantial impact on neighborhood racial compositions, with the movements of the Great Migration out of the South and into metropolitan areas of the Northeast, Midwest, and West leading to greater degrees of black segregation in urban neighborhoods (Ottensmann, Good, and Gleeson 1990) and more recent movements of immigrants into neighborhoods leading to greater rates of out-migration among native-born residents (Crowder, Hall, and Tolnay 2011).

Finally, a number of studies have gone beyond place-level analyses of neighborhood racial change to examine the determinants of individual household movements. For instance, (Hipp 2012) has found a strong correlation between the race of the prior resident of a housing unit and the race of the in-moving resident, a phenomenon that he attributes to a signaling mechanism for neighborhood belonging. (Sampson 2012) similarly finds that Hispanic and black residents overwhelmingly move to predominantly Hispanic and black neighborhoods of Chicago, respectively. Additionally, he finds strong effects of spatial proximity on selection of destination neighborhoods, as well as strong associations with similarities in income, perceptions of physical disorder, and social network connectedness between origin and destination neighborhoods. These findings may help explain results from other researchers that have found limited impact of housing policies and programs such as inclusionary zoning and housing choice vouchers to reduce neighborhood racial segregation (Glaeser 2003; Kontokosta 2013; Chaskin 2013). The literature on gentrification, discussed below, revisits this question of how in-migration patterns reshape neighborhoods. For further detail on racial transition and succession studies, see Appendix A.

**Finding: Racial segregation persists due to patterns of in-migration, "tipping points," and other processes; however, racial integration is increasing, particularly in growing cities.**

# Dimensions of Neighborhoods and Change

In general, studies of neighborhood change began with preoccupations about decline and have evolved into concerns about the impacts of neighborhood ascent, variously defined. Public investment – and disinvestment – has played a role in both types of change.

## Neighborhood Decline

The story of neighborhood decline in the United States is oft-told. While early researchers naturalized processes of neighborhood transition and decline, the drivers of decline are anything but natural and stem from a confluence of factors including: federal policy and investments, changes in the economy, demographic and migration shifts, and discriminatory actions. Neighborhood conditions and patterns of physical investment (or disinvestment) have been conflated with challenges of poverty (Katz 2012). Given this conflation, our review examines not only studies concerned with physical change but also research that investigates demographic and social dynamics that accompany neighborhood-level transitions.

Between the 1920s and 1950s, the African-American population in northern cities swelled due to the mechanization of agricultural production in the South and Jim Crow laws, even as deindustrialization started to take hold and jobs began moving out of central cities (Sugrue 2005). Simultaneously federal programs, (e.g., the Federal-Aid Highway Program and Home Owners Loan Corporation) provided quick automobile access (in the case of the former) and large subsidies for home ownership in the suburbs (in the case of the latter). The confluence of government subsidy and investment in infrastructure and regulation with private lending practices led to subsidies for racial segregation, with restrictive covenants on deeds and lending practices governed by racially discriminatory stipulations, i.e., redlining (K. Jackson 1987).

The demographic shifts enabled by these public policies and private actions left cities with a severely depleted tax base to support the more disadvantaged communities who did not have options to leave the city (Frieden and Sagalyn 1989). Ostensibly to address the persistent poverty in cities, urban renewal sought to revive downtown business districts and provide adequate housing for all. However, the divergent interests of stakeholders including developers, mayors, and affordable housing advocates resulted in a diluted policy that prioritized downtown redevelopment at the expense of primarily low-income communities and particularly African-American communities, leading many to refer to urban renewal as "Negro Removal." Meanwhile, public housing development served as a tool to physically and socially buffer central business districts from neighborhoods of poverty, which were predominantly African-American (Halpern 1995; Hirsch 1983). These efforts emphasize the approach of "solving" social, economic, and political problems with spatial and physical solutions. In essence, this period conflated urban policy with anti-poverty policy, due in part to the real policy challenges of addressing structural poverty (O'Connor 2002).

By the late 1980s, inner city poverty and metropolitan inequality were cemented. Wilson (1987), drawing on some of the earlier notions of neighborhood succession, argued that the key mechanisms driving inner-city poverty were: structural economic shifts; shifting migration flows; changes in the age structure; and the out-migration of middle-class blacks as a result of Civil Rights gains. These shifts resulted in "concentration effects," leaving residents even more isolated from

mainstream institutions, labor markets, and politics, which manifested spatially in the creation of the black ghetto neighborhood. Beyond Wilson's focus on class, Massey and Denton (1993) argued that neighborhood decline is caused by systems of discrimination pervasive in the housing market, and that "racial segregation…and the black ghetto – are the key structural factors responsible for the perpetuation of black poverty" (Massey and Denton 1993, 9). They suggest a "culture of segregation" forms from geographic isolation, resulting in limited political power, less resilience available to respond to economic shifts, and little or no access to job opportunities and mainstream institutions.

Sociologist Loic Wacquant offers another way of understanding the relationship between race, poverty, and space, extending Massey and Denton's focus on residential segregation. For Wacquant (1997), racial enclosure is a critical component to understanding urban decline. Analyses and proposed interventions focused only on poverty will never mitigate and deconstruct the ghetto, since it is, in fact, the racial and ethnic enclosure and control that creates poverty, not the other way around. He argues that the shift to class-based segregation at the expense of an analysis of race is a "tactical" choice by scholars, given the politics of influencing policy: "[scholars] have diligently effaced from their analytical framework the one causal nexus that the American state stubbornly refuses to acknowledge, confront, and mitigate when dealing with disparity and destitution: race" (1998, 149).

Complicating the issue of segregation for policymakers is the need to distinguish between the ghetto and the enclave (Marcuse 1997). In contrast to the ghetto, where society segregates residents involuntarily in a process of exclusion, the enclave is a spatial cluster where residents choose to congregate in order to achieve economic goals (such as Chinatown) or social cohesion (such as Hasidic Williamsburg, Brooklyn). The urban enclave may strengthen social groups or subcultures and more effectively provide the resources to prosper than an integrated neighborhood does (Fischer 1984).

More recently, scholars using quantitative methods have broadened analyses from the neighborhood level to metropolitan, county, and state geographies (Fischer et al. 2004; Massey, Rothwell, and Domina 2009; Reardon et al. 2008). Jargowsky's (1997) empirical work links ghetto poverty with metropolitan economies and finds that changes in economic opportunity at the metropolitan level impact the levels of inner city poverty. Further, Jargowsky's work raises questions about the concept of neighborhood as a self-contained ecosystem, highlighting neighborhoods' interdependency and their dependence on broader metropolitan economies and infrastructures. Neighborhood decline and disinvestment may reflect regional economic distress, but may also be related to the shift of investment elsewhere in the metropolitan area.

**Finding: Neighborhood decline results from the interaction of demographic shifts, public policy, and entrenched segregation, and is shaped by metropolitan context.**

## Neighborhood Ascent and Gentrification

Following decades of public and private initiatives to regenerate the inner city, scholars are increasingly paying attention to the causes and consequences of the upward trajectories of neighborhoods, also known as neighborhood ascent or upgrading. Much like decline, neighborhood ascent exhibits a variety of trajectories, which depend greatly on their starting points. Owens (2012), for instance, identified nine different types of neighborhoods that are all experiencing some form of upgrading in the United States: minority urban neighborhoods, affluent neighborhoods,

diverse urban neighborhoods, no population neighborhoods, new white suburbs, upper-middle-class white suburbs, booming suburbs, and Hispanic enclave neighborhoods. While different actors and catalysts may be at play in these different types of neighborhood ascent, Owens does not suggest any causality, and does not investigate the role of investment or public policies on these trajectories. In this section we provide an overview of the literature on gentrification, the most commonly studied form of neighborhood ascent involving the racial and economic transformation of low-income neighborhoods.

The first documented use of the term "gentrification" (Glass 1964) describes the influx of a "gentry" in lower-income neighborhoods in London during the 1950s and 60s.[1] Today, gentrification is generally defined as simultaneously a spatial and social practice that results in "the transformation of a working-class or vacant area of the central city into middle-class residential or commercial use" (Loretta Lees, Slater, and Wyly 2008, xv).[2] Often, gentrification has been understood as a tool of revitalization for declining urban neighborhoods, defined primarily by their physical deterioration. However, revitalization, as first noted by Clay (1979) can take two forms: incumbent upgrading and gentrification. Incumbent upgrading, whereupon existing residents improve the conditions of their neighborhood, is catalyzed by the cost of housing, the rise of neighborhood consciousness, demographic pressure, and reduced pressures from migrants to the city. Gentrification, on the other hand, draws middle-class residents to the city, attracted by job and recreational opportunities, low and appreciating housing prices, stabilization of negative social conditions (such as crime), and lifestyle or aesthetic considerations. Displacement, a negative outcome of gentrification, is not present in incumbent upgrading.

Gentrification literature conceptualizes neighborhoods as terrains not of isolated pockets of decline and abandonment, but rather as sites of exploration, potential investment, and emergent identity construction that are manifestations of larger city, metropolitan, and global forces. Gentrification is not driven by a singular cause. It may emerge when three conditions are present: the existence of a potential pool of gentrifiers, a supply of inner-city housing, and a cultural preference for urban living (Hamnett 1991). It is arguably a "chaotic" process, which does not lend itself to binary or linear analysis (Beauregard 1986; Freeman 2006; L. Lees 1996). Early debates, however, relied strongly on binaries to identify the causes of gentrification. Scholars argued that either macro-forces of capital accumulation or micro-sociological processes of individual preferences drive gentrification processes. Today, the overarching debate has generally drawn a line between the flows of capital versus flows of people to neighborhoods. This dichotomous narrative has spawned many analyses focused on either production and supply-side or consumption and demand-side catalysts. Flows of capital focus on profit-seeking and the work of broader economic forces to make inner city areas profitable for in-movers. Flows of people refer to individual gentrifiers who enter inner city areas, drawn by cultural and aesthetic preferences.

From the production or supply-side perspective, private capital investment, public policies, and public investments are the main mechanisms of gentrification. Smith (1979) argues that the return of capital from the suburbs to the city drives gentrification; the change in neighborhoods is the spatial manifestation of the restructuring of capital through shifting land values and housing development. Gentrification occurs in disinvested neighborhoods where there is the greatest "rent

[1] While Glass offers the first use of the term, the phenomenon predates this naming. For example, Osman (2011) documents earlier instances of class-based movement into inner city areas in the United States; his history of "brownstoning" in Brooklyn dates gentrifying neighborhood change to the 1940s.

[2] An early definition by London and Palen (1984) quoting the Urban Land Institute names gentrification as a "private-market non-subsidized housing renovation."

gap" between the cost of purchasing property and the price at which gentrifiers can rent or sell (1979). Smith (1979) sees individual gentrifiers as important, but places a greater emphasis on a broader nexus of actors – developers, builders, mortgage lenders, government agencies, real estate agents – that make up the full political economy of capital flows into urban areas. His focus goes so far as to obscure individual ascriptive characteristics (e.g., race or ethnicity) in favor of a more macro analysis of gentrification and urban land markets as a function of the capitalist economy.

Another "supply-side" actor is government – at the local, state, and federal levels – which through public subsidy and policy measures sets the conditions for and catalyzes gentrification processes. As mentioned previously, Smith (1979; 1996) sees government as part of a larger political economy that aims to accumulate capital through land use management and city development, echoing the idea of the city as a "growth machine" (Logan and Molotch 1987). Others (Freeman 2006; Wilson and Taub 2006; Pattillo 2008; powell and Spencer 2002) have clearly tied gentrification to historical patterns of residential segregation. Segregated neighborhoods experience the "double insult – a 'one-two' knock" (powell and Spencer 2002, 437) of neglect and white flight in the 1950s through 1970s and then the forces of displacement in the 1980s through today. These scholars highlight the role of policy in structuring the differential and inequitable spatial distributions of risks and resources by race and class across metropolitan areas. Gentrification represents merely the latest imprint of these efforts by the state. In subsequent sections we will review the literature on the specific role of government investment in infrastructure in housing prices and subsequent neighborhood change.

For those who explain gentrification as flows of people (rather than capital), two threads persist, both grounded in consumer-driven, demand-side principles. One thread focuses on aesthetic and lifestyle preferences of gentrifiers, who desire a gritty, authentically "urban" experience (Caulfield 1994; Ley 1994; Ley 1996; Zukin 1982), or who see themselves as agents to preserve some nostalgic, authentic character of a place (Brown-Saracino 2009). The second thread is embedded in neoclassical economics and links land values to housing location choice connected to shifts in the labor market (Hamnett 2003).

Ethnographic accounts have examined middle- and upper-class, primarily white, childless in-movers and their motivations to move to inner city neighborhoods. These studies have identified political persuasions and identity construction vis-à-vis their housing choices into declining neighborhoods as the primary catalysts (Brown-Saracino 2009; Caulfield 1994; Ley 1996; Ley 2003). Others also consider broader economic forces (Rose 1984; Zukin 1987), which point to the connections between the theories on macro flows of capital described above and these more micro-sociological processes of individuals.

These earlier studies on in-movers have focused primarily in inter-racial/ethnic gentrification, with white in-movers and incumbent communities of color. More recently, scholars have examined cases of middle-class black in-movers into predominantly low-income black neighborhoods (Boyd 2005; Freeman 2006; Hyra 2008; Moore 2009; Pattillo 2008; Taylor 2002). These studies tie neighborhood-specific processes to larger structural issues of residential segregation and exclusion, arguing that in some cases black in-movers feel more comfortable relocating to predominantly African-American neighborhoods because of a history of housing discrimination in predominantly white neighborhoods and the suburbs (Freeman 2006; Moore 2009; Taylor 2002). African-American in-movers also become connected to a set of cultural practices and aesthetics that link to their racial identities (Freeman 2006). Further, black gentrifiers may see their relocation in inner cities as a project of "racial uplift" for their lower-income black counterparts (Boyd 2005).

Additional work has also shown substantial racial diversity specifically among higher-income gentrifying households (Bostic and Martin 2003).

Looking at neighborhood racial transition through the lens of gentrification, existing evidence is mixed. Research has found trends of greater white movement into poor, non-white neighborhoods (Crowder and South 2005; McKinnish, Walsh, and Kirk White 2010), resulting in shifting racial compositions in the face of gentrification. Other research, however, presents a picture of less sharp differences in race among households moving into and out of gentrifying and non-gentrifying neighborhoods (Ellen and O'Regan 2011). Finally, Hwang and Sampson (2014) recently found that Chicago neighborhoods with higher proportions of black and Latino residents gentrified at a slower pace than predominantly white neighborhoods, indicating that gentrifiers have less of a taste for integrated neighborhoods than previously believed.

**Finding: Gentrification results from both flows of capital and people. The extent to which gentrification is linked to racial transition differs across neighborhood contexts.**

### *Cultural Strategies and Gentrification*

An analysis of the built environment unveils a range of cultural strategies undertaken in many cities, from large- to micro-scale, that can be linked to processes of gentrification. In order to stand out and take part in inter-urban competition, cities make use of "starchitects," innovative design, and "cultural" institutions/developments to give them a competitive edge (Zukin 1995). Flagship developments, including entertainment and business-oriented facilities such as festival marketplaces and entertainment districts (Boyer 1992; Hannigan 1998), sports arenas (Chapin 2004; Noll and Zimbalist 1997), convention centers (Sanders 2002), and office complexes (Fainstein 2011) play an influential and catalytic role in urban regeneration (Bianchini et al. 1992). Many cities have undertaken these types of development strategies as tools for city boosterism and economic revitalization.

These cultural strategies are considered essential in attracting the "creative class" (Florida 2002), as well as stimulating consumer spending. While certain theorists find that cities with a high level of these amenities have grown the fastest and see this as a positive development (Glaeser 2003); others argue that these strategies are predominantly aimed at elite and gentrifying areas or those seeking to attract tourists and thus promote greater social stratification (Zukin 1995; N. Smith 1996).

Critics also argue that the cultural economy drives redevelopment strategies toward the production of commercialized urban spaces, which are in turn geared primarily toward entertainment and tourism (Zukin 1995; Zukin 2009). The consequences of these strategies can be increased property values, gentrification, displacement, and inauthentic places.[3] Additionally, Zukin believes that "culture is […] a powerful means of controlling cities" (Zukin 1995: 1). Controlling cities in this sense refers to deciding who belongs in specific areas of cities and who doesn't. Nevertheless, the aesthetic improvements, city marketing, and economic growth that are associated with cultural development strategies are often touted as the necessary benefits in successful redevelopment projects (Florida 2002; Landry 2008).

Noting the increasing emphasis on the economic benefits of cultural initiatives, scholars have also

[3] Susan Fainstein (2001) questions whether "inauthentic" is an appropriate term to criticize new development; arguably, if it reflects underlying social forces, as for instance does Disneyland, then it is genuine.

pointed to the ever-increasing creation of commodified public spaces (Smith 1996; Zukin 1995). Zukin sees the production of cultural spaces in cities as a result of an organized effort among real estate interests, public-private partnerships, and community organizations. Zukin is implying that "middle class tastes" for cultural offerings—artist galleries, ethnic restaurants and shops, historic preservation, and mixed uses—are essentially part of a scripted program designed to increase city revenues and create spaces where the middle class will want to spend their disposable income, perhaps leading to gentrification. The prevalence of ethnic retail has also been shown to catalyze gentrification in Los Angeles and Toronto, where ethnic commodification attracted larger city audiences and served to revalorize local real estate markets (Loukaitou-Sideris 2002; Hackworth and Rekers 2005). Even when the change is ostensibly organic, as in emergent arts districts, planners are often working in tandem with artists and others to create economic development (Chapple, Jackson, and Martin 2010).

**Finding: Cultural strategies can transform places, creating new economic value but at the same time displacing existing meanings.**

***Commercial and Retail Gentrification***

Changes in the commercial environment of gentrifying neighborhoods have been seen as both an instigator and consequence of residential demographic change (Chapple and Jacobus 2009). Researchers have shown that retail and commercial amenities signal to middle-class residents that a low-income neighborhood is changing, consequently attracting new residents (Brown-Saracino 2004). On the other side, the shifting buying power and cultural preferences of new residents in gentrifying neighborhoods may influence the mix of retail in nearby commercial corridors (Chapple and Jacobus 2009).

At first, residents may have a positive response if new retail and services provide desired goods that were previously not available (such as Starbucks, CVS, etc.) and if that provokes only minimal displacement of other retail (Sullivan and Shaw 2011; Freeman 2006). However, new commercial amenities in gentrifying neighborhoods also imply rising property values, as well as an influx of white and middle-class residents, creating conditions for direct displacement through competition or rising rent (Zukin 2009). This association seems appropriate as local amenities, such as retail businesses, have been found to play an important role in household residential choice (Fischel 1985; Kolko, 2011).

Generally, commercial gentrification of urban areas involves complex issues of social class, cultural capital, and race (Zukin 2009: 48). Besides responding to a different consumer base, changes in the retail landscape reflect structural changes in the retail industry. Many scholars believe that commercial gentrification results in the disappearance of small, mom-and-pop stores and the arrival of national chains, such as CVS, Starbucks, Target (Loretta Lees 2003; Zukin et al. 2009; Fishman 2006; Bloom n.d.). Chains are usually interested in commercial districts at the mature end of any revitalization timeline: places with high foot traffic and strong demographics (Bloom, n.d.). Overall commercial rents increase because as local retail spending increases, more businesses compete to capture it (Kennedy and Leonard 2001; Chapple and Jacobus 2009).

The increase in rents can push out local businesses that are not drawing the same traffic as the chain stores and not generating similarly high sales volume. These local businesses may have had higher multiplier effects on the area, due to reliance on local suppliers and the recirculation of business owner profits (Civic Economics 2012). However, chains can also create their own customer traffic and that additional traffic can have positive effects on nearby businesses: as more

customers come into the commercial district, they encounter other businesses along the way (Bloom, n.d.). Moreover, they benefit consumers by offering goods and services at lower prices, likely offsetting any losses in the local multiplier. Others suggest that an influx of national chains can also indicate the changing corporate views of the commercial viability of the inner city (Porter 1995). Still, when Walmart or other big-box retailers come to town, there is net job and business loss, as well as decreases in retail wages (Dube, Lester, and Eidlin 2007; Ficano 2013; Haltiwanger, Jarmin, and Krizan 2010; Neumark, Zhang, and Ciccarella 2008).

Empirical studies on the nature of commercial change in gentrifying neighborhoods are mixed and scarce. Koebel (2002) measured the factors influencing changes in the number of neighborhood retail and service businesses in six cities, finding little relationship with neighborhood economic (e.g., median income) factors. Instead, he found that a substantial amount of the change in neighborhood commerce was related to property and location characteristics (such as redevelopment or revitalization projects). In contrast, Chapple and Jacobus (2009) found that overall retail establishment growth in the San Francisco Bay Area was associated with neighborhoods becoming middle- or upper-income rather than those that became bipolar. Meltzer and Schuetz (2011) analyzed changes among neighborhood businesses in New York City, finding that retail access improved rapidly in low-home-value neighborhoods that experienced upgrading or gentrification. The authors suggest that these results indicate that retail is quite sensitive to changes in neighborhood economic and demographic characteristics (Meltzer and Schuetz 2011). Finally, a study comparing retail change in California found that in gentrifying neighborhoods, new businesses grew more (in employment) than existing businesses in the 1990s, but not in the 2000s (Plowman 2014). This suggests the importance of extending the timeframe for the analysis of neighborhood change.

The relationship between transit-oriented districts and retail gentrification is similarly under-studied. Recently, Schuetz (2014) asked if new rail transit stations in California resulted in changes in retail employment, finding little support for such relationships. However, the absence of parking was found to be significantly associated with a decline in retail employment. Finally, in their analysis of the effects of TOD investments on small and ethnically owned businesses in Los Angeles County, Paul Ong and collaborators found that growth in Asian and small commercial establishments in TODs lagged behind the county average, despite the fact that real estate activity was higher in the TODs than for the county (Ong, Pech, and Ray 2014).

**Finding: Commercial gentrification can also transform a neighborhood's meaning, but research is mixed on whether it is positive or negative for existing residents and businesses.**

## The Role of Public Investments in Neighborhood Ascent

The vast majority of gentrification literature has focused on private actors and capital. However, the public sector plays an important role in neighborhood transformation. While we have detailed the study of urban renewal and federal programs as part of the discourse on neighborhood decline, government has had a strong hand in neighborhood improvement as well, investing in physical infrastructure such as rail transit, schools, parks, and highways, as well as neighborhood-based organizations. These initiatives date from at least the 1950s urban renewal and public housing development and include more recent interventions like the Empowerment Zones of the 1980s and 90s, HOPE VI in the 1990s and early 2000s, and today's Choice Neighborhoods and Promise Zones programs, among many others.

As described above, in the 1980s persistent poverty in inner-city areas, particularly among the African-American community, led to extensive scholarly inquiry, and federal housing policy realigned to focus on the deconcentration of poverty through the development of mixed-income housing and housing mobility programs (Goetz 2003). This shift in federal policy "to encourage deconcentration is based on the consensus among policy makers and scholars that high concentrations of very-low-income households in housing" is detrimental (Popkin et al. 2000, 928). Federal programs promoting mixed-income housing development aimed to alleviate poverty, however have had mixed results (Joseph 2006).

Recently, critics of these programs have raised concerns that mixed-income developments displace those living in poverty rather than supporting their social mobility by catalyzing other upgrades and development (Bridge et al. 2012). These critiques have placed government policy and programs at the center of longstanding debates about the catalysts and consequences of neighborhood ascent, suggesting that certain housing policies represent "state-sponsored gentrification" (Bridge, Butler, and Lees 2012).

In addition to federal housing policy, numerous other federal, state, and local government investments have the potential to significantly alter the physical and social makeup of low-income neighborhoods.

Although few studies have looked at the impact of public investments on neighborhood demographic change, there is a significant body of literature on the impact of transit on property values, which is intimately tied to the social status of the people who live there. In the next section we review the relevant body of literature to begin to relate public investments in infrastructure to neighborhood demographic change, with a specific focus on transit.

### *Rail Transit*

Transit and transit-oriented districts (TODs) are viewed as desirable amenities in urban neighborhoods due to their accessibility. Scholars have found that areas adjacent to transit stops often experience thriving commercial activity with the introduction of shops, restaurants, and other businesses that attract commuters and non-commuters (Bluestone, Stevenson, and Williams 2008). However, disadvantages also exist from being "too close" to transit, which can result in heightened noise, congestion, pollution, and traffic (Cervero 2006; Kilpatrick et al. 2007).

In a review of existing research on the topic, (Giuliano and Agarwal 2010) state that, "the literature does not establish unambiguously whether or not rail transit investments get capitalized in property values." They attribute inconsistent findings in part to differences in research methods and in the local conditions in which transit investments are made. They note that transit systems have an appreciable impact on accessibility only where road networks are insufficient for handling travel demands (i.e., where congestion is severe). Other researchers, however, argue that the accessibility benefits of living near transit outweigh the potential nuisance effects, and that proximity to public transit often leads to higher home values and rents (Wardrip 2011).

Most empirical studies on the impact of transportation investments focus on changes in property values rather than land use, household, or racial transition. (Landis et al. 1995) suggest this may be due to the fact that property value data is more widely available than data such as land use. In general, the literature agrees that transport investments (new stations, TODs) have economic benefits primarily if they improve access significantly. Households with easy access to public transit

are able to spend less on transportation and can thus afford to spend more on housing (Kilpatrick et al. 2007). Economic theory suggests that the value of decreased travel time should be reflected in home prices, as reviewed in Hess and Almeida (2007). Benefits tend to be the highest near, but not too near, network access points such as rail stations or freeway ramps.

Several recent literature reviews have summarized research related to the home price premiums that come with proximity to transit. These premiums vary significantly. (Cervero and Duncan 2004) found that the premium for home prices ranged from 6 percent to 45 percent (2004). Another literature review set the range between 3 percent and 40 percent (Diaz 1999). A third review, involving heavy and light rail systems only, found a maximum premium of 32 percent, although some studies found no effect, while others found negative effects (Hess and Almeida 2007). Summarizing the available research is difficult, because as (Duncan 2008, 121) argues, generalization is problematic owing to different methodologies and contexts. He concludes: "The most that one might safely generalize from the body of literature is that properties near stations sell at small to modest premiums (somewhere between 0% and 10%)."

There are two common methods to study the effect of transit proximity on housing costs. One is to compare residential prices near transit with similar homes farther away, using a hedonic price model to separate out the effects of housing characteristics from the impact of location.[4] The other method, "Pre/Post studies," which examines prices in an area before and after the initiation of transit, represents another, albeit less utilized, method to examine the effect of transit on housing costs.

In hedonic price models, the independent variable for modeling the price effects of transit is most often the distance from the nearest transit station (Chatman, Tulach, and Kim 2012; Duncan 2008; Cervero and Duncan 2002a), measured along streets or in terms of distance rings. Two earlier studies from Toronto have utilized weighted travel-time-based measures as an alternative to distance travelled (Bajic 1983; Dewees 1976). Hedonic price models may also use monetary savings[5] as an independent variable, inquiring how travelers respond when faced with a tradeoff between time and money, for example, when offered the option to pay extra for a faster trip (Nelson 1992; Lewis-Workman and Brod 1997; Chen, Rufolo, and Dueker 1998; Gatzlaff and Smith 1993; Wardman 2004). "Pre/Post" studies, although less commonly used because they require access to longitudinal data (Chatman et al. 2012), are considered "more optimal" because they make it easier to establish causal links (Duncan 2010: 5). A summary of the literature using hedonic price models and "Pre/Post" studies is included in the Appendix B.

Overall, the impact of transit on home values can vary depending on a number of mediating factors. Wardrip (2011) outlines several reasons, which include: housing tenure and type, the extent and reliability of the transit system, the strength of the housing market, the nature of the surrounding development, and so on. In an area with a strong housing market and a reliable transit system, the price premium may be much higher than the average. Additionally, effects may vary for different stations within a single market. For instance, averages can hide a lot of variation, and transit

[4] The basic premise of the hedonic pricing method is that the price of a marketed good is related to its characteristics. In the case of housing, this relates to square footage, number of rooms, amenities, etc. (http://www.ecosystemvaluation.org/hedonic_pricing.htm).

[5] Total travel time costs are the product of the amount of time (minutes or hours) multiplied by unit costs (measured as cents per minute or dollars per hour). Generally, travel time unit costs are calculated relative to average wages (Litman, 2011: 4). Personal travel time unit costs are usually estimated at 25-50% of prevailing wage rates, with variations due to factors such as age, income, or length of commute (Waters 1992; Litman 2007).

stations may have little or no impact on housing prices in some neighborhoods but a significant impact in others (Wardrip 2011). Some studies have also found that transit expansion plans may drive increases in property values before anything is built (Knaap, Ding, and Hopkins 2001). Finally, research suggests that heavy rail systems have a greater impact on property values than light rail systems. This is likely due to heavy rail's greater frequency, speed, and scope of service as compared to most light rail networks, as reviewed by (Brinckerhoff 2001; Lewis-Workman and Brod 1997; Landis et al. 1995).

### *Rail impacts on Commercial Land Values*

Most studies have focused on the impact of transit investment on residential properties. However, a few studies have examined the relationship between transit and commercial property values. A study of Northern California's Santa Clara County light-rail system found that properties within a half-mile of stations experienced rent premiums, and those that were a quarter- to a half-mile away were worth even more (Weinberger 2001). In another study of Santa Clara, (Cervero and Duncan 2002b) found that the commercial property land values were higher for commuter rail access than for light-rail access, which is the opposite result observed for apartments in the same city (Cervero and Duncan 2002c). In a meta-analysis of existing studies, Debrezion, Pels, and Rietveld (2007) found that commercial properties within a quarter-mile of the station were 12.2% more expensive than residential properties located the same distance away. Farther away from the station, residential properties received a higher premium than commercial properties.

**Finding: New fixed-rail transit has a generally positive effect on both residential and commercial property values, but its impact varies substantially according to context.**

### *Bus and Bus Rapid Transit*

Several scholars have described Bus Rapid Transit (BRT) as an attractive modal transit option (R. B. Diaz and Schneck 2000; Levinson et al. 2002; Polzin and Baltes 2002; Vuchic 2002). The attributes favoring BRT are its lower capital cost relative to other modes (such as fixed rail) (US GAO 2001) as well as its flexibility in implementation and operation (Jarzab, Lightbody, and Maeda 2002).

There is limited evidence about the relationship between land values and BRT (Rodriguez and Targa 2004; Johnson 2003). Similarly, traditional bus service is rarely considered when discussing the impact of transit on housing costs. In their review of the literature, Hess and Almeida (2007, 1043) explain that "…property values near bus routes have only modest gains, if any, from transit proximity, because most bus routes lack the permanence of fixed infrastructure."

Much attention and research has been focused on Bogota, Colombia's BRT TransMilenio. What makes TransMilenio an interesting case study is that affordable transport was coupled with affordable housing initiatives. This has been made possible with an innovative land-banking/poverty-alleviation program, called Metrovivienda, which was introduced in 1999 (Cervero 2005). Under this program, the city acquires land and provides public utilities, roads, and open space. Afterwards property is sold to developers with the stipulation that average prices be kept under a certain price and affordable to families with incomes of US$200 per month. An important aspect of the Metrovivienda program is the acquisition of land well in advance of the arrival of the BRT services. This has enabled the organization to acquire land before prices become inflated by the arrival of the BRT. This is important because, as a recent study found, those residing close to TransMilenio stations pay higher monthly rents: on average, housing prices fell between 6.8 and 9.3 percent for every five minutes' increase in walking time to a station (Cervero 2005).

Thus, acquiring land in advance has kept prices affordable for low-income households. However, more recent work has shown that by failing to leverage development around BRT stations, the TransMilenio system has created regional mobility at the expense of accessibility for the poor (Cervero 2013).

In North America, the relationship between accessibility to BRT and land values is only examined by a handful of studies focusing on bus priority treatments (high-occupancy-vehicle (HOV)-bus lanes) and transit ways. In an early study, (Knight and Trygg 1977) examined HOV-bus lanes in Washington, D.C.; California; Seattle; and Florida. They relied on previously published reports, interviews, aerial photographs, and other secondary sources available at the time to conclude that exclusive bus lanes incorporated into highways appear to have no impact on either residential or commercial development. A later study by Mullins, Washington, and Stokes (1990) found that the BRT in Ottawa, Canada, appeared to have some effect on land development in areas surrounding stations. A review of studies from Houston, Pittsburgh, Pennsylvania; and San Francisco conducted by Rodriguez and Targa (2004) revealed that bus transit had no impact on either residential or commercial development. A hedonic analysis applied to Los Angeles's BRT, one year after its initiation, did not detect any evidence of benefits to nearby multi-family parcels (Cervero and Duncan 2002a). More recent work, however, found that Los Angeles' Orange BRT Line had an effect on the neighborhood real estate market. Between 2000 and 2012, areas near the Orange Line saw median rent increase by 25% compared to 15% in the control area. Renter occupancy increase by 9% compared to 0% in the control area, and home value increase by 47% compared to 34% in the control area (Brown 2014). No significant differences in median income or household vehicle ownership were found; however, other demographic characteristics (growth, education, and race) were found to significantly change.

Rodriguez and Targa (2004) suggest that these mixed results could be partially explained by the BRT's lack of fixed guideways, as well as the cross-sectional research design and the newness of the service. Indeed, a study of a 25-year-old BRT system in Pittsburgh found a significant price premium for homes selling near it (Perk and Catala 2009). The implication is that where a BRT system can bring lasting improvements in accessibility on par with a fixed-rail transit system, housing markets may respond accordingly.

**Finding: Preliminary evidence suggests that BRT has limited or no effects on local property values.**

### *Transit-Induced Gentrification*

Although the vast majority of the literature has focused on the impacts of transit investments and planning on real estate value, a number of scholars are beginning to investigate the relationship between transit investments and the demographic shifts common in gentrifying neighborhoods as well (Lin 2002; Chapple 2009; Kahn 2007; Pollack, Bluestone, and Billingham 2010; Dominie 2012; see Appendix D for a summary of L.A.-specific TOD studies and policy reports). Studies have also found that the real estate premiums associated with rail investment can alter the demographic composition of the surrounding neighborhood (R. Diaz 1999; Cervero and Duncan 2004; Lin 2002).

There are several factors that scholars cite as the likely cause of gentrification near transit. The demand-side argument claims that transit is likely to spur gentrification when the new transit modes (rail, bus, etc.) provide a viable alternative to the car, thereby attracting higher-income

households. The reduction in transportation costs for residents is also thought to increase land values, attracting higher-value uses and higher-income residents (TCRP 2004).

The supply-side argument claims that transit is likely to cause gentrification when it counters pre-existing patterns of disinvestment. Thus, gentrification around transit investments is likely to occur when there is a credible commitment to large-scale investment: reinvestment in a disinvested neighborhood is likely when it appears that an actor (a state agency, financial institution, or large landowner) demonstrates a commitment to refurbish the physical environment at a scale capable of influencing the area's land or housing market (Knaap, Ding, and Hopkins 2001; N. Smith 1979). Large transit investments appear to have been used successfully and intentionally to demonstrate this type of commitment (Pollack, Bluestone, and Billingham 2010).

Pollack and coauthors (2010) affirm that transit can be a catalyst for neighborhood renewal, and that such improvements to neighborhood accessibility could potentially "price out" current residents because of rising property values. Despite the connections between improved accessibility, higher property values, and gentrification, only a few studies address these issues explicitly, and few look at issues of income and race (Lin 2002; Kahn 2007; Pollack et al. 2010; Dominie 2012). Thus, while Lin (2002) and Kahn (2007) develop models to explain the relationship between neighborhood gentrification and transit, they do not take into account race and ethnicity. See Appendix C for further detail on these studies.

### *Other Public Investments*

Government investment in a wide range of neighborhood infrastructure and services can also have significant impacts on property values and neighborhood change. In this section we outline the literature on the impact of schools, parks and open spaces, and highways on housing prices.

### *Schools*

The quality of public schools is widely believed to be a key determinant of housing prices (Max 2004). A number of studies employ hedonic regression models to examine this relationship. In 1969, Oates documented a positive relationship between school expenditures and housing values in 53 northern New Jersey municipalities. Following Oates' work, a number of researchers have estimated similar relationships. Most of these studies have produced similar findings. For instance Dubin and Goodman (1982) estimated the impact of school performance and crime measures on housing prices in Baltimore, finding a significant relationship between real estate value and school characteristics such as the pupil-to-staff ratio, average teacher experience, percent of staff with a graduate degree, and third and fifth grade test scores. In Minnesota, Reback (2005) identified the capitalization effects of a school choice program, finding that the adoption of an inter-district open enrollment policy weakened the link between local school quality and property values.

### *Parks and Open Spaces*

Extensive research has tried to value urban parks, forests, and open space through analysis of property data and stated preferences. The majority of these studies use hedonic analysis of property sales data, finding that home values increase with proximity to a park (Bolitzer and Netusil 2000; Acharya and Bennett 2001; Lutzenhiser and Netusil 2001; Troy and Grove 2008; V. K. Smith, Poulos, and Kim 2002) looked specifically at the price effects of urban greenways, or linear

areas of open space along rivers, streams, or abandoned railroad corridors in Austin, finding such adjacency resulted in significant increases in property values. Studies often distinguish broadly between protected open space, such as public parks and land under conservation easement, and developable open space, such as privately owned agricultural land (Irwin and Bockstael 2001; Irwin 2002; Geoghegan 2002; Bucholtz, Geoghegan, and Lynch 2003). This difference is relevant because studies have found that preserved open space surrounding a home increases home value, while developable open space has a lesser, insignificant, or negative effect on home value (Anderson and West 2006). Finally, in a study of Baltimore, Troy and Grove (2008) found that crime is a critical factor conditioning how residents perceive parks and how this is reflected in the housing market.

***Highways***

Studies of the impact of highways on nearby land and housing values date to the beginnings of the Interstate Highway Program (Adkins 1959; Mohring 1961). Huang (1994) reviewed the hedonic price literature, finding that studies from the 1950s and 1960s usually revealed large land price increases near major highway projects. Later studies, from the 1970s and the 1980s, typically showed smaller and often statistically insignificant land price effects from highway projects. Both Giuliano (1989) and Huang (1994) argued that this happens because as the highway system was developed in many urban areas, the value of access to any particular highway was reduced because accessibility was then generally good throughout the network. Huang (1994) also noted that for residential properties, noise and other disamenities reduce the value of locating close to a highway. Finally, using access rather than distance, Voith (1993) found that highway access (measured by travel time by highway to downtown) influenced housing prices in the Philadelphia area and that the magnitude of that effect increased during the 1980s.

**Finding: Proximity to high quality schools and parks, as well as access to highways, increases home values.**

# Understanding Negative Impacts of Gentrification: Displacement

Gentrification scholarship has used primarily qualitative research methods to uncover the causes and reveal the motivations of individual actors in neighborhoods. Unlike scholarly discourse on decline and revitalization in the 1950s and 1960s, the gentrification debates since the 1970s have largely neglected the public sector. Attention is shifting today, however, as increasingly, particular kinds of federal investments – specifically in mixed-income housing – have raised questions about state-sponsored or -catalyzed gentrification. The primary concern of gentrification is one of its negative outcomes: displacement[6]. Given today's landscape of public investment, advocates and scholars are increasingly concerned that public investments may create a situation in which incumbent residents have fewer options than they did before and are forced out or cannot move in.

To fully understand this concern, we now turn to review the literature on displacement. This literature has dominated much discussion by gentrification scholars since the early 1990s, and represents a departure from the methods employed until then. As we will describe, scholars

[6] Other negative consequences of gentrification that are not reviewed here include a sense of loss of place and belonging and erosion of social networks, community resources, and political power, among others.

became increasingly concerned with measuring displacement, assessing its extent, and predicting it as a result of first public and then private revitalization efforts.

Consistently activists, residents, and social justice actors identify displacement as the biggest impact of concern resulting from neighborhood revitalization and gentrification. Anxieties about residential, retail, and job displacement reflect the lived experience of neighborhood change and the social memory of displacements past. Yet social science research attempting to quantify the scale and nature of residential displacement has come up short. Why the discrepancy?

In this section we review the body of research on residential displacement related to gentrification, neighborhood investment, and revitalization. By tracing attempts to define and measure displacement, we highlight significant methodological limitations including data availability and narrow definitions of displacement and explore specific interpretations of the significance of displacement, which potentially mask the impacts on communities.

## Defining Residential Displacement

The Federal Urban Renewal program, local redevelopment efforts, and interstate highway construction of the 1950s and 60s forcibly displaced communities of color and low-income communities in urban neighborhoods en masse. Following these policy efforts, urban activists were particularly sensitive to the risks of displacement and the role of government in facilitating displacement. However, the nature of this displacement in the 1970s was no longer solely driven by forced removal by public action. Instead, a growing "back to the city" trend perceived to be largely driven by private actions and individual preferences, albeit with significant yet perhaps more subtle influences from the public sector[7], began to dominate the public concerns with neighborhood change and residential displacement (Clay 1979).

In 1978 the United States Department of Housing and Urban Development (HUD) sponsored the first of a series of reports on revitalization and displacement called "Urban Displacement: A Reconnaissance" (Grier and Grier 1978). In this report, authors Eunice and George Grier listed 25 factors that might lead to the involuntary movement of people from their place of residence (Figure 1.1). These factors imply a diverse set of actors: natural disasters; building owners who initiate condominium conversion or rent increases; local government conducting proactive code enforcement and planning decisions; federal government initiating large-scale urban renewal; and banks engaging in redlining practices, to name a few.

[7] Although large-scale urban renewal has dominated the social imagination about the ways in which the public sector can influence neighborhood change and displacement, myriad public interventions can influence the composition of neighborhoods: from tax abatement programs to zoning decisions and pro-active code enforcement.




**Figure 1.1 "Some Conditions Resulting in Displacement in Urban Neighborhoods"**
*Source: (Grier and Grier 1978, 2)*

In an effort to provide a definition of displacement that encompasses these various drivers, Grier and Grier proposed the following definition, which has been adopted by numerous researchers and agencies in subsequent decades:

> "Displacement occurs when any household is forced to move from its residence by conditions which affect the dwelling or immediate surroundings, and which:
> 1) are beyond the household's reasonable ability to control or prevent;
> 2) occur despite the household's having met all previously-imposed conditions of occupancy; and
> 3) make continued occupancy by that household impossible, hazardous or unaffordable." (Grier and Grier 1978, 8)

Although they use the term "forced" in their definition of displacement, Grier and Grier do not equate "forced" with involuntary. In fact, they describe the fact that many who are displaced are subject to a variety of actions or inactions that can be frank or subtle, therefore concluding:

> "For most residents to move under such conditions is about as 'voluntary' as is swerving one's car to avoid an accident. By the time the landlord issues notices of eviction, or the code inspector posts the structure as uninhabitable, few occupants may be left. Therefore we cannot define displacement simply in terms of legal or administrative actions – or even draw a clear-cut line between 'voluntary' and 'involuntary' movement." (p.3)

Newman and Owen (1982) extend the critique of the false distinction between voluntary and involuntary moves to moves driven by economic reasons when stating that "low-income households who experience extremely large rent increases may technically 'choose' to move, but the likelihood that they had any real alternative is very small" (p.137).

In an effort to categorize the causes of displacement, Grier and Grier distinguish between disinvestment displacement, reinvestment displacement, and displacement caused by enhanced housing market competition, despite their obvious inter-connections. Disinvestment-related displacement describe the conditions under which the value of a property does not justify investing in its maintenance, thereby resulting in decay and abandonment. Reinvestment-related displacement refers to the case where investments in a neighborhood result in increased rent to a point where it's profitable to sell or raise the rent, and tenants are forced to leave. The authors are

careful to note that "unrelated as they seem, these two conditions of displacement may be successive stages in the cycle of neighborhood change" (p.3). Finally, enhanced housing market competition referred to broad shifts in the national and regional housing market, which they argue have an even larger impact than disinvestment or reinvestment forces, although again acknowledging the inter-relationship among the three. As an example they discuss the needs of the then-young baby boom generation that were not being met by housing production of mostly single-family suburban homes, thus resulting in pressures on the pre-existing urban housing stock.

The distinctions in these three types of displacement pressures resurfaced eight years later when Peter Marcuse analyzed displacement in New York City (Marcuse 1986). Marcuse argued that when looking at the relationship between gentrification and displacement one must first consider the disinvestment of urban neighborhoods and subsequent displacement, which makes land ripe for investment with gentrification of "vacant" land. From this perspective gentrification can happen long after abandonment-induced displacement. Therefore, he argues, most gentrification-induced displacement studies significantly underestimated the magnitude of the problem and therefore "chains" of displacement must be considered. He further distinguishes between displacement caused by physical reasons (e.g., water is turned off, evictions, rehab, etc.) and economic causes (e.g., rising rent). In addition, Marcuse introduces the concept of exclusionary displacement, modifying Grier and Grier's definition of displacement to define exclusionary displacement as:

> "Exclusionary displacement from gentrification occurs when any household is not permitted to move into a dwelling, by a change in conditions, which affect that dwelling or its immediate surroundings, which:
> a) is beyond the household's reasonable ability to control or prevent;
> b) occur despite the household's being able to meet all previously-imposed conditions of occupancy;
> c) differs significantly and in a spatially concentrated fashion from changes in the housing market as a whole; and
> d) makes occupancy by that household impossible, hazardous or unaffordable." (p. 156)

Although Marcuse's four categories of displacement (e.g., direct/physical, direct/economic, chains of displacement, and exclusionary) provide the most comprehensive definition available, he warns that to sum across the categories would lead to an over-estimate of displacement as there is considerable overlap between them; yet to exclude any source could produce an underestimate.

Despite these early attempts to define displacement and the fact that most authors have formally adopted one or the other definition, in operationalizing the term for the means of study, most researchers have narrowly defined displacement as evictions or unaffordable price increases. This narrow focus stems from two factors. Researchers have access to limited data and are challenged to impute the motivation behind household moves. Tracking which exits from a neighborhood are displacement-motivated is difficult; measuring displacement is akin to "measuring the invisible" as the population under question has moved away from the place of study (Atkinson 2000). Perhaps because of this, definitions and operationalization of displacement is often driven by the data available. Furthermore, scholars often define displacement based on the scope and sponsor of their research agenda. For instance, many of the early HUD-funded studies on displacement were specifically concerned with the role of HUD programs in residential displacement and therefore narrowly defined it as displacement resulting from public action (US HUD 1979). Another study (Schill, Nathan, and Persaud 1983) that focused on revitalization-induced displacement defined displacement as that occurring as a result of "neighborhood reinvestment or upgrading" (p.47).

For the purposes of this literature review we do not adopt a singular definition of displacement. In our effort to review and evaluate the disparate literature on residential displacement, however, we adopt the framework of Marcuse (1986) and Grier and Grier to classify the types of displacement studies analyzed. As each of the studies reviewed below utilizes slightly different definitions of displacement in their analysis, we make a point to highlight their operating definitions in addition to the methods and results of their study.

**Finding: Displacement takes many different forms—direct and indirect, physical or economic, and exclusionary—and may result from either investment or disinvestment.**

## Measuring Residential Displacement

Researchers have varied in their approaches to studying gentrification/revitalization-induced displacement. Studies use qualitative and quantitative methods to answer a variety of questions ranging from the nature of displacement (e.g., how many and who gets displaced, where they move to, who is most vulnerable, and so on) to the causes (e.g., changes in rent, conversions to condos, disinvestment, and the like.) and consequences of displacement (e.g., neighborhood destabilization, re-segregation, crowding, disparities in rent burdens, satisfaction with new neighborhoods, and so on). For most of the studies reviewed, a number of questions are addressed in each, making it challenging to categorize studies by the questions they seek to answer. Instead, we review the studies on residential displacement chronologically; because of shifts in understanding and interests, data availability, and statistical methods, the timing of the study largely coincides with methodological approaches.

In the following sections, we review specific studies and then compare across studies to identify common methodological challenges, persistent gaps in inquiry, and promising indicators to include in our research. We proceed by summarizing relevant studies on displacement along the following dimensions: a) the context in which the studies were undertaken and the resultant questions that preoccupied them, b) the research approach, c) the source and type of data used, d) their working definition of displacement and gentrification/revitalization, e) their results, and f) the strengths and shortcomings of the study.

As mentioned above, quantitative studies on displacement found their origins in the late 1970s as urban America was witnessing a wave of downtown reinvestment following the urban crises. Because of the newness of the phenomenon, many early studies on displacement were concerned with quantifying its magnitude to determine if it was a "significant" phenomenon. In the late 1970s, for instance, HUD was actively considering the adoption of policies to address displacement associated with HUD's programs. In the 1979 "Displacement Report" they reviewed a series of case studies and national datasets to evaluate the nature and magnitude of the "displacement problem." Although it cited Grier and Grier's definition of displacement, the report mostly focused on displacement occurring as a result of eminent domain related to federal, state, or local government activity. Emphasis was placed on the results from the nationally representative American Housing Survey from which the report estimated that nationally, independent of neighborhood or city of residence and independent of the vulnerability of the household (i.e., income or race) over half a million households were displaced each year. When evaluated in light of the fact that 20% of all United States households move each year and in conjunction with data on the scale of urban revitalization the HUD report concluded that "the population and economic trends represented by 'revitalization' in urban areas are far too small to slow significantly or to reverse the movement to the suburbs and the loss of economic activity by central cities" (US HUD 1979, iii). These

conclusions were reached despite citing evidence from case studies in revitalizing neighborhoods in Seattle and Washington, D.C., which showed that nearly 20% of people moving out of revitalizing neighborhoods were displaced. This early study and its ambiguous criteria against which it evaluated the "significance" of the displacement phenomenon would prove to be a common theme in future studies that have displayed a lack of transparency and little consistency in how to assess displacement's significance.

One of the outcomes of HUD's initiative, however, was to invest in a series of research studies to better understand and quantify the magnitude and impacts of neighborhood revitalization and displacement. Two HUD-funded studies stand out for their methodological rigor. These studies identified and surveyed displaced households from revitalizing neighborhoods to find out their reasons for moving out. The first, a study of "Market Generated Displacement" (NIAS 1981), was concerned with the rapid revitalization of San Francisco's Hayes Valley neighborhood and the potential impacts on pre-existing residents. The researchers conducted a survey of previous residents who left the neighborhood, new residents who moved in, and residents who remained. They found that from 1975-1979, one out of four of the out- and intra-neighborhood movers from their sample were displaced, which they defined as any non-voluntary reason for moving except lifecycle factors (i.e., divorce, unemployment). They also found that displacees of Hayes Valley were more likely to be black, less educated, poor, renters, elderly, and living alone in comparison to in-movers and stayers. Displacees moved out for a variety of reasons, including investment-related causes (i.e., rising rent, eviction, condo-conversion), but also disinvestment-related reasons (i.e., crime, poor housing quality, poor schools.), calling into question both the nature and timing of neighborhood revitalization, disinvestment, and displacement, making it hard to identify a linear relationship or a before and after period. They did not, however, explicitly link information on the public or private revitalization investments in the neighborhood with displacement, and their study lacked any comparison to non-revitalizing neighborhoods, thereby limiting their ability to contextualize their results on the displacement impacts of revitalization.

Asking similar questions about the impacts of revitalization on residential displacement, in 1983 Michael Schill and coauthors published a study on displacement trends in nine revitalizing neighborhoods of five cities[8] (Schill, Nathan, and Persaud 1983). They surveyed and interviewed out-movers from these neighborhoods to better understand the frequency and effects of neighborhood reinvestment. From this sample, they found that 23% of out-movers in 1978-80 were displaced, which they defined as the following reasons for moving out of their neighborhood: 1) the rent was increased too much, 2) they were evicted or 3) the house they were renting was sold. Using statistical regression, Schill and coauthors found that crowding, frequency of previous moves, unemployment, and marital status predicted displacement. Although they conclude that the "advantages of neighborhood reinvestment outweighed its disadvantages" (p.7), their research also suffered from data limitations given the potential under-sampling of the most vulnerable and more transient households, since they were less likely to be detected by the door-to-door canvass used to construct the list of out-movers, as well as the absence of control neighborhoods. Furthermore, these authors look only at a two-year timeframe and do not define the stage of revitalization each of the neighborhoods were experiencing, thereby potentially missing what Marcuse would describe as chains of displacement, in addition to ignoring exclusionary displacement effects of revitalization.

In one of the first studies to try to estimate the national displacement rate associated with urban revitalization, Newman and Owens (1982) used longitudinal data from the Panel Study on Income Dynamics to estimate the scale, nature, and impacts of displacement. They considered people to be

[8] Boston, Cincinnati, Richmond, Virginia, Seattle, and Denver

displaced if they moved out of their previous residence because of: the conditions of the house/neighborhood, public action, and eviction by the landlord because of sale or reoccupation. Newman and Owens found that the average annual rate of displacement between 1970 and 1977 was roughly 1 percent, however when calculated as a fraction of all families who moved, the proportion was 5 percent and of urban families 8.2 percent. Using this dataset the authors were able to follow people over time, yet they lacked information on neighborhood conditions, thereby limiting their ability to make inferences about revitalization-induced displacement.

Research on gentrification and displacement waned in the late 1980s and early 1990s. However, in many respects the economic boom of the 1990s reinvigorated both the revitalization of downtown areas and the study of gentrification-induced displacement. Although sharing in some of the questions and methodologies of the previous literature, the new wave of displacement studies capitalized on larger, more detailed datasets, allowing for the introduction of control neighborhoods and the use of more advanced statistical techniques in an attempt tease out the independent effects of gentrification on residential displacement. Many of these studies also pay much closer attention to the impacts on disadvantaged households rather than studying displacement of the general population.

In one of the first attempts to use more detailed, disaggregate data to understand the displacement impacts of gentrification, Rowland Atkinson (2000) combined cross-sectional and disaggregate longitudinal census data for London. To proxy gentrification, he used increases in the number of professionals and managers in the neighborhood and approximated displacement by decreases in the number of residents from the following vulnerable groups: working class, unskilled labor, renters, unemployed, people of color, elderly and single-parent households. From this analysis he found a clear link between the rise in gentrification and displacement of vulnerable groups. Atkinson was one of the first to focus on specific vulnerable populations in his operationalized definition of displacement. Yet he cautioned that the study at the large ward- and district-scale with "noisy" data does little to provide a deeper understanding about the impacts of displacement, for which he suggests more qualitative research.

In response to the growing negative perception about the impacts of gentrification, in 2001 Jacob Vigdor asked if low-status households were more likely to exit housing units in gentrifying zones relative to other parts of the Boston metropolitan area. He analyzed aggregate census data and the American Housing Survey data by running a regression of residential stability on location in a gentrified zone, which had populations of roughly 100,00-200,000 people. Although he did not limit his analysis to this, he generally defined preference-driven gentrification as increased educational attainment and income-driven gentrification as increased owner-occupied housing values. In addition, he did not specify what constitutes displacement, but rather proxied it as any exit from a neighborhood that falls within a general "gentrifying region." Vigdor found that housing turnover was greater in gentrifying zones; however, educational attainment, which he used as an indicator of poverty, appeared to predict housing stability rather than turnover when interacted with location in a gentrified zone. Furthermore, he found that a poor household was more likely to exit poverty than to be replaced by a non-poor household. Vigdor's study emphasized the difficulties in characterizing the counterfactual: what would have happened to low-income residents if gentrification had not occurred? He chose to compare the moves of low-status households in gentrifying zones to non-gentrifying zones; however, the large size of the zones could significantly smooth over neighborhood variability, thereby limiting his ability to answer the question he asked.
Lance Freeman and Frank Braconi (2004) hailed the potential benefits of affluent households moving back to central cities and sought to help governments evaluate the potential negative consequences of policies to promote gentrification. Applying similar methodologies as Vigdor for

New York City, with the distinct advantage of having a higher spatial resolution and disaggregate data available from the New York City Housing and Vacancy Survey (NYCHVS), the authors compared the exit rates of poor households in gentrifying sub-boroughs (roughly 47,000 households) to the exit rates of the poor in low-income neighborhoods that did not gentrify. They classified a sub-borough as gentrifying based on higher rates of growth in white populations, monthly rent, educational attainment, and median income in contrast to other New York City neighborhoods. They did not, however, include an operational definition of displacement beyond neighborhood exits.

Controlling for life-cycle variables (e.g., age, marital status, children) and housing unit characteristics (e.g., rent, tenure, overcrowding in their regression, they found that poor households residing in gentrifying neighborhoods were less likely to move than poor households residing elsewhere. They do note, however, people moving into gentrifying neighborhoods were of a higher socio-economic status than those leaving. Despite these indications of exclusionary displacement, however, Freeman and Braconi state "a neighborhood could go from a 30% poverty population to 12% in as few as 10 years without any displacement whatsoever, providing that all vacated units are rented by non-poor households" (p.50). The authors also note that their findings could be due to the large spatial area and that the lower rates of residential mobility could be due to a lack of affordable housing in familiar nearby locations. In their later study, Newman and Wyly (2006) critiqued Freeman and Braconi's findings, pointing to the "chain of displacement" arguments that the "gentrified" neighborhoods had already seen the displacement of poor households in decades earlier. Furthermore, they argue, the non-gentrifying poor neighborhood control groups included residents of some of the poorest areas of the city with respective high turnover rates, creating an artificially high standard to use as a control.

Building off this analysis with a nationally representative sample, in his 2005 analysis of data from the Panel Study on Income Dynamics, Freeman compared displacement in poor gentrifying census tracts to poor census tracts that did not gentrify. He defined gentrifying census tracts as those disinvested, low-income central city tracts that experienced increased investment and educational attainment. Freeman considered displacement-motivated moves as those where residents wanted to consume less space, pay less rent, were evicted, got divorced, joined the armed forces, or other involuntary reasons. Freeman found that rental inflation was a significant predictor of mobility, and displacement was higher in gentrifying as opposed to non-gentrifying tracts. He also found that for in-movers the poverty rates declined and educational levels increased more sharply in gentrifying than in non-gentrifying neighborhoods. Freeman also found that moves originating in gentrifying neighborhoods were more likely to end outside of the neighborhood when compared to the counterfactual non-gentrifying neighborhoods. He defined this pattern, however, as succession (or reverse filtering), rather than exclusionary displacement. Despite his significant findings, Freeman concluded that the overall rate of displacement was very small, since the probability of a household in a gentrifying neighborhood being displaced was "only" 1.3% (Freeman 2005). Given the fact that this data is nationally, not locally representative, the results likely mask a great deal of heterogeneity between metropolitan areas and even within Census tracts.

In response to the media's interpretation of the previous studies that gentrification benefits all, Newman and Wyly (2006) reanalyzed the NYCHVS data, adding a qualitative component to their research. Given the limitations from the dataset, they were only able to look at the sub-borough in their quantitative analysis. Narrowing their analysis of displacement to households that moved for reasons of housing expense, landlord harassment, and displacement by private action (condo conversion, for example), they found between 6-10% of all moves in New York City from 1989 to 2002 were due to displacement. They argued that this could be a significant underestimate,

however, due to the inability of the NYCHVS data to capture "doubling up" or staying with relatives, which they found from their qualitative analysis to be an important coping strategy. For the qualitative component of their study, the authors interviewed 33 key informants to assess the catalysts for physical, demographic, political, and economic change. Their interviews revealed tremendous displacement pressures resulting in crowding, homelessness, or people moving out of the neighborhood or even city. None of these dynamics, the authors note, were captured in the NYCHVS. Despite the significance of their modeled results, the authors emphasize the low predictive power of the model, which they attribute to deficiencies in the dataset. Furthermore, and similar to the limitations of previous studies, their spatial unit of the sub-borough was too large to fully understand neighborhood dynamics.

In a more recent analysis, McKinnish et al. (2010) analyzed the confidential national Census Long Form data from 1990 and 2000 to understand who moves into and out of gentrifying neighborhoods, which they defined as low-income tracts in 1990 where the average household income increased by more than $10,000. They did not explicitly define displacement, although they did look at exit rates of specific vulnerable population groups. The authors found that migrants into gentrifying tracts were more likely to be higher-income, college-educated, younger, white, and black, and less likely to be Hispanic, have children, and be immigrants when compared to non-gentrifying low-income tracts. McKinnish and coauthors also found that 33% of the income gains in gentrifying neighborhoods were due to the in-migration of middle-income black households. They found little difference in the in-migration rates of non-college-educated black households between gentrifying and non-gentrifying neighborhoods, leading them to conclude that exclusionary displacement was not occurring. They also found "modestly" high exit of low-education and retention of high-education households in gentrifying neighborhoods. Although this study improved upon previous studies with its access to household-level data, it suffered from methodological limitations of the Census sample size (one in six) that could differ from the census tract populations, the narrow definition of gentrification (including an influx of higher-income residents but not capital, i.e., higher property values), the possibility that neighborhood change may occur at a smaller geography than the census tract, and the masking of geographical variability (e.g., differences between strong- versus weak-market cities).

Wyly and coauthors (2010) updated their 2006 study using more recent NYCHVS data (2002-2008), asking if recent changes in housing assistance and rent regulations altered the choices available to displaced renters. Using slightly modified methods, the authors compared the number of people moving out of a neighborhood to the number of people moving into a neighborhood as a means of analyzing displacement pressures, maintaining their definitions of gentrification and displacement from their previous study. The authors found that annualized displacement rates ranged from a minimum of about 10,000-20,000 households per year; however, they emphasized the considerable uncertainty in these estimates. When comparing their results to local eviction data, the authors estimate that the NYCHVS misses 12 out of 13 displacements. Wyly and coauthors also ran a regression model finding that poor households with high rent burden were nearly twice as likely to have been displaced in comparison to other groups. While their statistical analysis did not find any significant relationship between household composition (for example, race) and displacement, the authors note that "the interwoven relations of urban life should not be obscured by the illusory cleanliness of a multivariate test…. Insignificant estimates do not mean that race, gender, or family structure are irrelevant just that they are inextricably bound up with other circumstances" (pg. 2615). Furthermore, they explained that household composition is determined partly by how people and families cope with high housing costs and displacement; that is, the variable is endogenous. Despite certain innovations, this study suffered from some of the same

methodological limitations as their previous study, namely those relating to the geographic resolution of their dataset.

Finally, Ellen and O'Regan (2011) used a nationwide dataset from the American Housing Survey to compare characteristics of households that moved into or out of gentrifying neighborhoods to better understand how and why neighborhoods experience income gains. The longitudinal nature of this dataset, which follows housing units over time, allowed for the researchers to identify the characteristics of households that moved both out of and into gentrifying neighborhoods, which they defined as neighborhoods experiencing a 5% gain in income relative to the metropolitan area. For displacement rates they calculated 2-year exit rates and modeled them as a function of neighborhood income gains controlling for a series of household life-cycle characteristics. They found that neighborhood income gains did not predict household exit rates, even among vulnerable groups. Age, renter, and minority status did predict exit rates for the overall sample, including gentrifying and non-gentrifying tracts. As opposed to other authors (e.g., Newman et al.), Ellen and O'Regan make no mention of the low predictive power of their models ($R^2$ of 0.122). Instead they take their results to indicate that there is "no evidence that original residents – even renters and poor households – exited these communities at elevated rates" (p.94). The authors suggested that selective entry and exit among homeowners were key drivers of neighborhood change. To some, however, such selective entry would be an indicator of displacement. The most significant shortcomings of this study were the narrow definitions of gentrification (not including private investment), the lack of information about reasons for moving, as well as the masking of geographic variability.

Although varied in their approaches, questions, and results, one consistent finding across these studies is that in-movers to gentrifying neighborhoods are wealthier, whiter, and of higher educational attainment, and out-movers are more likely to be renters, poorer, and people of color. The research also consistently shows that rent appreciation predicts displacement. A number of the above studies also found that government intervention in the housing market through rent stabilization and public housing programs are protective factors limiting the displacement effects of gentrification. However, the studies are not consistent in their finding that gentrification induces displacement. Why the discrepancy? One possible explanation for the unexpected residential stability is that in neighborhoods that are gaining new amenities (along with new residents), the normal neighborhood transition process slows; residents try harder to stay in the neighborhood, even if it means paying more rent in exchange (Chapple 2014). Yet, these higher rent burdens are unlikely to be sustainable over the long term, resulting in displacement in a longer term framework than is typically measured. In the following section we review some of the methodological limitations discussed above as a means to consolidate and advance future research directions.

**Finding: Despite severe data and analytic challenges in measuring the extent of displacement, most studies agree that gentrification at a minimum leads to exclusionary displacement and may push out some renters as well.**

## Challenges to Understanding Displacement

Most studies reviewed here suffer from significant data limitations and consequently limited advances in understanding what drives displacement and how to predict it. In this section we review the most common methodological limitations contributing to the conflicting and ambiguous understanding about the relationship between revitalization/gentrification and residential displacement. Among other limitations, we review the following four below: 1) inconsistent definitions and operationalization of the terms gentrification and displacement, 2) differences in

the definitions of a comparison group and controls to calculate and compare displacement rates, 3) the time-scale of analysis that may not capture the full processes of neighborhood change, 4) ambiguous criteria against which to determine the significance and meaning of research results. Together, these challenges limit the ability of researchers to adequately capture the full magnitude and impact of gentrification and displacement.

Each of the above reviewed studies defined and operationalized the concepts of gentrification and displacement in slightly different ways, not only making it difficult to compare across studies, but also significantly impacting the results achieved. For some, displacement only encompasses evictions, whereas others include such concepts as exclusionary displacement and even chains of displacement (i.e., Millard et al. not reviewed here). The vast majority of studies narrowly define displacement under what Marcuse would classify as physical or economic displacement, but ignore or dismiss exclusionary displacement as simply succession and replacement. This limitation results not only from data and methodological limitations, but also normative understandings of what constitutes forced displacement. Where one study may claim to find evidence of displacement (at least of the exclusionary kind) because in-movers are becoming whiter and more affluent, other authors may define such phenomena as merely succession or replacement. How we define the phenomenon matters for how we interpret the results. Furthermore, the definition and operationalization of gentrification is highly varied, and very few authors attempted to systematically capture the many dimensions of gentrification. In almost all of these studies (with the exception of Freeman), gentrification is proxied for by income change rather than private or public investment. However, an influx of capital into a neighborhood might have much stronger impacts on resident stability than simply higher-income households moving next door. Furthermore, the link between what predicts gentrification and subsequently displacement has not been made. It is important to not only understand if gentrification predicts displacement, but what dimensions of gentrification and what factors spurring gentrification also cause displacement.

Another key limitation is a lack of a consistent and clear identification of a comparison group. While some argue we should be comparing displacement from poor gentrifying neighborhoods to poor non-gentrifying neighborhoods (i.e., Freeman 2005 and Vigdor 2001), others believe we should be comparing to city-wide averages or more stable neighborhoods in general (i.e., Newman and Wyly 2006). Furthermore, some studies calculate displacement as a percentage of all movers or as a percentage of all households, either citywide or by neighborhood. These comparison groups are important because they not only provide a context against which to evaluate results, but also reveal belief systems about our normative understandings of how neighborhoods should function. More and more, researchers are becoming more transparent about the reference population and control groups, which is a trend that needs to continue.

Further obscuring the relationship between gentrification and displacement are the issues of timing. Neighborhood change is a long process, and many of the studies examined above only look at relatively short time periods. In its early phases, gentrification may not result in displacement, but over time, in the absence of protections, tenants may be forced to move. As a result, the principal barrier to studying the relationship is the lack of appropriate panel data to determine the extent of mobility and displacement. Furthermore, if one is to consider the full chains of displacement, as suggested by Marcuse, it would be important to extend our analysis to the period prior to gentrification to carefully consider disinvestment-related displacement as part of the gentrification-displacement phenomenon.

Finally, the review of this literature highlights the lack of any consistent measure or criteria against which to interpret study results. Whereas some studies highlight the low predictive power and

limited interpretability of their modeling results (i.e., Wyly et al. 2010) others barely even report on the statistical significance of their results or, when statistically significant (i.e., Vigdor 2001), minimize the relevance of findings based on the statistical magnitude of the effect. These inconsistencies are not unique to studies of gentrification and displacement, but rather social scientific inquiry in general. This likely highlights the underlying subjective nature of belief systems of social science research. For instance, some authors interpret their statistically significant results of the higher rates of displacement in gentrifying neighborhoods to be too small to be of concern (Freeman 2005). But for other researchers, such results are of concern because they significantly impact real people in real neighborhoods. Whether the impact is large or small is a relative interpretation that lies in the eyes of the beholder. This limitation, which mirrors the differences in the definition of the reference population and control groups, should be carefully examined, made transparent, and its implications should be discussed in any study that has the potential to impact real lives.

Much of the methodological limitations discussed above are ultimately data-driven. Where more detailed disaggregate data exist, it lacks information about households' reasons for moving (i.e., Panel Survey of Income Dynamics (PSID) or the Census long form) and does not have sufficient spatial resolution or coverage to contribute to local knowledge (i.e., National Household Survey). Where local data is available, it may not contain information about where displaced households are displaced from (i.e., NYHVS). Without panel data, it is not possible to understand the nature of turnover in a neighborhood (i.e., whether neighborhood household income changes are occurring to existing residents or newcomers). But even when datasets such as the American Housing Survey (the confidential panel version) or the PSID allow tracking of individual households, their responses to questions about reasons for moving are not precise enough to measure displacement (e.g., there is no answer option for "the landlord raised the rent"). For this reason it is important to not only compare and combine datasets as much as possible but to carefully understand and explore the implications of the data limitations as much as possible.

**Finding: Previous studies have failed to build a cumulative understanding of displacement because they have utilized different definitions, compared different populations, and adopted a relatively short timeframe; there is not even agreement on what constitutes a significant effect.**

## Indicators for Analyzing Residential Displacement

As is evidenced from the above review, researchers have used myriad indicators and sources of data for characterizing residential displacement, each with its own set of advantages and disadvantages. In this section we summarize the types of indicators and data used to analyze such indicators, highlighting the typical sources of such data. Table 1.1 summarizes quantitative data sources only. As discussed above, data on many of the drivers and impacts of gentrification and displacement are not regularly gathered or are hard to quantify. It is therefore important to consider qualitative sources of information to better understand the drivers and impacts of neighborhood change.

**Table 1.1 Indicators and Data Sources for Analyzing Gentrification and Displacement**

| Indicator Type | Indicators | Data sources |
|---|---|---|
| Change in property values and rents | Sales value, property value | County tax assessor's office, Department of finance, data aggregator |
| | Rent | Data aggregators, apartment operating licenses, craigslist |
| | Changes in availability of restricted affordable housing | HUD, housing departments |
| Investment in the neighborhood | Building permits, housing starts, renovation permits, absentee ownership | Jurisdiction's building or planning departments |
| | Mortgage lending and characteristics | HMDA and assessor data |
| | Sales (volume and price | County assessor's office, data aggregators |
| | Condo conversions | Assessor office, housing department, department of public works |
| | Change in community and business orgs (#, membership, nature of activities, etc.) | Chamber of commerce, NETS, neighborhood or local business associations, etc. |
| | Public investments (transit, streets, parks, etc.) | Public works departments, transit agencies, parks and rec, etc. |
| Disinvestment | Building conditions, tenant complaints, vacancies, fires, building condemnation, | Surveys, Census, maps, building departments, utility shut-offs, fire department |
| | School quality, crime, employment rates, neighborhood opportunity | Department of Education, Police Departments/crime maps, Census, Bureau of Labor Statistics |
| | Neighborhood quality | Local Surveys |
| Change in tenure and demographic changes | Tenure type, change in tenancy | Building department, assessor's office, census |
| | Evictions | Rent board, superior court |
| | Foreclosure | HUD, proprietary data sources |
| | Demographics data on in- vs. out-movers (race, ethnicity, age, income, employment, educational achievement, marital status, etc.) | Census, voter registration, real estate directories, surveys, American Housing Survey, DMV |
| Investment potential | Neighborhood and building characteristics (e.g., age and square footage, improvement-to-land ratio) | Tax assessor, Census, Deeds, etc. |
| | Neighborhood perceptions | Surveys of residents, realtors, lenders, neighborhood businesses, Newspapers, TV, blogs, etc. |
| Reasons that people move in/out of 'hood | Reason for move | Surveys of in- and out- movers, HCD housing discrimination complaints database. |
| Coping strategies / displacement impacts | Crowding/doubling up | Census, utility bills, building footprint |
| | Increased travel distance and time | Census |

# Implications for Strong versus Weak Markets

The intensity of gentrification, as well as how it is experienced by local residents, will differ according to market context. Where economic growth is above average and demand for land is strong, new private and public investment can accelerate neighborhood change and push up

property values. This process likely transforms neighborhood meanings and crowds out existing residents. Where the economy is more tepid, the new investment will also transform neighborhoods, but may not have the same displacement effects. The Center for Transit-Oriented Development (2013) has illustrated this market variation: new fixed-rail investments have transformed some neighborhoods while leaving others essentially unchanged.

Yet, the existing literature on gentrification and displacement fails to acknowledge these market differences. Many studies examine strong market cities such as New York, San Francisco, and London, with findings that may not be at all applicable to weaker market regions or even neighboring cities. Although these case studies provide some of the most methodologically rigorous analyses of neighborhood change processes, they do not provide systematic comparisons across market types. Where studies do look across market types, they typically try to predict change across many different metropolitan areas without controlling for local economies. As a result, these more systematic models likely have poor predictive value for individual metros. This in turn raises questions of the utility of these analyses for local policymakers.

**Finding: Existing studies rarely account or proxy for regional market strength, which undermines their relevance to particular contexts.**

# Urban Simulation Models and Neighborhood Change

In recent years, a number of computational models have sought to simulate aspects of neighborhood change associated with gentrification. The models discussed here fall into two broad categories: those that address the phenomenon of gentrification explicitly, and those that focus primarily on processes of residential choice and residential segregation, patterned after Schelling's early model of neighborhood "tipping" along racial lines (Schelling 1971). Roughly following the same division, the simulation models in the literature can also be grouped according to their structure. Models focusing on representing the movement of individuals and households into spatial patterns of settlement tend to be specified through "agent-based models," also referred to in the literature as "multi-agent systems," while models that focus on capturing inter-related patterns of change among spatially fixed entities (such as housing units or entire neighborhoods) tend to be specified through cellular automata (Torrens and Nara 2007). Additionally, a number of hybrid model specifications contain both spatially fixed automata and spatially mobile agents (Torrens and Nara 2007; Diappi and Bolchi 2013). The integrated land use and transportation models utilized by metropolitan planning organizations (e.g., UrbanSim and PECAS) simulate the individual decisions and interactions of agents (e.g., households, businesses), fixed physical characteristics of urban environments (e.g., buildings and transit), as well as larger structural constraints (e.g., land use regulations) (Johnston and McCoy 2006).

Despite their compatibility with the study of residential spatial dynamics, relatively few simulation models have been specified to focus explicitly on gentrification. One explanation for this paucity is the difficulty of adequately incorporating the breadth of social theory needed to account for the range of gentrifying mechanisms (Torrens and Nara 2007). Here we analyze four studies that attempt to simulate neighborhood economic and racial change. In developing the first widely published work on gentrification-based computational models, O'Sullivan (2002) relies heavily on Smith's rent gap theory for specifying the structure of his cellular automata model of gentrification in a region of East London. Specifically, O'Sullivan sets out to model the role of neighborhood status in determining the "gap" in a given parcel's potential and capitalized rents and the gap's impact on states of "for sale," "owner-occupied," "for rent," and "rented" (O'Sullivan 2002; p. 260). In assessing

the performance of the model, O'Sullivan suggests to nest the neighborhood within a broader urban structure, allowing neighborhood status to better reflect position within a wider city hierarchy.

Diappi and Bolchi (2013) model gentrification in Milan through a specification of "active agents," including real estate investors, housing owners and housing tenants; and "passive agents," which they specify as individual buildings. Within this general structure, investor agents choose to develop housing based on citywide assessments of rent gaps, housing owner agents make housing upkeep decisions based on localized market conditions, and tenant agents sort themselves into different housing units based on housing conditions, rents, and their (heterogeneous income-based) ability to pay. Additionally, potential rents are shaped by local amenities and proximity to the city center. Finally, the amount of capital that investor agents have to spend is shaped by exogenous business cycles (Diappi and Bolchi 2013; 89-90).

Similarly, Torrens and Nara, in a simulation of gentrifying change in Salt Lake City, specify properties and aggregations of properties as "fixed automata" and residential households as "mobile automata," which they liken to agents. Torrens and Nara (2007) reference the importance of capital-driven, supply-based approaches to modeling gentrification and include demand-based drivers of gentrification. Within this general framework, they generate nested patterns of behavior between household agents, large neighborhood markets that they chose to either enter or stay in, and specific housing properties within the market of choice. A number of variables drive the dynamics of these moves including spatial amenities and economic prosperity at the market level; price, housing quality, and spatial amenities at the property level; and economic status, amenity preferences, and moving thresholds at the household level. Notably, ethnicity (Latino or non-Latino) is also included as a state variable for both households and properties.

Finally, Jackson and coauthors (2008) utilize an agent-based model to study gentrifying patterns in Boston. While the structure of their model is similar to those of Diappi and Bolchi (2013) and Torrens and Nara, they operationalize gentrifying change as being driven by demand-side consumer decisions, rather than by supply-side development decisions, justifying this approach by pointing to the absence of an observed relationship between large-scale neighborhood investment projects and changes in nearby rents in Boston between 2003 and 2007. The residential dynamics simulated by Jackson et al. are driven by the interactions of four classes of agents: professionals, students, non-professionals, and elderly, each of whom are motivated by varying abilities to pay and preferences for neighborhood composition and amenity access.

The above four models (see Appendix E for further details), while exemplars of computational modeling approaches to gentrification, all suffer from a related set of limitations. First, each of the above models is constrained in its ability to theoretically ground mechanisms of neighborhood change. While the work of O'Sullivan (2002) and Diappi and Bolchi (2013) is well-grounded in Smith's rent gap theory, it does not incorporate competing theories of the drivers of gentrification, notably those focusing on the housing demand of gentrifying populations and their particular set of locational preferences. Similarly, all four models are limited by a lack of important empirical detail, both in their specifications of agent attributes (such as agent incomes and baseline parcel rents), as well as in their specification of neighborhood choice and parcel change mechanisms. An important example of the latter drawback is in the incorporation (or lack thereof) of race and ethnicity in the models. Despite empirical work demonstrating the importance of race above and beyond income in shaping housing decisions (see Charles 2003; Pais, South, and Crowder 2012), the majority of the models covered here do not include any measure of race or ethnicity.

Looking beyond models that explicitly simulate gentrification, a number of computational models examine processes of neighborhood segregation. The seminal model on which much of this work draws upon was specified by Schelling (1971) in an attempt to account for the dynamics of residential segregation between whites and blacks. In his model of residential movement on a simple grid, Schelling demonstrates that when whites and blacks are ascribed thresholds of same-race neighborhood preference, they can generate very sharp patterns of segregation, even when their preference thresholds are relatively innocuous.

More recent efforts have extended on this model in a number of ways (summarized by Huang et al. 2013). For instance, various extensions have modified the structure of neighborhood composition preferences and attached them to empirical estimates of residential preference (Bruch and Mare 2006; Xie and Zhou 2012), situated models in realistic and empirically grounded urban environments (Crooks 2010; Yin 2009), gone beyond binary racial distinctions to include interactions among a greater diversity of agents (Ellis et al. 2012; Clark and Fossett 2008), and incorporated competing sets of non-racial preferences (K. Chen et al. 2005). The range of residential choice mechanisms explored in these model extensions hold the potential to help refine and improve the incorporation of race in simulations of gentrification.

Finally, researchers are beginning to use integrated land use and transportation models to simulate neighborhood composition and gentrification. Using the Simple Integrated Land-Use Orchestrator (SILO) model, Dawkins and Moeckel (2014) analyzed the impact of an inclusionary housing program and more compact development for Washington, D.C., on neighborhood gentrification. The SILO model accounts for household relocation constraints, housing costs, transportation costs, and travel times, but not race and ethnicity. No simulation model to date has been used to explicitly study residential displacement.

**Finding: Urban simulation models are guided by consumer decision-making, rather than the development decisions – flows of people rather than capital – and have neglected the role of race; thus they may not capture complex gentrification dynamics.**

# Moving from Research to Praxis: Prediction and Mitigation

A number of researchers have developed models and analyses to aid activists and governments to better understand, predict, and plan for neighborhood change. One of the earlier iterations of work predicting gentrification is a presentation by researchers from the Urban Institute (Austin Turner and Snow 2001). Analyzing data for the Washington, D.C., area, they identified the following five leading indicators as predictive of future gentrification (defined as sales prices that are above the District's average) as low-priced areas that are: 1) adjacent to higher-priced areas, 2) have good Metro access, 3) contain historic architecture, 4) have large housing units, and 5) experience over 50% appreciation in sales prices between 1994 and 2000. Census tracts were scored for each indicator and then ranked according to the sum of indicators with a maximum value of 5. This ranking system is one of the first recorded attempts to create a policy-relevant tool to analyze and predict gentrification; however, the presentation did not include their methodology nor an evaluation of the results.

In a 2001 discussion paper prepared for the Brookings Institution and PolicyLink, Kennedy and Leonard conducted a literature review, case studies, and stakeholder interviews to determine the

predictors, impacts, and responses to neighborhood gentrification (Kennedy and Leonard 2001). From this research they identified the following factors to be predictive of gentrification:

a) high rate of renters,
b) ease of access to job centers,
c) high and increasing levels of metropolitan congestion,
d) high architectural value,
e) comparatively low housing values,
f) high job growth,
g) constrained housing supply,
h) large rent gap,
i) urban amenities,
j) targeted public sector policies (e.g., tax incentives, public housing revitalization, construction of transit facilities, disposition of city-owned properties, code enforcement, etc.),
k) growing preference for urban amenities.

In addition, they characterized the following factors as indicative that the process of gentrification was already underway: a) shift in tenure, b) increase in down payment and decrease in FHA financing, c) influx of households interested in urban living, and d) increase in high-income serving amenities such as music clubs, coffee shops, galleries, and the like.

In 2009, sponsored by the Association of Bay Area Governments, Karen Chapple at the Center for Community Innovation (CCI) at UC Berkeley conducted an analysis of neighborhood change in the San Francisco Bay Area from 1990 to 2000 and used the results of this analysis to predict neighborhood susceptibility to gentrification (Chapple 2009). Chapple adopted Freeman's (2005) definition of gentrifying neighborhoods as low-income census tracts in central city locations in 1990 that by 2000 experienced housing appreciation and increased educational attainment above the average of the nine counties in the Bay Area. The author then constructed a multivariate statistical model that had gentrification as the dependent variable, and a set of 19 socio-economic, locational, and built environment factors for 1990 as independent variables[9]. Based on the outcome of the regression, Chapple determined the direction, significance, and rank of the variables. The author assigned a value of 1 if census tracts scored above the regional average for each of the 19 predictive variables and summed across the variables. With a maximum score of 19, tracts were determined highly susceptible if they scored 16 or higher and of moderate susceptibility with scores between 13 and 15. No analysis or prediction of displacement or exit rates was included in this study, as neighborhood gentrification and change was the object of analysis.

The Dukakis Center for Urban and Regional Policy (2010) conducted an analysis transit oriented development and its association with neighborhood gentrification and displacement (Pollack, Bluestone, and Billingham 2010). Analyzing 42 neighborhoods (block groups within a half-mile of a transit station) near rail stations in 12 metro areas across the United States, they studied changes between 1990 and 2000 for neighborhood socio-economic and housing characteristics (e.g., number of units, racial composition, household income, auto ownership, and the like) and compared it to the metropolitan area to determine if patterns in transit-oriented neighborhoods differed significantly (i.e., over 20%) from non-transit-oriented neighborhoods. They found that rail-served neighborhoods were more likely to experience higher rates of growth in population, production of housing units, household incomes, housing costs, in-migration, and car ownership

[9] % of workers taking transit, density of youth facilities, density of public space, density of small parks, % non-family households, % of dwelling units in buildings with 5+ units, % of dwelling units in buildings with 3-4 units, % renter-occupied, Public housing units, income diversity, % of renters paying > 0.35 of income, distance to San Jose, % of dwelling units with three or more cars available, density of recreational facilities, % married couples with children, % non-Hispanic white, median gross rent, % of owners paying > 0.35 of income, Distance to San Francisco

when compared to the averages for the respective metropolitan areas. To discern whether gentrification occurred more often in neighborhoods with initially high proportions of renters rather than homeowners, they looked for a correlation between the rate of homeownership in 1990 (before the transit station opened) on the one hand and both the percentage change in the non-Hispanic white population between 1990 and 2000 and the percentage change in median household income between 1990 and 2000 on the other. In both cases they found that a higher initial proportion of renters was correlated with a larger change in racial and ethnic composition and larger increases in median household income.

Applying the same methodology he used to study gentrification and displacement in London, in 2011 Atkinson and coauthors characterized household vulnerability to displacement from neighborhoods that gentrified between 2001 and 2006 in the Melbourne and Syndey greater metropolitan areas. A vulnerability score (from 1-13) was measured based on tenure, number of employed persons per household, and occupation, ranking owner-purchaser, two-income, professional households at the least vulnerable end of the scale (1) and working-age private renters not in the labor force at the most vulnerable (13). Displacement rates were calculated by dividing the number of out-migrants with vulnerability characteristics by the number of households with these characteristics exposed to the likelihood of moving in 2001. Gentrified neighborhoods were defined by projecting the population for various sub-groups (e.g., low-income) and comparing projected to actual populations. Neighborhoods that had higher-than-projected numbers of high-income, occupied, and professional populations were designated gentrified.

Building off the same methodology as Chapple (2009), researchers from the Local Initiative Support Corporation (LISC) constructed a model predicting gentrification in neighborhoods of Houston (Winston and Walker 2012). They created a narrower definition of gentrifying neighborhoods by restricting the label to those that experience increases in a neighborhood's median incomes, median housing values, and educational attainment that are at least 10 percent higher than for all Houston neighborhoods. They began with the same list of independent variables (excluding the locational and income diversity ones), and added several others such as percent poverty, vacancy rates as well as dis-amenity variables such as industrial land uses for 1990. In addition, they included in the regression changes in the variables between 1990 and 2000. From this original list of 32 only seven variables[10] were significantly associated with gentrification rates and were included in the susceptibility model. Rather than scoring tracts like CCI, the LISC researchers used the regression coefficients and continuous independent variables in predicting the rate of gentrification, resulting in higher predictive accuracy. Validating their model using 2007 (2005-2009) American Community Survey (ACS) data, they found 86% accuracy for highly susceptible tracts (i.e. those that the model predicted were 75% likely to gentrify) and 60% accuracy for moderate susceptibility (i.e., between 50% and 75% likelihood).

A recent study in Portland by Lisa Bates (2013) set out to predict market changes based on a small set of indicators (vulnerability to displacement, demographic changes, and housing market conditions). She defined tracts as vulnerable to displacement in 2010 when they had higher-than-average populations of renters, communities of color, a lack of college degrees, and lower incomes. For housing market conditions Bates defines neighborhood market typologies as 1) adjacent tracts (low/moderate 2010 value, low-moderate appreciation, touch boundary of high value/appreciation tract), accelerating tracts (low/moderate in 2010 with high appreciation rates), and appreciated

[10] % of non-family households 1990, % of dwelling units in buildings with 5+ units 1990, % of dwelling units with three of more cars available 1990, number of youth facilities, *Δ* in % of married couples with children 1990 – 2000, *Δ* in % of non-family households 1990 – 2000, *Δ* in % of renter-occupied units 1990 – 2000

tracts (low or moderate 1990 values, high 2010 value, high 1990-2010 appreciation). Combining this information with demographic shifts for vulnerability factors (see above) between 2000 and 2010, she identified the following neighborhood typologies:

1. Susceptible tracts: are near high-value and/or high-appreciation tracts, but still have low or moderate home values and appreciation rates. They have vulnerable populations and are not yet experiencing demographic change indicative of gentrification.
2. Early: Type 1 tracts experienced high appreciation rates over the last decade, but still have low or moderate home values. Their populations are vulnerable but no gentrification-related demographic change has occurred.
3. Early: Type 2 tracts are near high-value and/or high-appreciation tracts but still have low or moderate home values and appreciation rates. They have vulnerable populations and have experienced demographic change indicative of gentrification.
4. Dynamic tracts experienced high appreciation rates over the last decade but still have low or moderate home values. They exhibit demographic change indicative of displacement but still have vulnerable populations.
5. Late tracts had low or moderate median home values in 1990, but experienced high appreciation over the last two decades and are now high-value tracts. They have experienced gentrification-related demographic change, but still have populations that are vulnerable.
6. Continued loss tracts are also high-value areas that experienced high appreciation over the last two decades starting from low or moderate 1990 values. They no longer have above-average levels of vulnerable populations, but exhibited high levels of demographic change over the previous period, and remaining vulnerable households may be in a precarious situation.

Bates then uses these typologies to recommend how to tailor policy approaches to the specific characteristics and needs of neighborhoods.

Finally, the Puget Sound Regional Council (PSRC) together with the Center for Transit Oriented Development created a typology of neighborhoods as part of their "Growing Transit Communities" Strategy (PSRC 2013). They constructed a "people profile" and "place profile" matrix and aligned policy responses according to neighborhood typology. The people profile consisted of a social infrastructure/access-to-opportunity axis comprised of a composite indicator of education, economic health, housing and neighborhood quality, mobility and transportation, and health and environment. The other axis - change/displacement - measured risk of displacement due to recent neighborhood change, current community risk factors, and current and future market pressure. Data used to quantify these factors relate to income, education, race and ethnicity, household type, housing tenure, and residential market strength measured at the block group level and were categorized into low, potential, and immediate risk. Low-risk communities tend to be moderate- to higher-income communities and/or communities with lower market pressures. Immediate-risk communities tend to have indications that displacement of lower-income populations has begun, higher current market strength, and/or high number of community risk factors. Potential-risk communities are those that have a weak market strength and therefore do not face imminent displacement risk; however, they also exhibit numerous community risk factors that suggest needs for community stabilization efforts to avoid future displacement risk should market forces change.

The place profile also consisted of two dimensions: the degree to which a transit community's physical form and activity support a dense and walkable transit community (the physical form+activity/transit orientation axis) and the likelihood that the community will change due to real estate market strength (the change/market strength axis). The physical form+activity/transit

orientation axis measures the degree to which a community's place characteristics are transit-oriented—with a form and activity level that support a dense and walkable community served by high-capacity transit. The composite index includes five sub-measures: pedestrian infrastructure, transit performance, physical form, population, and proximity of a mix of uses. The change/market strength axis measures the strength of the residential transit-oriented development market, which was intended to evaluate the potential demand for residential transit-oriented development, includes measures related to the real estate market, employment patterns, density, and household income and size. Combining the people and place typologies, they identify eight general typologies, for each of which they identified implementation and policy approaches.

**Finding: Many different descriptive toolkits offer typologies of neighborhood change, but few have analyzed the causality behind it, limiting the usefulness of such tools to predict and mitigate change.**

# Chapter 1 Conclusions

Scholarly interest in the relationship between investment and displacement dates back to the 1970s, in the aftermath of displacement related to urban renewal. More recently, a new wave of scholarship examines gentrification, primarily in strong-market cities, and its relationship to public investment, particularly in transit. The results of these studies are mixed, due in part to methodological shortcomings. However, the following findings emerge across the literature:

- Influential early models of neighborhood change present processes of succession and segregation as inevitable, underemphasizing the role of the state.

- Neighborhoods change slowly, but over time are becoming more segregated by income, due in part to macro-level increases in income inequality.

- Racial segregation harms life chances and persists due to patterns of in-migration, "tipping points," and other processes; however, racial integration is increasing, particularly in growing cities.

- Neighborhood decline results from the interaction of demographic shifts, public policy, and entrenched segregation, and is shaped by metropolitan context.

- Gentrification results from both flows of capital and people. The extent to which gentrification is linked to racial transition differs across neighborhood contexts.

- Cultural strategies can transform places, creating new economic value but at the same time displacing existing meanings.

- Commercial gentrification can also transform a neighborhood's meaning, but research is mixed on whether it is positive or negative for existing residents and businesses.

- New fixed-rail transit has a generally positive effect on both residential and commercial property values, but its impact varies substantially according to context.

- Preliminary evidence suggests that BRT has limited or no effects on local property values.

- Proximity to high-quality schools and parks, as well as access to highways, increases home values.

- Displacement takes many different forms—direct and indirect, physical or economic, and exclusionary—and may result from either investment or disinvestment.

- Despite severe data and analytic challenges in measuring the extent of displacement, most studies agree that gentrification at a minimum leads to exclusionary displacement and may push out some renters as well.

- Previous studies have failed to build a cumulative understanding of displacement because they have utilized different definitions, compared different populations, and adopted a relatively short timeframe; there is not even agreement on what constitutes a significant effect.

- Existing studies rarely account or proxy for regional market strength, which undermines their relevance to particular contexts.

- Urban simulation models are guided by consumer decision-making, rather than development decisions – flows of people rather than capital – and have neglected the role of race; thus they may not capture complex gentrification dynamics.

- Many different descriptive toolkits offer typologies of neighborhood change, but few have analyzed the causality behind it, limiting the usefulness of such tools to predict and mitigate change.

In sum, previous work on neighborhood change has showed that income segregation is generally increasing. Gentrification, or the influx of capital and higher-income, higher-educated residents into working-class neighborhoods, is transforming some areas. Displacement, which includes moves out of neighborhood that are for reasons beyond a households control (e.g., rent increase) as well as exclusion or the prevention of households from moving into neighborhoods where they could have previously afforded to live, may result from disinvestment as well as investment in neighborhoods. The impacts of gentrification are mixed, at a minimum leading to exclusionary displacement and most likely pushing out some renters as well. New fixed-rail transit, inasmuch as it has a positive effect on residential and commercial property values, may also affect neighborhood stability and composition.

# Chapter 2: Analysis of Historic Patterns of Neighborhood Change

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## Acronyms Used in This Chapter

- ACS (American Community Survey – U.S. Census)
- AIN (Assessor Identification Number)
- APN (Assessor Plat Number)
- CASP (Cornfield Arroyo Seco Specific Plan)
- CBO (Community-Based Organization)
- CTCAC (California Tax Credit Allocation Commission)
- HCD (California Department of Housing and Community Development)
- HUD (U.S. Department of Housing and Urban Development)
- JD (Joint Development – Los Angeles Metro)
- LIHTC (Low-Income Housing Tax Credits – HUD)
- LTDB (Longitudinal Tract Data Base)
- NCDB (Neighborhood Change Database)
- OLS (Ordinary Least Squares)
- PUMA (Public Use Microdata Area)
- PUMS (Public Use Microdata Sample)
- SEACA (Southeast Asian Community Alliance)
- SUR (Seemingly Unrelated Regressions)
- SNAP (Station Neighborhood Area Plan)
- TOD (Transit-Oriented Development or Transit-Oriented District)
- VTA (Santa Clara Valley Transportation Authority)

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# Chapter 2 Introduction

In Chapter 2, we present a series of quantitative and qualitative analyses to examine if key characteristics associated with gentrification and displacement are driving neighborhood change in fixed-rail transit neighborhoods in Los Angeles County and the San Francisco Bay Area. The sections in this chapter provide the following: 1) a summary of steps taken to construct the quantitative databases for each area, which are used to model neighborhood change; 2) a description of the typologies of transit neighborhoods we encounter in these regions; 3) a series of multivariate regression models on mobility, displacement, and neighborhood change; 4) sensitivity analyses of the models; and 5) the methods and findings used to ground-truth our quantitative models through an extensive inventory of neighborhood observations and interviews with key informants.

We find that gentrification in Los Angeles and the Bay Area TODs cannot be attributed to new development, as both areas experienced relatively little residential development during the period of observation. We also find that transit neighborhoods in both areas are experiencing similar demographic shifts, including new residents with higher-income in Los Angeles and new residents with higher levels of educational attainment in the Bay Area. Further, we see an increase in the use of housing development tax credits as well as an increase in eviction rates near fixed-rail transit in both regions. Spatial variations within the two areas exist in terms of race and measures of affordable housing. The findings of the field observations were generally consistent with the secondary data; however, observations and interviews also reflected processes currently underway that have the potential for displacement but are not captured in our neighborhood change databases. We conclude that proximity to a rail station impacts neighborhood change patterns associated with gentrification and displacement.

# Section 2A: Development of a Neighborhood Database

This section summarizes the data sources and general methods used to construct a customized database for Los Angeles and the Bay Area at the neighborhood level. We use Census tracts as a proxy for neighborhoods[1]. For Los Angeles we analyze all tracts within Los Angeles County. For the Bay Area we analyze all tracts within the 9-county region as defined by the Metropolitan Transportation Commission: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma counties. The database is used to model neighborhood change from 1990-2013 at the Census tract level. While we strived to ensure consistency in the variables and indicators used in both regions, each site had access to varying data sources; however, the database for each region is consistent in use of key demographic, socioeconomic, and housing variables. Detailed information on methods used, and challenges faced when processing the datasets for the two regions can be found in Appendix F and Appendix G.

## 2A.1. Census-Tract Datasets

The primary datasets used to construct the databases for each region are derived from the Census Bureau's decennial Census and American Community Survey (ACS). The ACS is conducted annually but only the 5-year estimates provide data at small geographies such as the tract. In addition to

[1] There is much debate and research into the definitions and analytical proxies for neighborhoods that is beyond the scope of this research. Due to data availability, we use the Census tract as a proxy for neighborhood scale for the purposes of this study.

Census datasets, a wide variety of other data were collected and analyzed for exploratory purposes. Table 2A.1 shows the common datasets and variables collected for both regional databases.

Decennial Census and ACS data were used to derive information on demographics of the population, socioeconomic status of households and individuals, and housing characteristics. These data are from the 1990 and 2000 decennial Censuses, and the 2009-2013 ACS 5-year estimates. Due to shifting Census tract boundaries, it is necessary to harmonize tract-level data to the same tract boundaries to be able to compare them over time. We analyzed two datasets that harmonize tract boundaries, Geolytics' 2010 Neighborhood Change Database and Brown University's Longitudinal Tract Data Base (LTDB), and compared them to our own population estimates. We determined that the LTDB was the most accurate of the two datasets we assessed. As such, most of the Census-based variables were derived from Brown University's LTDB or downloaded from the U.S. Census and converted to 2010 Census geography using LTDB free conversion scripts. Detailed information on the assessment, methods used, and challenges faced when processing the datasets for the two regions can be found in Appendix F.

**Table 2A.1: Common Neighborhood-level Datasets Collected for Both Regions**

| Dataset | Variables | Data Source |
|---|---|---|
| Decennial Census and ACS | Demographic, housing, and socioeconomic characteristics | Brown University Census' American Fact Finder |
| PUMS | Movement in/out of neighborhood (with race, income, education) | Census' American Fact Finder |
| HUD Picture of Subsidized Housing | # Section 8 voucher recipients<br># public housing units | HUD |

## 2A.2. Address-Level Datasets

When we encountered address-level data, we geocoded these data to the corresponding Census tracts and spatially joined them to the 2010 Census tract data to calculate tract-level indicators which were then added to the neighborhood database. Table 2A.2 shows the common datasets and variables collected for both regional databases at the address level.

**Table 2A.2: Common Address-level Datasets Collected for Both Regions**

| Dataset | Variables | Data Source |
|---|---|---|
| Low-Income Housing Tax Credit (LIHTC) | # housing units constructed | HUD |
| NETS | # jobs, establishments, sales | Walls & Associates |
| Evictions | # fault/no-fault evictions (SF), # Ellis Act evictions (LA) | SF Rent Board, HCIDLA |
| Transit Stations | Presence of rail station | Various; respective metropolitan transportation agencies |

# Section 2B: Development of a Parcel-Level Database

In an attempt to build a finer grain understanding of neighborhood change in the Bay Area and Los Angeles County, various indicators of changes to the residential housing stock were constructed at the parcel-level. Parcel-level data provide information on the changes associated with a plot of land, including transaction history, land-use changes, new construction of a residential structure in a parcel, major renovations of existing structures, and conversions of apartments to condos. These data allowed us to develop proxies to assess different types of displacement (economic, physical, and exclusionary). The parcel datasets were purchased from Dataquick, a lead provider of county assessor data (Dataquick has since been acquired by CoreLogic). Data was also acquired directly from the county assessor for the Los Angeles database. The parcel-level data were then aggregated to the tract-level and integrated to the neighborhood database. The methods used and challenges faced when processing the parcel-level datasets for the two regions can be found in Appendix G.

# Section 2C: Developing Typologies of Transit Neighborhoods

In this section we analyze neighborhood-type clusters to answer questions related to transit-oriented development (TOD) neighborhoods, gentrification, and displacement. Specifically, we created TOD neighborhood (Census tracts that intersect within a half-mile station buffer) typologies based on new development and transit investment types, where data is available. We used cluster analysis to group transit neighborhoods based on their shared characteristics. For the analysis in this section, new development includes data on new residential units, renovations of single-family homes, condo conversions, and the change in the number of low-income housing tax credit (LIHTC) units for Los Angeles County. As data for renovations and condominium conversions were only available for San Francisco, the analysis for the entire Bay Area is limited to new market-rate housing development, new and rehabbed subsidized housing units, and new transit stations. For further discussion of data and variable construction for the above, please see Appendices F and G.

New residential units, renovations, and condo conversions all represent private investments, while LIHTC is a combination of both public and private investment. Data on transit investment for Los Angeles include the number of Metro Joint Development (JD) projects in a tract. JD represents a public-private partnership and occurs when a transit agency collaborates with a private developer to develop property that is owned by the transit agency and located near a transit station. No such data was available for the entire Bay Area. Four main cluster types emerged from this analysis for Los Angeles and three for the Bay Area.

As of 2014, the Los Angeles Metro Rail system was comprised of 80 transit stations. Using the half-mile definition, 387 Census tracts were classified as TOD tracts. Figure 2C.1 below displays all 387 TOD tracts in Los Angeles.

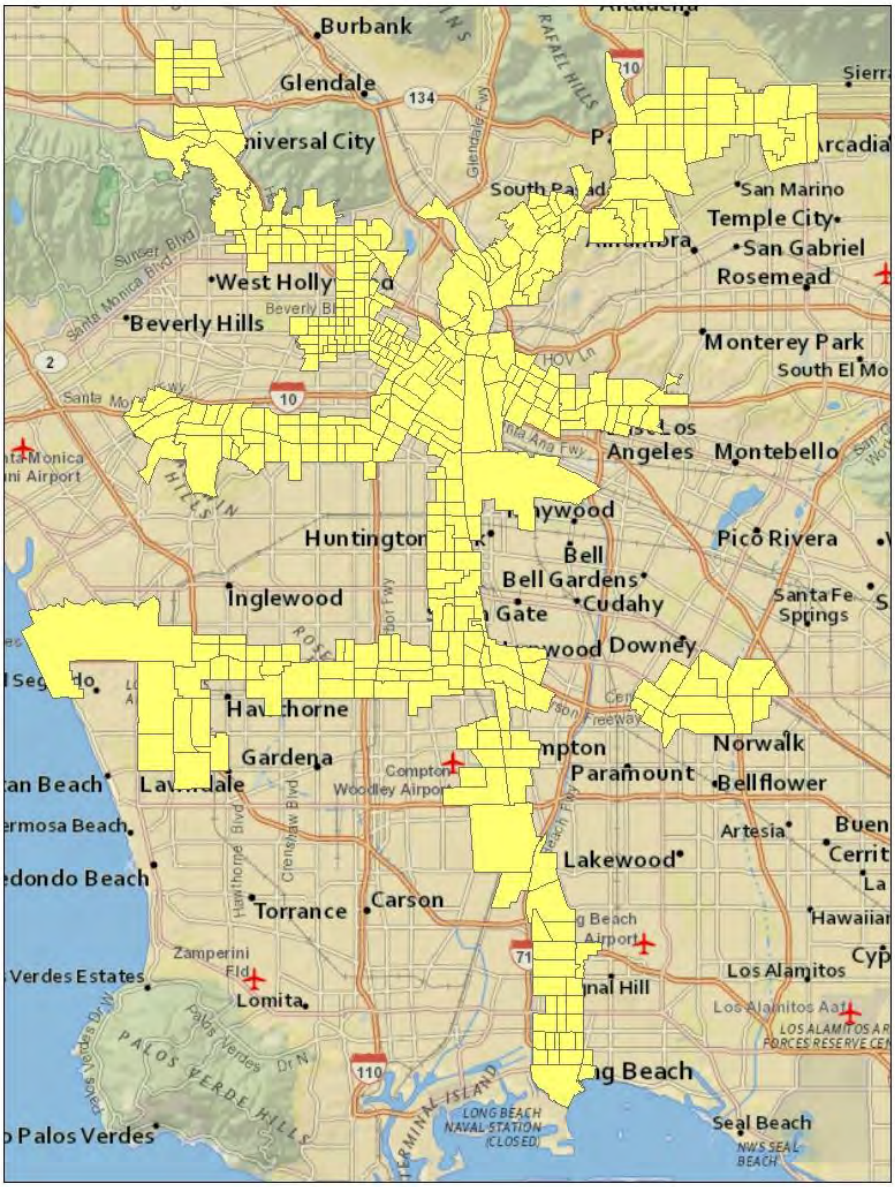



**Figure 2C.1: Map of 2010 TOD tracts, Los Angeles**

As of 2014, there were 548 Census tracts that intersected with the half-mile buffers around rail stations (Figure 2C.2). In 2000 there were only 422 rail stations, and their half-mile buffers intersected with 488 Census tracts, and in 1991 there were 302 rail stations, covering 418 Census tracts. Thus, while the number of rail stations has more than doubled since 1990, they have clustered in heavily populated areas, and the Census tract coverage has only increased by 31%.




**Figure 2C.2: TOD Areas in the Bay Area**

The following describes the four main cluster types for Los Angeles and Table 2C.1 reports their summary statistics:

1. *Private-driven* – On average, have a greater number of new residential units and condo conversions.
2. *Mixed without joint Metro development* – Generally have more newly constructed residential units, an increase in LIHTC units, and condo conversions, but on average, no joint development and no renovations to single-family homes.
3. *Mixed with joint Metro development* – Characterized by a combination of newly constructed residential units, an increase in LIHTC units, condo conversions, joint development, and renovations to single-family homes.
4. *Subsidy-driven* – On average, have experienced an increase in the number of LIHTC units.

**Table 2C.1: Summary Statistics for Transit Station Types in Los Angeles (Means)**

| | Private-Driven | Mixed w/o Joint Metro Development | Subsidized-Driven | Mixed w/ Joint Metro Development |
|---|---|---|---|---|
| New Residential Units, 2005-12 | 538.5 | 1,237.5 | 64.8 | 450.2 |
| SFH Renovations, 2007-13 | 2.5 | 0.0 | 2.0 | 13.2 |
| Condo Conversions, 2003-13 | 483.5 | 58.0 | 35.0 | 36.6 |
| Δ LIHTC Units, 2000-13 | 0.0 | 224.5 | 782.3 | 149.5 |
| Joint Development, 2014 | 1.0 | 0.0 | 1.0 | 1.2 |
| n | 2 | 2 | 4 | 13 |

Source: 2000 Decennial Census, 2009-13 ACS, LA County Assessor, TCAC

Figure 2C.1 displays the typologies alongside tracts that have gentrified between 2000 and 2013. Broadly speaking, gentrified neighborhoods are defined as socioeconomically disadvantaged tracts that are at risk of displacement due to influx of higher income, better educated, increasing rent and loss of affordable rental housing. For further discussion of the methodology used to calculate gentrification, see Section 2E.

When we compare the two maps side by side for Los Angeles (Figure 2C.3), we see the existence of both development-driven gentrification and gentrification without extensive development. For example, if a place suddenly becomes attractive, it can attract more affluent, higher educated, and non-Hispanic whites who might just use the existing built environment. Gentrification can also overlap with high levels of development as we see in the two maps. For example, there seems to be a lot of overlap in the areas around Downtown, particularly around the Staples Center and Arts District. Both of these areas have gentrified or are in the process of gentrifying, and both are experiencing high levels of development, but the types of development occurring are different. The area around the Staples Center is experiencing more mixed development (with and without Metro's joint development), and the Arts District is being driven primarily by private development. We also see tracts that are adjacent to development and gentrified tracts experiencing changes, indicating some sort of spillover effect.

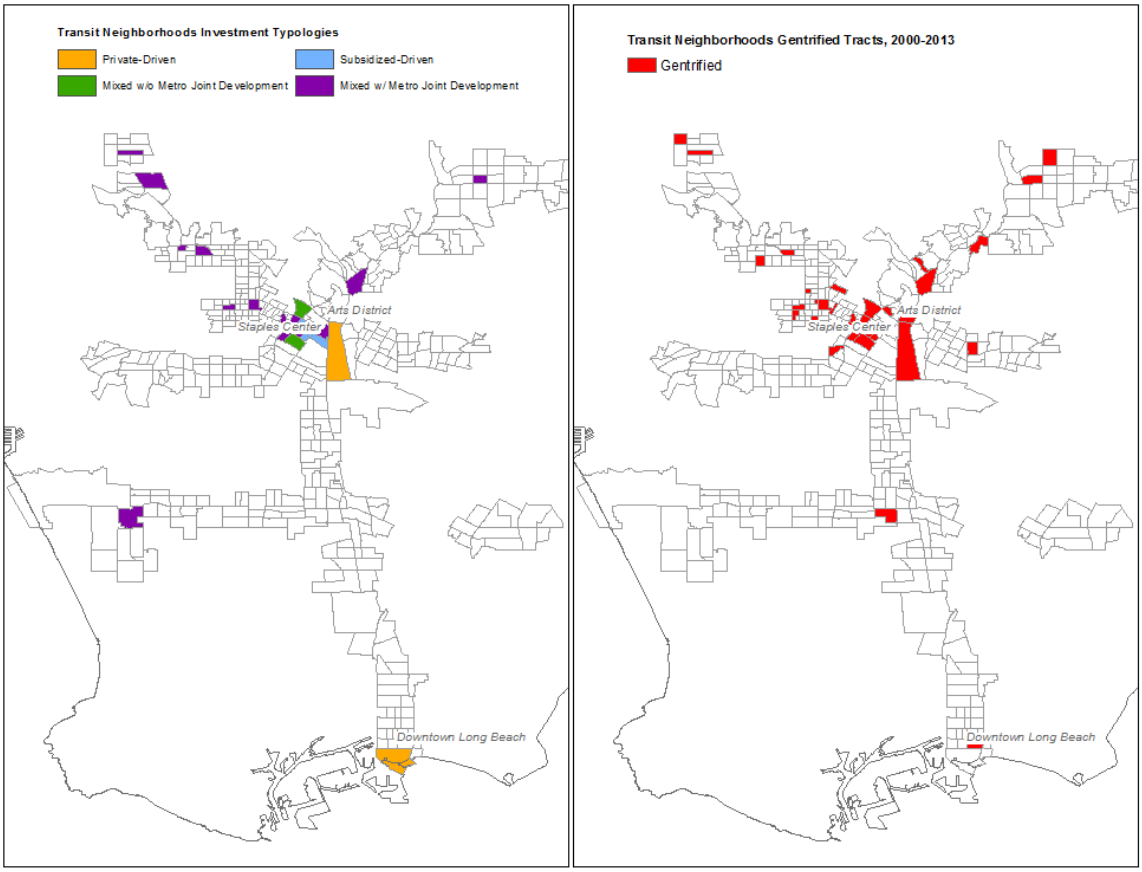



**Figure 2C.3: Development Tracts in LA County (L) and Gentrified Tracts in LA County (R)**

The tracts that experienced extensive development but did not cross the threshold of gentrification are also interesting. The southern part of Long Beach provides an example. The tract gentrified in the 1990s to the extent where it is no longer eligible (i.e., it no longer housed sufficient low income or other vulnerable population per the criteria listed in section 2E.1) to be included in our assessment in the 2000s. The gentrification that occurred in the 1990s seems to have precipitated a wave of development in the following decade. Table 2C.2 provides a breakdown of all 387 TOD tracts by whether or not they gentrified and whether it was with or without housing development.

**Table 2C.2: TOD Tracts, Gentrified With/Without Development for Los Angeles County**

| | # of TOD Tracts |
|---|---|
| Gentrified w/ Development | 11 |
| Gentrified w/o Development | 20 |
| Development Only | 7 |
| Not Gentrified/No Development | 349 |

*Source: 2000 Decennial Census, 2009-13 ACS*

For the Bay Area, the three typologies that emerged (Table 2C.3) were:

1. *Private-driven* – On average, have a greater number of new market rate residential units and more new transit stations.
2. *Little development* – Characterized by few new market-rate or subsidized residential developments with some new transit
3. *Subsidy-driven* – On average, have experienced an increase in the number of LIHTC units with little new transit.

**Table 2C.3: Summary Statistics for Transit Station Types in the Bay Area**

| | Private-Driven Development | Little Development | Subsidy-Driven Development |
|---|---|---|---|
| Average Number of New Market Rate Units, '00-'13 | 65.8 | 109.1 | 1997.6 |
| Average Number of New and Rehabbed Subsidized Units, '00-'14 | 417.9 | 20.8 | 150.3 |
| Average Number of New Transit Stations '00-'14 | 0.3 | 0.8 | 2.3 |
| n (# of tracts) | 24 | 510 | 14 |

Source: 2000 Decennial Census, 2009-13 ACS, TCAC, MTC, HUD

In the Bay Area, we see a similar mix of non-development-driven gentrification and some development-driven gentrification of different types (Table 2C.4 and Figure 2C.4). Of the 125 Census tracts that gentrified between 2000 and 2013, half (63) were in TOD areas. Yet, the vast majority of these TODs (58) that gentrified did not experience much development. Only five of these tracts experienced housing development, including two subsidy-driven neighborhoods. One of these gentrifying TODs that witnessed a significant amount of subsidized residential development is in San Francisco's South of Market neighborhood, where 438 units were developed in five different projects between 2002 and 2013. The other is in Downtown Oakland, where 313 subsidized units (along with 400 market-rate units) were developed in three different projects. The three TOD neighborhoods that experienced privately driven development and gentrified between 2000 and 2013 were: 1) the Jack London Square neighborhood of Oakland where 1,301 market-rate units were developed as well as 103 subsidized units, 2) Milpitas near the Santa Clara Valley Transportation Authority (VTA) Great Mall Station where 2,904 new market-rate units were developed and no subsidized housing was built, and 3) the Midtown neighborhood in San Jose near the VTA light-rail stations, where 1,087 market-rate units were developed and no subsidized housing was built.

While many TOD tracts experienced housing development, they did not undergo gentrification either because they were not low-income to begin with, or because there was not sufficient demographic change during the time period analyzed.

**Table 2C.4: Number of tracts that gentrified and did not gentrify in the 9-County Bay Area, Categorized by TOD Typology**

| | Gentrified '00-'13 | Did not Gentrify '00-'13 |
|---|---|---|
| Subsidized Housing Driven Development | 2 | 22 |
| Little Development | 58 | 452 |
| Private Development w/New Transit | 3 | 11 |

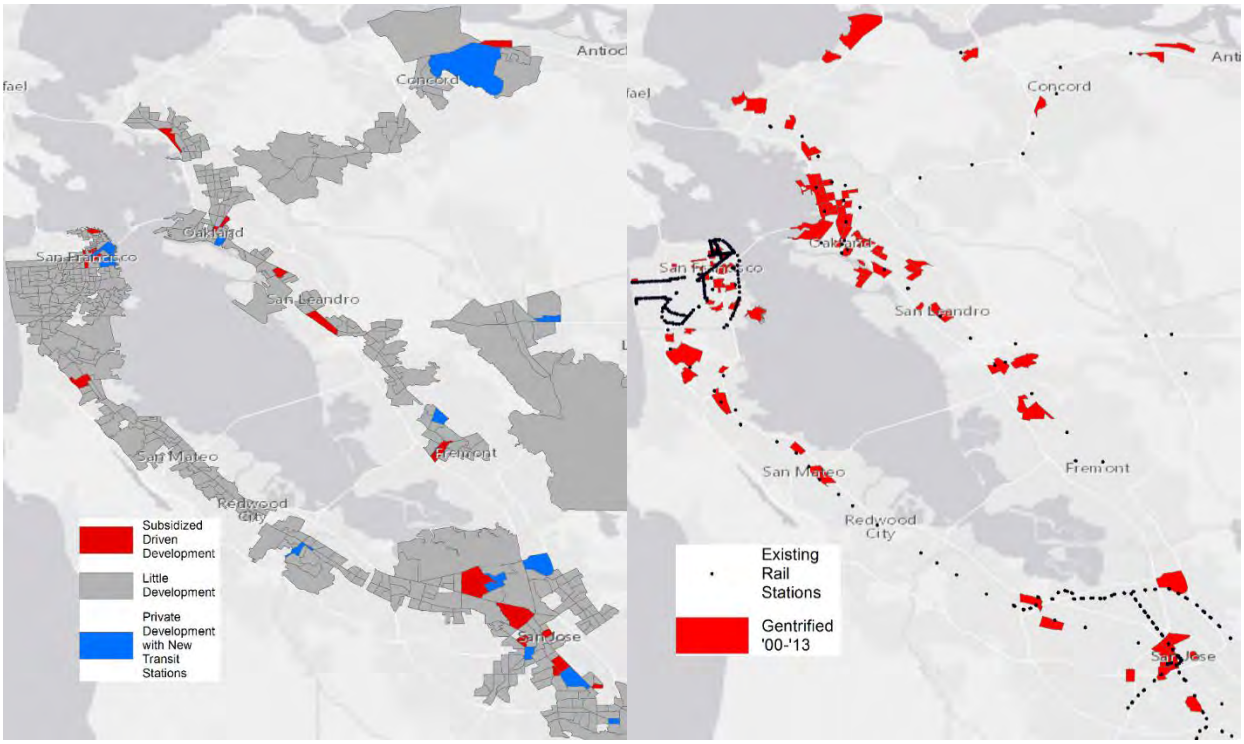



**Figure 2C.4: Development Tracts in the Bay Area (L) and Gentrified Tracts in the Bay Area (R)**

The relationship between gentrification and development is complex. The analysis depends on creating mutually exclusive categories, which may over-simplify complex phenomena (such as the changes in and around Downtown Long Beach, described on page 54). However, we find in general that the vast majority of tracts experienced relatively little development during the time period of analysis. In the Bay Area, most development occurred in tracts that did not gentrify. In contrast, in Los Angeles, development occurred in both gentrifying and non-gentrifying areas — but with most gentrification occurring in the absence of development.

# Section 2D: Modeling Neighborhood Mobility

To assess neighborhood mobility patterns and the effects of proximity to rail transit stations, we developed models controlling for demographic characteristics, income, housing price appreciation, and other covariates. Our analysis of neighborhood mobility is done in two parts. The first part models both in-migration and out-migration rates for overall movers who reported moving within the last year. Part two examines the demographic and socioeconomic characteristics of in-movers. We attempted to estimate the numbers out-movers and examine their demographic and socioeconomic characteristics but it did not produce any robust results. Our main finding is that higher-income and better-educated persons make up a higher share of in-movers in TOD areas for both the Bay Area and Los Angeles. Additionally, non-Hispanic whites also make up a higher share of in-movers to TODs adjusting for all other factors for both regions. These findings are consistent with the gentrification thesis: that is, TODs are associated with demographic and socioeconomic change.

For the dependent variable of household mobility, we relied on the American Community Survey's (ACS) tract-level data. The five-year ACS now includes information on in-migration by race/ethnicity and income levels.

## 2D.1. In-/Out- Migration

This section examines both the in- and out-migration rates using data from the 2009-13 five-year ACS estimate. We use ordinary least squares (OLS) regressions to model residential mobility. The dependent variables are the calculated in- and out-migration rates. We include a series of independent variables related to socioeconomic, demographic, and housing characteristics. Additionally, variables related to residential mobility choice (e.g., proximity to amenities, housing cost burden, and the like) are included. The key variables of interest are the downtown and non-downtown TOD variables, which were included to measure whether or not TOD had an impact on the likelihood of people moving into or out of a neighborhood.

For Los Angeles, TOD neighborhoods are grouped into two separate categories: TODs that are located in Downtown Los Angeles ("Downtown TOD") and TODs that are located elsewhere ("Other TODs"). In recent decades, Downtown has gone through a major revitalization process with a surge in private investments and new developments. While it is important to control for these effects, the problem lies with the fact that all of the Downtown Los Angeles tracts are also TOD tracts, making it difficult to tease out the individual effects. The Downtown variable can only be interpreted as a subset of TOD areas that just happens to be in Downtown. In the Bay Area, there is no such obvious "downtown." However, we did separate out TODs in the three largest cities — San Francisco, Oakland and San Jose — and labeled them as "downtown" to determine if different dynamics are at play in the region's major cities in contrast to other TODs.

In order to calculate in-migration rates, we first calculated the number of in-movers. This was done by subtracting the number of non-movers or "stayers" (lived in the same house 1 year ago) from the total number of persons in that tract. We then divided this number by the tract's total population in the previous year, in this case 2012, and multiplied this by 100. We relied on the 2008-2012 ACS for the total population counts in the previous year, since it is the only available source of information to include population counts in 2012 at the tract level. To calculate the out-movers, we subtracted the total population in the previous year (2012) and total number of estimated in-movers from the

total population in 2013. The numerator of the rate is the number of out-movers, while the denominator is the population in the previous year. Figure 2D.1 provides the formulas utilized in calculating migration rates.

In-movers = total number of persons – lived in same house 1 year ago

Out-movers = Total $Pop_{2013}$ – Total $Pop_{2012}$ – In-Movers

$$\text{In-Migration Rate} = \left(\frac{\text{Number of In-Movers to Tract X in 2013}}{\text{Total Population in Tract X in 2012}}\right)$$

$$\text{Out-Migration Rate} = \left(\frac{\text{Number of Out-Movers to Tract X in 2013}}{\text{Total Population in Tract X in 2012}}\right)$$

**Figure 2D.1: In- and Out-Migration Rates Calculations**

We begin with a simple bivariate analysis of the relationship between TODs and in-/out- migration rates. Figures 2D.2 and 2D.3 compare the rates for TOD and non-TOD areas. From the bivariate analysis, we do observe that TOD neighborhoods have higher rates of in- and out-migration than non-TOD areas in Los Angeles. This is consistent with the literature that TODs have an impact on residential mobility. TODs can make a neighborhood more desirable and attractive to those who want to be closer to transit, leading to in-migration. Conversely, the neighborhood's proximity to transit can also lead to price escalation, pricing out those who can no longer afford to live in the neighborhood, and thus exiting.

The effect is less dramatic in the Bay Area, where TOD areas have in- and out-migration rates that are only slightly higher than non-TOD areas. The bivariate analysis, however, does not account for other neighborhood characteristics that may influence in- and out-migration. For example, low-income and renter households generally have higher mobility rates. A TOD neighborhood with a larger share of low-income or renter households might exhibit higher rates of in- and out-migration because of other factors in the neighborhood, not due to TOD per se. We used multivariate regression models to determine if this relationship holds after controlling for all other factors related to the neighborhood's characteristics.

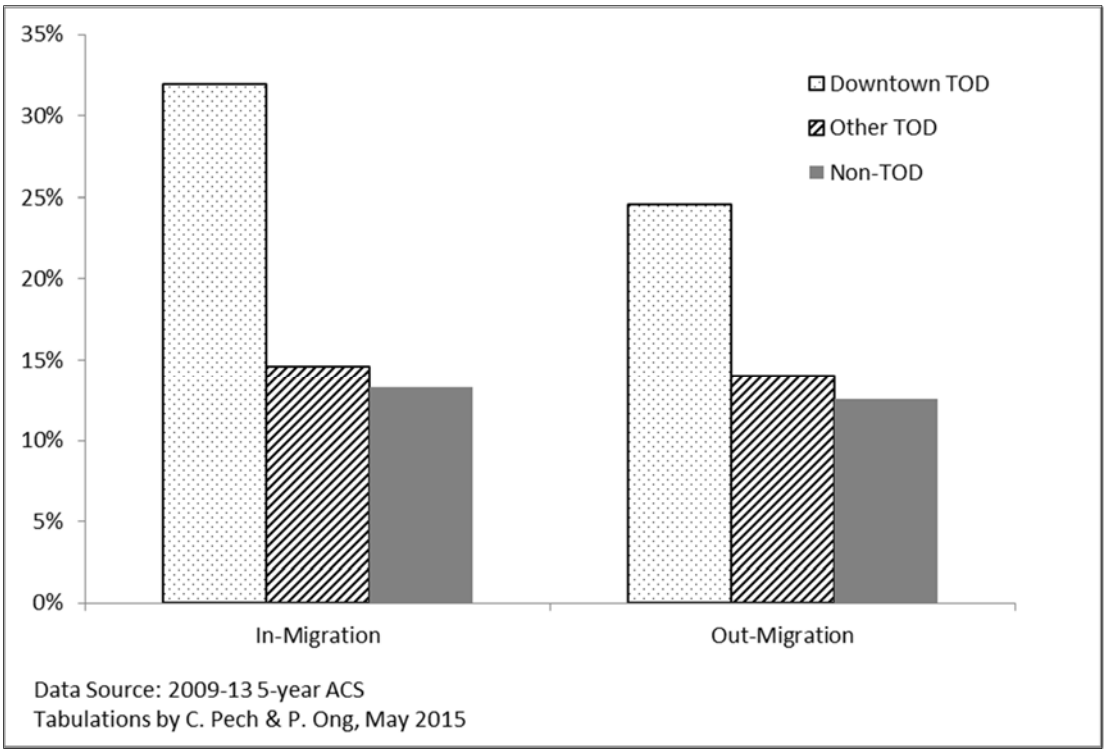



**Figure 2D.2: Bivariate Analysis, In- and Out-Migration Rates for Los Angeles, 2009-2013**

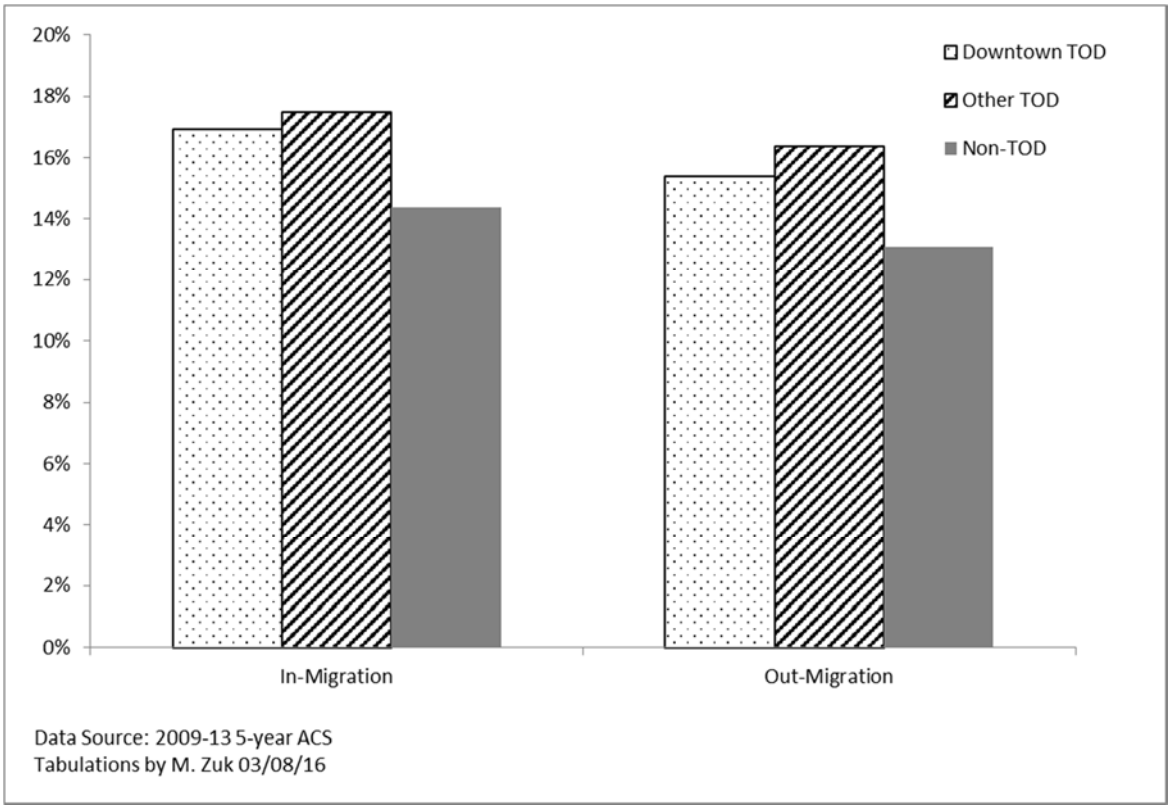



**Figure 2D.3: Bivariate Analysis, In- and Out-Migration Rates for the SF Bay Area, 2009-2013**

We initially ran regressions for both in- and out-migration that included an extensive list of control variables, many of which were collinear, producing problems of multi-collinearity and endogeneity. The results are presented in Appendix R. To reduce multi-collinearity, we ran more parsimonious models to include a more limited set of key variables. The key independent variables are lagged (that is, from the previous period), thus reducing endogeneity. Data for the independent variables come from the 2006-2010 five-year ACS, the earliest available in which the tract boundary is consistent with the 2009-2013 five-year ACS (the previous five-year ACS uses the 2000 boundary). We acknowledge that this method is not perfect since the 2009-2013 and 2006-2010 five-year ACS both include the 2009 and 2010 individual ACS.

Results for the parsimonious migration models are presented in Table 2D.1 In Los Angeles, with the exception of Downtown TODs, we do not see TODs having any effect on mobility in Los Angeles. In comparison, proximity to rail outside of the three major cities in the Bay Area (San Francisco, Oakland, and San Jose) is positively associated with in-migration, and negatively associated with out-migration. In the three main cities of the Bay Area, the pattern is reverse, with higher out-migration rates and lower in-migration rates.

In Los Angeles, TODs seem to accelerate change in locations that are going through transitions. The transit system going through Downtown Los Angeles was meant to bring people in and out of Downtown. It contributes to making Downtown more accessible and more susceptible to neighborhood change and development. The other changes occurring in Downtown (e.g. Grand Avenue project, Staples Center) are not the consequence of TOD; instead, TODs may help serve them.

For the Bay Area, the variability in TODs and development seems to be too great to draw any general conclusions. For instance, when including a variable for TODs, without differentiating between those in the major cities, we find positive, but not significant association for both in- and out-migration. When we differentiate between TODs in the three major cities versus other TODs, we find greater in-migration and less out-migration in non-central TODs, and the reverse in central TODs. This non-intuitive relationship may result from the wide variability in land use types among the TODs in the three major cities: some actually have more suburban land use characteristics (e.g., low density), despite being in a major city. This could also result from the timing of construction, which we don't control for – if the "Other TODs" are built more recently than the "Downtown TODs", and construction is a nuisance, out-migration rates may temporarily be higher than in-migration.

**Table 2D.1: In-Out Migration, Parsimonious Multivariate Regressions**

| | In-Migration | | Out-Migration | |
|---|---|---|---|---|
| | Los Angeles | Bay Area | Los Angeles | Bay Area |
| Constant | 0.0909 *** | 0.1122 *** | 0.0348 * | -0.1123 *** |
| Median Household Income (/10,000) | 0.0061 *** | -0.0033 | 0.0115 *** | 0.005996 ** |
| Income Squared | -0.0003 *** | 0.00014 | -0.0005 *** | -0.00026 ** |
| % non-Hispanic black | -0.0002 ** | 0.037 ** | -0.0001 | -0.0015 |
| % Asian | -0.0007 *** | -0.0278 *** | -0.0004 *** | 0.023764 ** |
| % Hispanic | -0.0011 *** | -0.0579 *** | -0.0009 *** | 0.065866 *** |
| Downtown TOD | 0.1219 *** | -0.0107 ** | 0.0558 ** | 0.015904 *** |
| Other TOD | -0.0046 | 0.0129 *** | -0.0043 | -0.01239 ** |
| % Renters | 0.0016 *** | 0.18276 *** | 0.0018 *** | -0.19257 *** |
| Adj R-Squared | 0.3411 | 0.3256 | 0.2576 | 0.268 |
| n | 2,315 | 1578 | 2,315 | 1578 |

*** P<.01, ** p<.05, *p<.10

Source: 2006-10, 2009-13 ACS

Tabulations by C.Pech & P. Ong, May 2015, M. Zuk Aug 2015

## 2D.2. Composition of In-Movers

Our second analysis of residential mobility looks at the composition of the in-movers by income and demographic characteristics. Specifically, we focus on the share of in-movers who are low-income, high-income, non-Hispanic white, individuals with less than a high school diploma, and persons with a bachelor's degree or higher. In part due to differences in the income distributions between the two regions (and high intra-region variability in the Bay Area), we use slightly different categories for low and high income. For Los Angeles we define low-income as persons who move with less than $10,000 annual income, and for the Bay Area we use the Census calculated incomes below the Federal Poverty level (~$11,500 for a one-person household in 2013). For high income in Los Angeles, we use $65,000 annual individual income as the cutoff and for the Bay Area we use 120% of each county's median per capita income for that year (between ~$35,000 and $68,000) and rounded to the closest Census income category.

We attempted to estimate the number of out-movers by subgroup using the method presented in Figure 2D.1, but the small sample size of the ACS resulted in uncertain estimates that made the models unreliable. We therefore only report results for in-movers by subgroup. We use the following equations to estimate the share of in-movers for each sub-population (example shown for low-income):

$$\#\ \text{In-Movers}_{\text{low-income}} = (\text{Total}_{\text{Persons Age 15+}} - \text{Non-Movers}_{\text{low-income}})$$
$$\%\ \text{In-Movers}_{\text{low-income}} = (\#\ \text{In-Movers}_{\text{low-income}} / \text{Total In-Movers}) * 100$$

Table 2D.2 contains the bivariate analysis by subgroup. The bivariate analysis shows mixed results for the gentrification hypothesis. Data for both TOD and non-TOD areas show that in-movers are lower income than stayers (Δ = % in-movers - % stayers). This, however, may be confounded by the Great Recession which depressed overall income. Figure 2D.4 shows the decline in per-capita income (adjusted to 2013 dollars) following the Great Recession. The changes in TOD by educational levels in Los Angeles show an increase at the two extremes; that is, in-movers are more likely to have less than a high school diploma and more likely to have at least a bachelor's degree. In

the Bay Area, while in-movers to TODs are more likely to have bachelor's degrees, they are less likely to have less than a high school diploma. The analysis for non-Hispanic white is unambiguous in Los Angeles. In-movers in TOD areas are more likely to be of that group than stayers. This is also true for the Bay Area, except for TOD areas outside of the three major cities, where in-movers are less likely to be non-Hispanic white.

**Table 2D.2: Bivariate Analysis by Subgroups, LA County and the Bay Area, 2009-2013**

| | Los Angeles | | | | Bay Area | | | |
|---|---|---|---|---|---|---|---|---|
| | Not TOD | All TOD | Down-town TOD | Other TOD | Not TOD | All TOD | Down-town TOD | Other TOD |
| **Low Income (LT 10K)[1]** | | | | | | | | |
| Stayers (% Below 10K) | 15.8 | 17.7 | 21.2 | 17.5 | 9.3 | 12 | 14.8 | 9.2 |
| In-Movers (% Below 10K) | 18.4 | 19.3 | 21.9 | 19.2 | 15.8 | 18.8 | 22.1 | 15.5 |
| Δ (% In-Movers-% Stayers) | 2.7 | 1.7 | 0.6 | 1.7 | 6.5 | 6.7 | 7.2 | 6.3 |
| Δ Δ (Δ TOD-Δ Non-TOD) | 0 | -1.0 | -2.0 | -0.9 | 0 | 4.0 | 4.5 | 3.6 |
| **High Income (65K+)[2]** | | | | | | | | |
| Stayers (% Above 65K) | 15.8 | 9.5 | 14.7 | 9.3 | 22 | 21.2 | 20.5 | 21.9 |
| In-Movers (% Above 65K) | 12.7 | 9.1 | 15.8 | 8.8 | 4 | 5.1 | 5 | 5.3 |
| Δ (% In-Movers-% Stayers) | -3.1 | -0.5 | 1.1 | -0.5 | -18 | -16.1 | -15.5 | -16.6 |
| Δ Δ (Δ TOD-Δ Non-TOD) | 0 | 2.6 | 4.2 | 2.6 | 0 | -13.0 | -12.4 | -13.5 |
| **non-Hispanic white** | | | | | | | | |
| Stayers (% non-Hispanic White) | 30.8 | 17.1 | 25.9 | 16.7 | 46.6 | 38.7 | 34.5 | 42.8 |
| In-Movers (% non-Hispanic White) | 28.4 | 19.4 | 28.4 | 19.0 | 43.2 | 39.5 | 39.2 | 39.7 |
| Δ (% In-Movers-% Stayers) | -2.3 | 2.3 | 2.4 | 2.3 | -3.5 | 0.9 | 5 | -3.1 |
| Δ Δ (Δ TOD-Δ Non-TOD) | 0 | 4.6 | 4.8 | 4.6 | 0 | 3.2 | 7.3 | -0.8 |
| **Less than High School** | | | | | | | | |
| Stayers (% w/ LT HS) | 23.5 | 28.6 | 29.3 | 35.5 | 29.9 | 32.1 | 34.3 | 29.9 |
| In-Movers (% w/ LT HS) | 20.9 | 35.2 | 25.0 | 28.8 | 28.8 | 27.9 | 28 | 27.8 |
| Δ (% In-Movers-% Stayers) | -2.6 | 6.6 | -4.3 | -6.7 | -1 | -4.1 | -6.4 | -1.8 |
| Δ Δ (Δ TOD-Δ Non-TOD) | 0 | 9.2 | -1.7 | -4.1 | 0 | -1.5 | -3.8 | 0.8 |
| **Bachelor's Degree or Higher** | | | | | | | | |
| Stayers (% w/ BA+) | 28.8 | 22.0 | 32.7 | 21.6 | 41.6 | 43.2 | 42.1 | 44.3 |
| In-Movers (% w/ BA+) | 32.0 | 28.4 | 40.3 | 28.0 | 44 | 49.1 | 48.2 | 49.9 |
| Δ (% In-Movers-% Stayers) | 3.3 | 6.4 | 7.7 | 6.4 | 2.3 | 5.9 | 6.3 | 5.5 |
| Δ Δ (Δ TOD-Δ Non-TOD) | 0 | 3.1 | 4.4 | 3.1 | 0 | 2.6 | 3.0 | 2.2 |
| **n** | 1,960 | 387 | 15 | 372 | 1,029 | 551 | 276 | 275 |

[1] In the Bay Area, people in poverty that moved in or stayed was used for this category

[2] Because of the higher incomes in the Bay Area, this category was calculated as in-movers and stayers that had incomes greater than 120% of the county median income

Source: 2009-13 ACS

Tabulations by C.Pech & P. Ong, May 2015, M. Zuk, Aug 2015

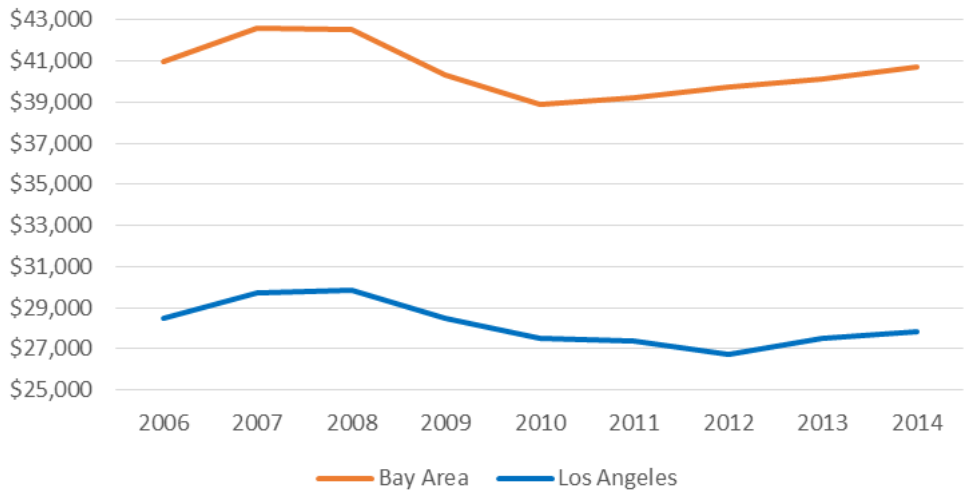



**Figure 2D.4: Per-Capita Income, LA County and 9-County Bay Area (adjusted to 2013 dollars)**

We ran also multivariate regressions to see whether or not we find the same results even after controlling for neighborhood demographics. Tables 2D.3 and 2D.4 report the results of the OLS regressions for each of the subgroups. After accounting for the demographic and socioeconomic characteristic (race/ethnicity and income), Downtown location, and tenure, we find that low-income and less-educated persons make up a lower share of in-movers in TOD areas than in non-TOD areas for Los Angeles. In the Bay Area, individuals in poverty actually make up a higher share of in-movers into downtown TODs, but not into non-downtown TODs. This may be related to the location of subsidized housing opportunities for very-low-income households. Conversely, higher-income and better-educated persons make up a higher share of in-movers in TOD areas for both the Bay Area and Los Angeles. Finally, non-Hispanic whites make up a higher share of in-movers to TODs after adjusting for all other factors for both regions. The multivariate results are consistent with the gentrification thesis: that is, TODs are associated with the a priori hypothesis of demographic and socioeconomic change.

**Table 2D.3: Modeling Share of In-Movers by Subgroups, Multivariate Regressions for Los Angeles County, 2009-2013**

| | Low-Income (<10K) | High-Income (65K+) | Less than High School | Bachelor Degree or Higher | non-Hispanic white |
|---|---|---|---|---|---|
| Constant | 19.233 *** | 2.561 | 5.992 * | 0.744 | 51.633 *** |
| Median Household Income | -1.642 *** | 0.633 ** | -0.677 | 1.472 *** | 0.002 |
| Income Squared | 0.064 *** | 0.011 | 0.024 | -0.052 *** | 0.296 *** |
| % non-Hispanic black | 0.020 | -0.041 *** | 0.078 *** | -0.114 *** | -0.560 *** |
| % Asian | -0.033 ** | -0.048 *** | -0.016 | 0.007 | -0.551 *** |
| % Hispanic | 0.005 | -0.076 *** | 0.130 *** | -0.101 *** | -0.546 *** |
| Downtown TOD | -0.316 | 4.225 * | 2.970 | 2.700 | 4.821 |
| Other TOD | -1.599 ** | 1.315 *** | -1.175 | 2.798 *** | 1.440 * |
| % Renters | -0.024 * | 0.030 *** | -0.060 *** | 0.105 *** | 0.066 *** |
| n | 2,307 | 2,307 | 2,307 | 2,307 | 2,307 |
| Adj. R-Squared | 0.1206 | 0.5915 | 0.5698 | 0.677 | 0.7639 |

*** P<.01, ** p<.05, *p<.10

Source: 2009-13 ACS

Tabulations by C.Pech & P. Ong, May 2015

**Table 2D.4: Modeling Share of In-Movers by Subgroups, Multivariate Regressions for the Bay Area, 2009-2013**

| | In Poverty | High-Income (> 120% County Median Income) | Less than High School | Bachelor Degree or Higher | non-Hispanic white |
|---|---|---|---|---|---|
| Constant | 0.412 *** | -0.055 *** | 0.496 *** | 0.078 * | 0.898 *** |
| Median Household Income | -0.053 *** | 0.013 *** | -0.051 *** | 0.055 *** | -0.001 |
| Income Squared | 0.002 *** | 0.000 *** | 0.001 *** | -0.001 *** | 0.000 |
| % non-Hispanic black | 0.171 *** | -0.013 * | 0.198 *** | -0.345 *** | -0.794 *** |
| % Asian | 0.016 | -0.014 *** | 0.132 *** | -0.043 * | -0.933 *** |
| % Hispanic | 0.077 *** | -0.048 *** | 0.684 *** | -0.671 *** | -0.959 *** |
| Downtown TOD | 0.019 ** | 0.004 * | -0.024 ** | 0.045 *** | 0.048 *** |
| Other TOD | -0.014 | 0.008 *** | -0.015 ** | 0.048 *** | 0.002 |
| % Renters | 0.020 | 0.091 *** | -0.258 *** | 0.410 *** | 0.066 *** |
| n | 1,575 | 1,578 | 1,575 | 1,575 | 1,576 |
| Adj. R-Squared | 0.328 | 0.3922 | 0.5685 | 0.579 | 0.7169 |

*** P<.01, ** p<.05, *p<.10

Source: 2009-13 ACS

Tabulations by M. Zuk, Aug 2015

# Section 2E: Modeling Neighborhood Displacement

To better understand the relationship between TODs, gentrification, and displacement, we develop dichotomous and multinomial logit models. We conduct two primary analyses, one on gentrification and the other on changes affordable rental housing. We first construct gentrification measures, which can include both direct and exclusionary displacement, for both Los Angeles and the Bay Area. Due to the unique conditions of each region and access to different data sources, gentrification is defined differently for each region. The second analysis focuses on a more direct measure of displacement, the loss of affordable housing which includes changes in affordable rental units, condo conversion, Section 8 housing, Low-Income Housing Tax Credit units, and evictions. For the San Francisco Bay Area we also explore the decline in low-income households, an indicator of displacement that is particularly salient in the region due to rising income inequality. Our main findings are that there is evidence of neighborhood change and gentrification in TOD areas. The magnitude of change varies by the type of TOD. Additionally, we find that relative to non-TOD areas, transit neighborhoods are experiencing greater losses in affordable rental housing.

## 2E.1. Gentrification

The method used to develop the gentrification index for this study incorporates several methods of gentrification from previous studies. These include the work done by Lance Freeman (2005) for the U.S., Lisa Bates for Portland (2013), the Bay Area (CJJC 2014; Haas Institute 2015), and the recent analysis of the largest 50 cities in the United States by *Governing Magazine* (Maciag 2015). We made some modifications to reflect the unique conditions of Los Angeles. We use the following criteria to define a neighborhood (Census tract) as having gentrified between years 1 and 2.

For Los Angeles, a tract was vulnerable to gentrification (or eligible to gentrify) if it met all of the following criteria:

1. The tract had a population of at least 500 residents in year 1
2. Vulnerable, meeting 3 out of 4 of the following indicators:
    a. % low-income households (household income below 80% of the county median) > county median
    b. % college educated < county median
    c. % renters > county median
    d. % nonwhite > county median

A tract is said to be gentrified or gentrifying if it meets eligibility and all of the following criteria:

1. Demographic change between years 1 and 2
    - Change in % college educated > county (percentage points)
    - Change in % non-Hispanic white > county (percentage points)
    - Change in median household income > county (absolute value)
2. Change in Median Gross Rent > Change County Median Gross Rent (absolute value)

For Los Angeles, two major modifications were made to the index that makes it different from the previous work on gentrification. One, instead of focusing on homeowners and property values (e.g., change in home values), we focused on the rental housing market. Renters are more susceptible to gentrification and displacement due to increase in rent (e.g., generally, homeowners benefit from rising property values). Second, we included change in non-Hispanic whites into the demographic change criteria. As noted in the literature review, gentrification involves racial changes, particularly the replacement of minority population with the dominant social group. In Los Angeles, the dominant social group, in terms of political power and socioeconomic status, are non-Hispanic whites.

For Los Angeles, we were unable to estimate the number of changes in market and non-market units (e.g., affordable, below market rate, subsidized) because we did not have information on affordable units that were negotiated with private developers in exchange for concession. Table 2E.1 reports the county averages and changes for the three decades in Los Angeles.

**Table 2E.1: Gentrification Criteria for Los Angeles, County Averages**

| | 1990 | 2000 | 2013 | Δ 1990-2000 | Δ 2000-2013 |
|---|---|---|---|---|---|
| % non-Hispanic white | 41% | 31% | 28% | -10% | -4% |
| % with bachelor's degree or higher | 22% | 25% | 30% | 3% | 5% |
| Median Household Income (2013 dollars) | $63,423 | $58,982 | $55,909 | -$4,441 | -$3,073 |
| Median Gross Rent (2013 dollars) | $1,082 | $952 | $1,204 | -$130 | $252 |

*Source: 1990 and 2000 Decennial Census, 2009-2013 five-yr ACS*

Using the above definition for Los Angeles, we find that 81 tracts gentrified between 1990 and 2000, and 82 tracts gentrified between the years 2000 and 2013. Of these 82 tracts that gentrified between 2000 and 2013, eight also gentrified in the previous decade. We estimate that a total of 155 tracts gentrified between 1990 and 2013 in Los Angeles. The tracts that gentrified are displayed in Figure 2E.1. It includes tracts that gentrified *in each* of the time period and those that gentrified in *both* time periods. Additionally, vulnerable tracts (see above criteria) are also displayed, regardless of the time period of when they were vulnerable.

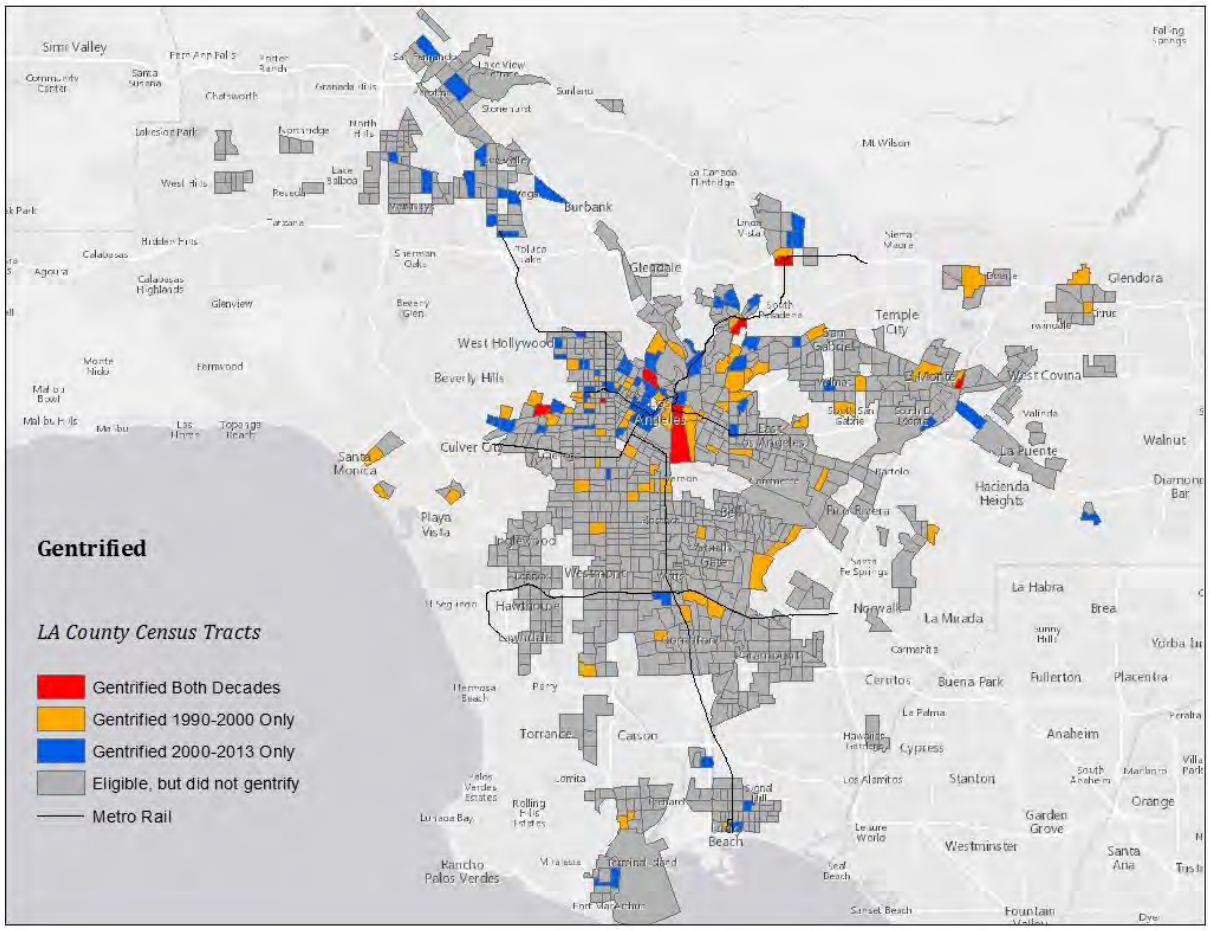



**Figure 2E.1: Gentrified/Gentrifying Census Tracts, LA County 1990-2013**

For the Bay Area, this index was modified slightly to reflect the conditions of the region. First, all measures were compared to the regional median that includes nine counties. Second, we did not use change in non-Hispanic white in the demographic change criteria, as considerable research has emerged on the nature of black- and Asian-driven gentrification in strong markets like the Bay Area. Finally, because of the role of the influx of global capital into the housing market, we used a combination of housing price increases and new market-rate units for the second criteria of change.

For the Bay Area, a tract was vulnerable to gentrification if it met all of the following criteria:

1. The tract had a population of at least 500 residents in year 1
2. Vulnerable, meeting 3 out of 4 of the following indicators:
    a. % low-income households (household income below 80% of the county median) > regional median
    b. % college educated < regional median
    c. % renters > regional median
    d. % nonwhite > regional median

A tract is said to be gentrified or gentrifying if it meets eligibility and all of the following criteria:

1. Demographic change between years 1 and 2
    a. Change in % college educated > region
    b. Change in median household income > region

2. Investment between years 1 and 2:
    a. % market rate units built > regional median
    b. Growth in of the following
        - % increase of single-family sales price per square foot > regional median
        - % increase of multi-family sales price per square foot > regional median
        - % increase of home value > regional median (where sales value is unavailable = 57 tracts)

Table 2E.2 reports the regional medians used for the Bay Area.

**Table 2E.2: Gentrification Criteria, Medians for the 9-County Bay Area**

| | 1990 | 2000 | 2013 | Δ 1990-2000 | Δ 2000-2013 |
|---|---|---|---|---|---|
| % low-income | 37% | 37% | 39% | 0% | 2% |
| % with bachelor's degree or higher | 27% | 35% | 41% | 8% | 6% |
| % renter | 38% | 37% | 41% | -1% | 4% |
| % non-white | 33% | 46% | 57% | 13% | 11% |
| Δ with bachelor's degree or higher | - | - | - | 6% | 5% |
| Δ in median household income | - | - | - | $9,925 | -$5,719 |
| % of market-rate units built | - | - | - | 3% | 3% |
| % increase in single-family sales price per square foot | - | - | - | 22% | 8% |
| % increase multi-family sales price per square foot | - | - | - | 23% | 5% |
| % increase home value for owner-occupied units | - | - | - | 2% | 15% |

*Source: 1990 and 2000 Decennial Census, 2009-2013 five-yr ACS, and Dataquick (2014)*

Using the above criteria for the Bay Area, we find that 83 tracts gentrified between 1990 and 2000 and 85 tracts gentrified between the years 2000 and 2013 (Figure 2E.2). Of these 83 that gentrified between 2000 and 2013, 19 were tracts that gentrified between 1990 and 2000 as well. In total we estimate that 149 tracts gentrified between 1990 and 2013. The fact that a tract has gentrified between two years does not preclude them from continued change. In fact, of the 149 tracts that we estimate to have gentrified between 1990 and 2013, 71 had lower rates of growth of low-income households than the rest of the region, 105 lost naturally occurring affordable housing, and 100 had lower rates of in-migration of low-income residents in 2013 than they did in 2009. Furthermore, 88 of the gentrified tracts continue to have higher proportions of low-income households than the region (39%).

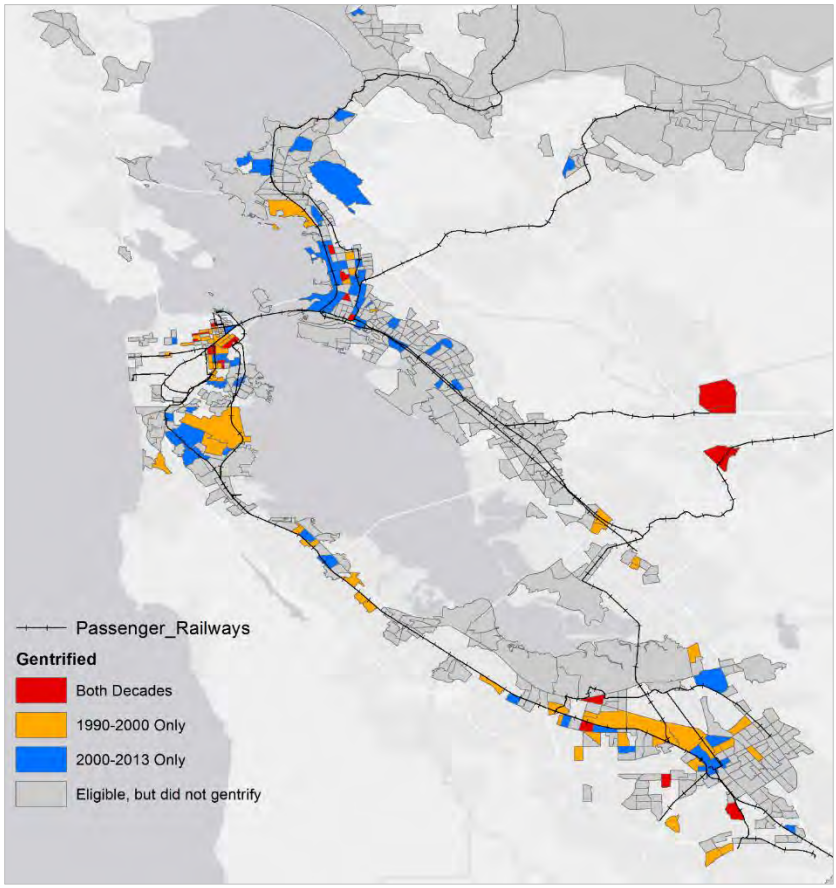



**Figure 2E.2: Gentrified/Gentrifying Census Tracts, SF Bay Area 1990-2013**

Our finding that tracts that gentrified in the first decade from 1990-2000 had a higher risk of gentrifying again from 2000-2013 is also shown with a simple bivariate analysis. In the Bay Area, the probability to continue gentrifying from 1990-2000 to 2000-2013 were over twice as likely as newly gentrifying areas from 2000-2013 (23% vs. 11%). In Los Angeles, a neighborhood that gentrified in the previous time period was over three times as likely to gentrify again in the following decade (10% vs. 3%). To test whether or not the findings hold true after controlling for the characteristics of the neighborhood, we ran a logit model for the 2000-2013 period to include a variable indicating whether the tract was gentrifying in the previous decade (1990-2000). After controlling for the characteristics of the neighborhood, we did not find any independent significance for Los Angeles; however, the relationship in the Bay Area was highly significant after controlling for neighborhood characteristics. The results for Los Angeles are likely due to the fact that the same variables that compelled the neighborhood to gentrify in the first period are compelling it to gentrify again, making it difficult to capture the independent effects. If a tract gentrifies in the first time period, it has much the same chance of gentrifying again, because the neighborhood has the same characteristics that led it to gentrify.

Although the chance of a tract potentially gentrifying again may be small, the fact of higher risk means that we should give additional consideration to these tracts relative or other potentially eligible tracts. Moreover, it is expected that changes that lead to gentrification would slow in the second decade, in part because some of the changes are reaching a "ceiling." What is worth noting is that another half of these tracts continued to change in the second decade in a direction that is partially related to gentrification.

Overall, we see that, if a tract started gentrifying, it will have a much higher risk of continuing down the path of gentrifying and/or upscaling. In some ways, if we project this forward, starting with the tracts that gentrified between 2000 and 2013, we can expect that a majority of these tracts will either continue to gentrify or upscale, thus putting them at a higher risk. In some ways, the methodology used to construct the gentrification index obscures some of the upscaling that continues to go on in some of these neighborhoods. Additionally, we need to look at other key factors that make an area gentrify. The next section uses logit and multinomial logit regression models to examine this.

***Logit Regressions***

Gentrification can include both direct displacement (socially and economically disadvantaged residents who are forced out) and exclusionary displacement (barriers that make it difficult for disadvantaged residents to move in). It is difficult to separate these two elements in the regression model. In this section, we begin by modeling gentrification for two individual time periods: 1990-2000 and 2000-2013.

For Los Angeles and the Bay Area, we use a logit regression model with two types of regression results (Tables 2E.3 and 2E.4). The first two models (I & II) only look at tracts that are eligible to gentrify, whereas the second set of models looks at all tracts (III & IV). The dependent variable is a dichotomous variable indicating whether or not a tract has gentrified. The independent variables include key factors related to gentrification (race and income), a tenure variable (percent renters), and two place variables (TOD neighborhoods and Downtown TOD). In this analysis, we separated TOD neighborhoods into three categories depending on the year the transit station opened: TOD 1990s (opened in the 1990s), TOD 2000s (opened in the 2000s), and TOD Recent (opened in 2012 or later *for LA only,* since there has been a lot of recent station development in LA compared to the Bay Area). Additionally, we include a built environment variable (percent of housing units in pre-WWII buildings, defined as those constructed before 1950) and an accessibility variable (# jobs/square mile). The baseline year data for the independent variables are either 1990 or 2000 depending on the period examined.

For Los Angeles, we find that when a station opens, there is a measurable statistical impact. In the first model, the transit stations that opened in the 1990s are associated with a significant positive impact on the tract gentrifying in that decade (Model I), but not in the following decade (Model II). Furthermore, for stations that opened in the 2000s, they negatively predict gentrification in that decade (Model II), and for stations that opened after 2012, they had a significant positive impact on the gentrification outcome. Downtown TODs positively predicted gentrification in all models. For the Bay Area, while new stations appear to influence gentrification positively between 1990 and 2000, they do not seem to have an impact on gentrification from 2000 to 2013. TODs in the three major cities (Oakland, San Francisco, and San Jose, labeled downtown) were more likely to gentrify than TODs in other cities for both time periods, however only downtown TODs were significant for the more recent model.

The role of race remains significant, but its impact changes from one decade to the next. For Los Angeles, the first model tells us that gentrification is occurring in minority areas. Model I (which covers 1990-2000) indicates that neighborhoods with a higher share of non-white population were more likely to gentrify, while Model II (which covers 2000-2013) implies the opposite. In other words, gentrification was initially concentrated in minority areas and then shifted to others. This may be due in part to the possibility that some areas continued to gentrify even after losing much of their minority population. When comparing the eligible and non-eligible models for Los Angeles, we

see a flip in the signs on the race variables, particularly for the 1990-2000 models (Model I and Model III). This would indicate that while gentrification is occurring more in predominantly minority neighborhoods, overall upscaling is more likely to occur in predominantly white neighborhoods. The changes in the estimated coefficients indicate that some patterns of gentrification/upscaling are time- and location-specific, perhaps due to changes in unobserved factors that alter the relative attractiveness for development. In the Bay Area, African-American neighborhoods were more likely to experience gentrification during the later time period (2000-2013), but not the earlier (1990-2000), possibly reflecting shifts in neighborhood preferences or housing availability.

With respect to non-demographic drivers of gentrification, in Los Angeles, the percent of all units that were built prewar is statistically significant, indicating that neighborhoods with a higher share of older units are more likely to experience gentrification. The same was true for the Bay Area model from 2000-2013, again potentially reflecting shifts in neighborhood and housing preferences. While the impact of the access variable (job density) was positive and significant in all of the Los Angeles models, it was only significant and positive in the Bay Area in the 2000-2013 model when including all of the Census tracts, possibly indicating that accessible neighborhoods have become more attractive to gentrifiers over time.

**Table 2E.3: Logit Regressions of Gentrification, 1990-2000 and 2000-2013, Los Angeles**

| | ***Eligible Tracts*** | | | | ***All Tracts*** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Model I LA** 1990-2000 | | **Model II LA** 2000-2013 | | **Model III LA** 1990-2000 | | **Model IV LA** 2000-2013 | |
| Intercept | -3.2807 | *** | 2.6899 | *** | -5.7477 | *** | -4.5411 | *** |
| Median Household Income (/10000) | -0.2130 | ** | -0.8161 | *** | 0.4623 | *** | 0.2741 | *** |
| Income Squared | 0.0208 | * | 0.0852 | *** | -0.0111 | *** | -0.0240 | *** |
| % non-Hispanic black | 0.0065 | *** | -0.0756 | *** | -0.0069 | *** | -0.0124 | *** |
| % Asian | 0.0273 | *** | -0.0296 | *** | -0.0157 | *** | 0.0015 | |
| % Hispanic | 0.0126 | *** | -0.0538 | *** | -0.0106 | *** | -0.0160 | *** |
| % Renters | -0.0065 | *** | 0.0026 | | 0.0214 | *** | 0.0247 | *** |
| Downtown TOD | 0.5736 | *** | 0.4838 | *** | 0.7406 | *** | 0.6822 | *** |
| TOD 1990s | 0.1327 | ** | -0.0381 | | 0.3575 | *** | -0.0193 | |
| TOD 2000s | - | | -0.2962 | *** | - | | -0.2677 | *** |
| TOD Recent | - | | 1.0297 | *** | - | | 0.3971 | *** |
| % of Housing Units Prewar (<1950) | 0.0178 | *** | 0.0345 | *** | 0.0259 | *** | 0.0309 | *** |
| Employment Density (# jobs / square mile) | 0.0001 | *** | 0.0006 | *** | 0.0001 | *** | 0.0002 | *** |
| N | 937 | | 929 | | 2,273 | | 2,306 | |
| Likelihood Ratio | 493.110 | *** | 2157.547 | *** | 7822.79 | *** | 6436.391 | *** |
| ***<.01 **<.05 *<.10 | | | | | | | | |

*Source: 1990 and 2000 Decennial Censuses, 2009-13 5-year ACS, NETS (1990, 2000)*
*Tabulations by C.Pech & P. Ong, July 2015*

**Table 2E.4: Logit Regressions of Gentrification, 1990-2000 and 2000-2013, Bay Area**

| | *Eligible Tracts* | | | | *All Tracts* | | | |
|---|---|---|---|---|---|---|---|---|
| | **Model I BA** | | **Model II BA** | | **Model III BA** | | **Model IV BA** | |
| | 1990-2000 | | 2000-2013 | | 1990-2000 | | 2000-2013 | |
| Intercept | -6.690 | *** | -4.861 | *** | -8.060 | *** | -7.191 | *** |
| Median Household Income (/10000) | 0.692 | ** | 0.332 | | 0.765 | ** | 0.698 | ** |
| Income Squared | -0.032 | | -0.011 | | -0.059 | ** | -0.057 | ** |
| % non-Hispanic black | 0.012 | | 2.030 | ** | 1.383 | * | 3.772 | *** |
| % Asian | -0.890 | | -0.362 | | 0.256 | | 1.385 | |
| % Hispanic | -0.711 | | -0.242 | | 1.800 | ** | 2.216 | *** |
| % Renters | 2.373 | *** | 0.598 | | 3.524 | *** | 1.412 | * |
| Downtown TOD | 1.906 | *** | 0.782 | ** | 1.363 | *** | 0.366 | |
| Non-Downtown TOD | 0.841 | ** | -0.269 | | 1.058 | *** | 0.087 | |
| TOD 1990s | 0.823 | ** | -0.465 | | 0.883 | *** | -0.179 | |
| TOD 2000s | - | | 0.354 | | - | | 0.372 | |
| % of Housing Units Prewar (<1950) | 0.438 | | 1.783 | *** | -0.143 | | 1.039 | * |
| Employment Density (# jobs / square mile) | 0.000 | | 0.000 | | 0.000 | | 0.000 | * |
| N | 640 | | 626 | | 1576 | | 1579 | |
| Likelihood Ratio | 219.9 | *** | 229.9 | *** | 262.5 | *** | 266.7 | *** |
| ***<.01 **<.05 *<.10 | | | | | | | | |

*Source: 1990 and 2000 Decennial Censuses, 2009-13 5-year ACS*
*Tabulations by M. Zuk Aug 2015*

## 2E.2. Changes in Affordable Housing

In this section, we look at the loss of affordable housing, which serves as proxy for displacement. This is measured by the change in affordable rental units, condo conversions (cities of Los Angeles and San Francisco only), Housing Choice Vouchers (Section 8), Low-Income Housing Tax Credit (LIHTC) units, Ellis Act evictions (city of Los Angeles only) and fault/no fault evictions (city of San Francisco only).

In Los Angeles, we define affordable rental units as units with median gross rent of less than 80% of the county median. For the Bay Area, we define these units as those where low-income households are paying less than 30% of their income on rent and we subtract out subsidized units. Details on data sources and definitions can be found in Appendix I.

Table 2E.5 presents the results for each of the regression models for Los Angeles. We begin by first examining the change in affordable rental units and condo conversions, which is presented in the first two columns. The market as a whole is facing some losses of affordable rental units and of apartments converted to condos, particularly in Downtown. TOD neighborhoods outside of Downtown are also experiencing loss in affordable rental units and conversions from apartments to condos. The next two columns – changes in Section 8 and LIHTC units – look specifically at subsidized housing. While Los Angeles county overall has seen an increase in the number of Section 8 units within the last decade, TOD areas are not experiencing increases in Section 8 units, and TODs outside of Downtown are actually losing them. LIHTC seems to help offset some of the loss because there is an increase of them in both TOD areas, much more so for the Downtown. The increase in LIHTC in TOD areas, however, has not been large enough to offset the total loss of affordable rental units that are occurring in the area. The final model looks at Ellis Act evictions, which are only available for the City of Los Angeles. Because of these data limitations, the results should be interpreted cautiously. They indicate that there are not many Ellis Act evictions occurring in TOD areas. The negative coefficient on the Downtown TOD variable indicates that Ellis Act

evictions are occurring less in the Downtown area. Other types of evictions, which are not Ellis Act, can be occurring in TOD areas, but because this data is unavailable, it is hard to capture this.

**Table 2E.5: Changes in Affordable Housing[2], Linear Regressions (Los Angeles)**

| | Model I | | Model II | | Model III | | Model IV | | Model V | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Δ Affordable Rental Units (00-13) | | Condo Conversions (03-13) | | Δ Section 8 (00-13) | | Δ LIHTC (00-13) | | Ellis Act Evictions (07-14) | |
| Intercept | -2.353 | ** | 1.556 | *** | 3.284 | *** | 4.071 | *** | 1.137 | *** |
| Median Household Income (/10000) | 0.634 | *** | -0.055 | | -0.494 | *** | -0.664 | *** | -0.100 | *** |
| Income Squared | -0.028 | *** | -0.001 | | 0.017 | *** | 0.023 | *** | 0.002 | ** |
| % non-Hispanic black | 0.027 | *** | -0.010 | *** | 0.013 | *** | 0.003 | | -0.008 | *** |
| % Hispanic | 0.021 | *** | -0.015 | *** | -0.008 | *** | -0.002 | | -0.008 | *** |
| % Asian | 0.008 | | -0.008 | ** | -0.005 | * | 0.001 | | -0.003 | |
| Downtown TOD | -18.966 | *** | 4.486 | *** | -0.678 | | 12.945 | *** | -0.290 | * |
| Other TOD | -2.551 | *** | 0.341 | *** | -0.365 | *** | 0.392 | * | 0.050 | |
| Adj. r-squared | 0.091 | | 0.052 | | 0.112 | | 0.147 | | 0.0704 | |
| N | 2,316 | | 2,317 | | 2,316 | | 2,316 | | 993 | |
| ***<.01 **<.05 *<.10 | | | | | | | | | | |

*Ellis Act Evictions Data Are Only for LA City, All Other Data are for the County*
*Source: 2000 Decennial Census, 2006-10 & 2009-13 5-year ACS, 2000 & 2013 HUD's Picture of Subsidized Households, CTCAC, Housing Authority of the City of Los Angeles, Tabulations by C.Pech & P. Ong, July 2015*

For the Bay Area (Table 2E.6), we find that being in a TOD predicts the loss of non-subsidized affordable housing and use of Section 8 vouchers; however, the effect is not significant. Similar to Los Angeles, we find that being in a TOD in one of the Bay Area's three major cities – San Francisco, Oakland, and San Jose – positively predicts the addition of federally subsidized housing (LIHTC). However, being in a TOD outside of these three cities predicts fewer new subsidized units. For the entire region, an increase in affordable housing is predicted for minority neighborhoods through both naturally occurring rental units and the use of housing choice vouchers; however, only Hispanic neighborhoods see new federally subsidized units.

[2] We ran an analysis looking at the change in public housing units in TOD and non-TOD areas and found that changes in TOD areas are essentially the same as in non-TOD areas (the difference in proportion is not statistically different). From 2000 to 2013, non-TOD areas lost 5.8% of their public housing units, whereas non-TOD areas lost 6%.

**Table 2E.6: Changes in Affordable Housing, Linear Regressions (Bay Area)**

| | Model I | Model II | Model III |
|---|---|---|---|
| | Δ Affordable Rental Units (00-13) | Δ Section 8 (00-13) | Δ Federally Subsidized (00-14) |
| Intercept | -142.541 *** | 34.043 *** | 96.232 *** |
| Median Household Income, 2000 | 14.112 *** | -3.880 *** | -14.105 *** |
| Income Squared, 2000 | -0.365 *** | 0.086 * | 0.4716 *** |
| % Asian, 2000 | 40.256 *** | 36.249 *** | 3.703 |
| % non-Hispanic Black, 2000 | 92.624 *** | 14.739 * | -18.857 |
| % Hispanic, 2000 | 95.357 *** | 16.762 ** | 43.516 *** |
| % Renter, 2000 | -119.277 *** | -0.453 | 11.843 |
| Downtown TOD, 2000 | -2.978 | -0.964 | 21.084 *** |
| Non-downtown TOD, 2000 | -6.507 | -2.744 | -23.961 *** |
| adjusted R squared | 0.189 | 0.184 | 0.082 |
| n | 1,579 | 1,579 | 1,579 |
| ***<.01 **<.05 *<.10 | | | |
| Source: 2000 Decennial Census, 2006-10 & 2009-13 5-year ACS, 2000 & 2013 HUD's Picture of Subsidized Households, CHPC | | | |

Taking advantage of the unique datasets available for San Francisco, we ran linear regressions on the rates of evictions (both fault and no-fault) as well as condominium conversions at the finer geography of the Census block group. Data on condominium conversions, building renovation permits, and code violations were all derived from San Francisco departmental data (Planning, Buildings, and the Rent Control Board). *For these models, TOD neighborhoods are defined as Census block groups that intersect with a quarter-mile buffer of a rail-transit station*.

In Table 2E.7, we show that Hispanic neighborhoods were more likely to experience higher eviction rates than other neighborhoods, whereas Asian neighborhoods were less likely to experience fault evictions. Location near rail transit appears to increase fault evictions rates, but not no-fault rates. Condominium conversions, on the other hand, appear to be less likely to occur in minority neighborhoods, and the impact of TODs is not significant.

**Table 2E.7: Evictions and Condominium Conversions, Linear Regressions, San Francisco***

| | Fault Evictions Rate, '10-'15 | No Fault Evictions Rate, '10-'15 | All Evictions Rate, '10-'15 | Condo Conversion Rate, 10-15 |
|---|---|---|---|---|
| Intercept | 0.018 *** | 0.002 | 0.021 ** | 0.029 *** |
| Median Household Income, 2010 | -1.8E-04 | 1.0E-03 | 8.3E-04 | 1.9E-03 *** |
| Income Squared, 2010 | -2.9E-05 | -4.5E-05 | -7.4E-05 | -8.5E-05 ** |
| % non-Hispanic black, 2010 | -0.006 | -0.003 | -0.009 | -0.042 *** |
| % Asian, 2010 | -0.014 *** | -0.002 | -0.016 * | -0.058 *** |
| % Hispanic, 2010 | 0.027 *** | 0.018 *** | 0.045 *** | -0.009 |
| TOD | 0.004 ** | 0.001 | 0.005 * | -0.001 |
| Adj. r-squared | 0.071 | 0.001 | 0.043 | 0.287 |
| n | 576 | 576 | 576 | 578 |

**Note: This analysis differs from previous analyses in that TOD neighborhoods are defined as Census block groups, rather than Census tracts and we look at the quarter mile buffer around the rail station rather than half mile...*

## 2E.3. Loss of Low-income Households

Another approach to estimating displacement is to use the loss of low-income households as a proxy. For the Bay Area, we take this approach as another way to model displacement effects of TODs. Researchers have found that neighborhood composition in the United States is considerably stable (Wei and Knox 2014; Landis 2015). In fact, on average, Bay Area Census tracts' low-income population grew by 59 households between 2000 and 2013. Therefore, we may assume that any neighborhood that experienced a net loss of low-income households while stable in overall population is a result of displacement pressures. Although the change in low-income households could be due to income mobility (e.g., low-income households moving into middle- or upper-income categories, or vice versa), from our analysis of data from the Panel Study on Income Dynamics we estimate that the Great Recession would have caused a net increase in low-income households in most places. In Table 2E.8, we find that TODs outside of the three major cities had an increase in the likelihood of losing low-income households, which is consistent with the lower rates of low-income in-migration and higher rates of higher-income in-migration found in Section 2D. In TOD neighborhoods in the three major cities, we found an increase in the likelihood of gaining low-income households, which may be related to the growth in subsidized housing found in these neighborhoods (see table 2E.6).

Neighborhoods with a high proportion of renters were more likely to lose low-income households, whereas minority neighborhoods were more likely to gain. In an alternative scenario we consider characteristics related to the built environment such as the percent of housing units in prewar buildings, and find that neighborhoods with a high proportion of historic, pre-war housing stock were more likely to lose low-income households, whereas development of any kind, both market-rate and subsidized, predicted a gain in low-income households. Finally, neighborhoods that had a high proportion of housing stock in public housing were more likely to gain low-income households, whereas neighborhoods where low-income residents were living in naturally affordable rental units were more likely to lose low-income households.

**Table 2E.8: Change of Low-Income Households, Linear Regressions (Bay Area)**

| | Change in Low Income Households, 2000-2013 | | Change in Low Income Households, 2000-2013 ALT | |
|---|---|---|---|---|
| Intercept | -33.829 | | 96.519 | *** |
| Median Household Income (/10000), 2000 | 9.850 | * | | |
| Income Squared, 2000 | -0.326 | * | | |
| % Asian, 2000 | 108.805 | *** | | |
| % non-Hispanic Black, 2000 | 14.670 | | | |
| % Hispanic, 2000 | 234.995 | *** | | |
| % Renters, 2000 | -74.772 | *** | | |
| Donwtown TOD, 2000 | 17.886 | | 48.539 | *** |
| Non-Downtown TOD, 2000 | -44.087 | *** | -73.647 | *** |
| % of housing units prewar (<1950), 2000 | | | -140.675 | *** |
| Employment Density (/1000), 2000 | | | 0.000 | |
| % increase in property sales value per square foot, 1990-2000 | | | -15.782 | |
| % increase in rent paid, 1990-2000 | | | -6.582 | |
| New market rate units, 1990-2000 | | | 0.052 | *** |
| New subsidized units, 1990-2000 | | | 0.378 | *** |
| % of housing units in Public Housing, 2000 | | | 167.638 | * |
| % of low income households paying less than 30% in rent in non-subsidized units, 2000 | | | -67.788 | ** |
| Adj. r-squared | 0.065 | | 0.105 | |
| n | 1569 | | 1524 | |

# Section 2F: Modeling Neighborhood Change

Given the shortcomings of the data available to analyze mobility and displacement, we conducted a third set of analyses to look at changes in neighborhood composition by income classes, income inequality, racial/ethnic groups, racial diversity, and rent burden. First we present the findings for Los Angeles County, followed by those for the Bay Area.

## 2F.1. Neighborhood Change in Los Angeles County

Our analysis of neighborhood change is broken into two parts. We begin with a simple bivariate analysis, comparing the changes in neighborhood characteristics between TOD and non-TOD areas using the characteristics previously described pertaining to income, race, education, and tenure. TOD neighborhoods are grouped into two separate categories: TODs that are located in Downtown Los Angeles ("Downtown TOD") and TODs that are located elsewhere ("Other TODs").

Table 2F.1 reports the average (both mean and median) tract level changes for TOD and non-TOD areas. Our analysis looks specifically at the changes in: 1) population with less than a high school diploma; 2) population with a bachelor's degree or higher; 3) non-Hispanic white; 4) rent burden (paying 30 percent or more of income on rent); 5) low-income households (households with less than $10K); 6) high income-households (households with $125K or more); 7) median household income (adjusted to 2013 dollars); and 8) gross rent (adjusted to 2013 dollars). With the exception

of the change in median household income and gross rent (which are absolute changes), all changes represent percentage point change.

It is evident from the table that TOD tracts are changing more in the direction of gentrification than non-TOD areas. In terms of demographic and socioeconomic changes, TODs, on average, experienced greater increase in white, college-educated, and higher-income households. While the county overall experienced declines in median household income from 2000 to 2013 (-$3,460), largely a result of the recent recession, the impact on TOD areas was smaller. Surprisingly, Downtown TODs on average saw a gain in median household income during this period (+$1,405). Increases in gross rent are also higher in TOD tracts than non-TOD areas.

**Table 2F.1: Changes in Neighborhood Characteristics, LA County, 2000-2013***

| | ***Downtown TOD*** | | ***Other TOD*** | | ***non-TOD*** | |
|---|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | Mean | Median |
| Δ Less than High School | -16.41 | -16.6 | -10.8 | -10.27 | -6.98 | -5.59 |
| Δ Bachelor's Degree or Higher | 16.98 | 15.97 | 5.77 | 4.17 | 4.9 | 4.3 |
| Δ non-Hispanic white | 12.37 | 13.04 | 0.21 | -0.1 | -4.76 | -3.56 |
| Δ Rent Burden | 8.29 | 7.37 | 12.7 | 13.36 | 11.64 | 12.55 |
| Δ Low-Income Households (<10K) | -4.74 | -0.42 | -0.23 | -0.01 | 1.00 | 0.89 |
| Δ High Income Households (125K+) | 3.85 | 3.25 | -0.57 | -0.99 | -2.1 | -2.06 |
| Δ Gross Rent | $358.75 | $247.98 | $246.95 | $226.39 | $223.87 | $233.34 |
| Δ Median Household Income | $8,864.43 | $1,405.51 | $327.72 | -$824.07 | -$4,110.56 | -$3,460.36 |
| % Asian, 2000 | 35.08 | 32.23 | 10.7 | 7.03 | 13.01 | 8.21 |
| % non-Hispanic black, 2000 | 15.02 | 8.57 | 14.62 | 6.82 | 8.92 | 3.45 |
| % Hispanic, 2000 | 35.47 | 26.61 | 56.47 | 57.83 | 41.78 | 36.81 |
| % Renter, 2000 | 92.87 | 93.66 | 70.78 | 72.99 | 48.46 | 48.9 |
| n | 12 | | 367 | | 1,884 | |

*Data Source: 2000 Census, 2009-2013 5-year ACS*

**With the exception of change in gross rent and median household income, all changes represent percentage point change. Values for gross rent and median household income are adjusted to 2013 dollars.*

While the patterns seem to be consistent with the literature on gentrification, we ran multivariate models to test whether the relative changes for TOD tracts hold after accounting for other neighborhood characteristics that can also influence change (Table 2F.2). The dependent variables (in column headings) include the change in: population with less than a high school diploma (LTHS), those with a bachelor's degree or higher (BA+), non-Hispanic white (NHW), rent burden, low-income households, high-income households, median household income, and gross rent. The control variables are the 2000 baseline data presented in each row.

**Table 2F.2: Neighborhood Change Multivariate Regressions, LA County, 2000-2013***

| | Δ LTHS | Δ BA+ | Δ NHW | Δ Renter Burden | Δ Low-Income HHs (<10K) | Δ High Income HHs (125K+) | Δ Median HH Income | Δ Median Gross Rent |
|---|---|---|---|---|---|---|---|---|
| Constant | -5.544 *** | 3.230 * | -19.657 *** | -4.181 | 2.129 | 2.938 * | 6,007 * | 266.135 *** |
| Median Household Income (/10,000) | 1.212 *** | 0.137 | 0.106 | 1.333 *** | 0.366 ** | -0.841 *** | -410.652 | 28.163 *** |
| Median Household Income Squared | -0.049 *** | -0.003 | 0.030 *** | -0.049 *** | -0.022 *** | 0.016 ** | -75.488 *** | -2.745 *** |
| % Asian | -0.034 *** | 0.021 ** | 0.078 *** | 0.024 | -0.039 *** | 0.001 | -40.271 ** | -1.875 *** |
| % NHBLK | -0.006 | -0.036 *** | 0.116 *** | 0.055 *** | -0.024 *** | -0.038 *** | -88.725 *** | -1.246 *** |
| % Hispanic | -0.108 *** | -0.055 *** | 0.087 *** | 0.120 *** | -0.011 * | -0.044 *** | -95.379 *** | -1.240 *** |
| Downtown TOD | -4.975 *** | 9.028 *** | 11.312 *** | -3.361 | -4.596 *** | 1.591 | 7,703 ** | 166.895 *** |
| Other TOD | -0.440 | 0.897 ** | 1.422 *** | -1.186 | -0.696 ** | 0.611 * | 2,679 *** | 17.775 |
| % Renters | -0.023 ** | 0.045 *** | 0.131 *** | 0.057 *** | -0.008 | 0.017 ** | 0.671 | 0.184 |
| Δ Gross Rent | -0.003 *** | 0.005 *** | 0.002 ** | 0.006 *** | -0.003 *** | 0.004 *** | 9.520 *** | |
| Adjusted R-Squared | 0.359 | 0.133 | 0.258 | 0.071 | 0.055 | 0.144 | 0.279 | 0.156 |
| n | 2,224 | 2,224 | 2,224 | 2,224 | 2,224 | 2,224 | 2,224 | 2,224 |

***<.01 **<.05 *<10

*Data Source: 2000 Census, 2009-2013 5-year ACS*
**With the exception of change in gross rent and median household income, all other changes represent percentage point changes. Values for gross rent and median household income are in 2013 dollars.*

Not surprisingly, we find similar results to what was discussed in the previous sections. Relative to non-TOD areas, TOD tracts are changing more into the direction of gentrification. Focusing specifically on Downtown TOD and Other TOD, we see that relative to non-TOD areas, TOD neighborhoods are more likely to see a decline in people with less than a high school diploma (significant only for Downtown TOD) and low-income households. Conversely, TOD tracts are more likely to see an increase in the share of people with a bachelor's degree or higher, a gain in non-Hispanic white population, a gain in higher-income households (significant only for Other TOD neighborhoods), an increase in median household income, and a rise in gross rent relative to non-TOD areas. The multivariate results are consistent with the gentrification thesis, that is, TODs are associated with the a priori hypothesis of demographic and socioeconomic change.

We found no significance in terms of rent burden, although the negative coefficients do indicate that relative to non-TOD tracts, TOD neighborhoods are more likely to see a drop in burden households. One explanation for this could be the increase in higher-income households. In early gentrifying neighborhoods, rents are cheaper and, according to existing literature on gentrification, they often attract higher-income and educated young professionals. Hoping to take advantage of the cheaper rent (cheaper relative to their income), these newcomers might displace lower-income families who can no longer afford to live in the neighborhood. The low-income family's higher housing burden status is now replaced with the new higher-income households for whom the rent is not a burden (i.e., they pay less than 30% of their income on housing). Although declining rent burden is not proof of gentrification, it certainly is consistent with what is known about early stages of gentrification.

## 2F.2. Neighborhood Change in San Francisco Bay Area

Using similar datasets and procedures as in Los Angeles County, Table 2F.3 reports the average (both mean and median) tract-level changes for TOD and non-TOD areas for indicators in the San Francisco Bay Area. For rent burden, we only look at low-income households that are rent burdened, defined as households earning less than 80% of the county median income that spend more than 30% of their household income on rent. Because of the high variability in incomes across

the region, we define low-income households as those earning less than 80% of the county median income and high-income households as those earning more than 120% of the county median income.

It is evident from the table that TOD tracts in the Bay Area are changing more in the direction of gentrification than non-TOD areas. In terms of demographic and socioeconomic changes, TODs, on average, lost fewer non-Hispanic whites and adults with less than a high school education than non-TODs. In contrast, TODs experienced greater increases in college-educated and higher-income households. While the region overall experienced declines in median household income from 2000 to 2013, largely a result of the recent recession, the impact on TOD areas was about half as much as on non-TOD areas. While the patterns seem to be consistent with the literature on gentrification, we ran multivariate models to test whether the relative changes for TOD tracts hold after accounting for other neighborhood characteristics that can also influence change.

**Table 2F.3: Changes in Neighborhood Characteristics, SF Bay Area, 2000-2013***

| | Non-TOD | | Downtown TOD | | Non-Downtown TOD | |
|---|---|---|---|---|---|---|
| | Mean | Median | Mean | Medan | Mean | Median |
| Δ Less than High School | -3.40 | -3.28 | -6.29 | -4.66 | -3.23 | -3.55 |
| Δ Bachelor's Degree or Higher | 5.29 | 4.72 | 8.02 | 7.14 | 5.84 | 5.54 |
| Δ non-Hispanic white | -8.51 | -8.09 | -2.43 | -2.64 | -8.53 | -9.11 |
| Δ Rent Burden | -6.45 | -8.02 | -3.87 | -5.39 | -10.54 | -11.71 |
| Δ Low Income Households (<80% County median Income) | 2.31 | 2.41 | 1.80 | 1.88 | -0.02 | -0.29 |
| Δ High Income Households (>120% County Median Income) | 0.02 | -0.16 | 0.83 | 0.51 | 2.61 | 2.65 |
| Δ Median Rent | $145.61 | $170.95 | $192.97 | $194.15 | $133.25 | $144.82 |
| Δ Median Household Income | -$6,688.40 | -$6,946.20 | -$1,986.81 | -$4,124.38 | -$2,460.94 | -$3,033.15 |
| % Asian, 2000 | 18.73 | 13.14 | 28.41 | 22.97 | 23.10 | 19.76 |
| % non-Hispanic Black, 2000 | 7.97 | 3.00 | 12.05 | 4.83 | 7.03 | 3.12 |
| % Hispanic, 2000 | 17.09 | 12.41 | 21.74 | 15.92 | 20.32 | 15.92 |
| % Renter, 2000 | 35.32 | 31.90 | 56.80 | 59.65 | 47.99 | 46.04 |

*Data Source: 2000 Census, 2009-2013 5-year ACS*

**With the exception of change in gross rent and median household income, all other changes represent percentage point changes. Values for gross rent and median household income are in 2013 dollars.*

Focusing specifically on the one TOD variable for the Bay Area (Table 2F.4), we see that relative to non-TOD areas, TOD neighborhoods are more likely to see a decline in those with less than a high school diploma and low-income households. Conversely, TOD tracts are more likely to see an increase in the share of those with a bachelor's degree or higher, a gain in non-Hispanic white population, more higher-income households, and an increase in median household income and median gross rent relative to non-TOD areas. The multivariate results are consistent with the gentrification thesis, that is, TODs are associated with the a priori hypothesis of demographic and socioeconomic change.

**Table 2F.4: Neighborhood Change Multivariate Regressions, SF Bay Area, 2000-2013***

| | Δ Less than High School | | Δ Bachelor Degree or Higher | | Δ non-Hispanic White | | Δ Rent Burden of Low Income Households | | Δ Low income Households | | Δ High Income Households | | Δ Median Household Income | | Δ Median Gross Rent | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Constant | -0.03 | | 0.01 | | -0.14 | *** | 0.01 | | -0.07 | *** | 0.07 | *** | 959.01 | | 493.59 | *** |
| Median Household Income | 0.00 | | 0.00 | | 0.00 | | -0.02 | *** | 0.01 | *** | -0.01 | *** | -30.20 | | 1.58 | |
| Income Squared | 0.00 | | 0.00 | | 0.00 | ** | 0.00 | *** | 0.00 | *** | 0.00 | *** | -30.87 | | -2.15 | *** |
| % Asian | 0.02 | | -0.01 | | 0.02 | *** | 0.08 | *** | 0.08 | *** | -0.08 | *** | -11314.17 | *** | -204.25 | *** |
| % non-Hispanic black | -0.05 | *** | 0.03 | * | 0.20 | *** | 0.13 | *** | 0.06 | *** | -0.08 | *** | -6834.32 | * | 110.26 | * |
| % Hispanic | -0.02 | * | -0.03 | ** | 0.06 | *** | 0.05 | | 0.14 | *** | -0.11 | *** | -28243.65 | *** | -106.73 | ** |
| % Renters | -0.03 | ** | 0.04 | *** | 0.08 | *** | -0.08 | ** | -0.04 | *** | 0.03 | *** | 4813.04 | ** | -269.02 | *** |
| TOD | -0.01 | ** | 0.02 | *** | 0.01 | *** | 0.00 | | -0.01 | *** | 0.02 | *** | 4416.09 | *** | 26.48 | * |
| Δ Median Gross Rent | -3.4E-05 | *** | 4.09E-05 | *** | 3.33E-05 | *** | 4.28E-05 | ** | -5.5E-05 | *** | 5.33E-05 | *** | 11.00 | *** | | |
| n | 1,575 | | 1,575 | | 1,575 | | 1,546 | | 1,567 | | 1,567 | | 1,574 | | 1,575 | |
| Adj. R-Squared | 0.0633 | | 0.0414 | | 0.1765 | | 0.028 | | 0.1436 | | 0.1301 | | 0.146 | | 0.2109 | |

*** P<.01, ** p<.05, *p<.10

*Data Source: 2000 Census, 2009-2013 5-year ACS*

**With the exception of change in gross rent and median household income, all other changes represent percentage point changes. Values for gross rent and median household income are in 2013 dollars.*

# Section 2G. Sensitivity Analyses

For Sections 2D, 2E, and 2F, we report the results for the regression models that are both conceptually sound and empirically reasonable. There are two different methods of comparing the model results for the sensitivity analyses. One is a pure statistical comparison. We look at the estimated parameters to see if they are statistically different from or similar to each other across models. This includes conducting a simple t-test of the coefficients. The second is a more qualitative comparison of the outcomes. For example, are the directions of the impacts in the same (e.g., positive coefficients in all models), and are they roughly of the same relative magnitude?

The sensitivity analyses to test the robustness and reliability of our models can be grouped into four broad categories: 1) alternative specifications; 2) alternative data construction; 3) identifying outliers; and 4) other types of robustness testing.

### *Alternative Specifications*

This essentially consists of purposely running a number of alternative specifications to determine whether particular results are robust to a change in specification. For example, while we ran mostly ordinary least square regressions (OLS), we also explored other types of regression models. For the research task described in section 2D, we ran both OLS and seemingly unrelated regressions (SUR) to model neighborhood mobility. SUR accounts for possible correlation of the error terms across equations. We ran the model using both techniques and found them to produce similar results, which confirmed our original conclusion derived from the OLS model. Other modeling techniques employed include logit models, both binary and multinomial, which we used to model neighborhood displacement in Section 2E, and censored regression models, specifically Tobit models, which we used to deal with datasets with a high number of zero values. On the whole, they produced similar results.

In addition to the type of regressions adopted, we also made modifications to the method itself. For example, we had to decide whether or not to apply weights to the models. We acknowledge that

they generally do not produce the same results, but conceptually, we know that the greatest inaccuracies lie within tracts with very small numbers or sample sizes. These tracts often overly influence the regression results because they often have extreme values. By applying weights to the models, we could counteract this undue influence. Changes were also made to the sets of independent variables. This process involved using different types of independent variables by adding or swapping out individual variables that either have or do not have a major impact on the estimated equation.

***Alternative Data Construction***

Another sensitivity analysis employed includes the construction of the same variables using different types of methods or definitions. In the analysis presented in Section 2F, for example, we ran a series of linear regressions to measure housing affordability using different definitions of rent burden. The most widely accepted definition is that a household should spend no more than 30 percent of their income towards housing costs. As part of our sensitivity analysis, we also model households paying 35 percent or more. Additionally, we ran models to include, as the dependent variable, all households (both homeowners and renters), and separately, homeowners and renters who are paying at these different levels.

Another alternative data construction test involved varying our estimates of the number of residential units. While we relied on the assessor's parcel data for information about individual properties, the parcel data had incomplete information on the number of residential units in a given parcel, as noted earlier. For properties classified as "Five or More Units", for example, we estimated the number of units in the structure by dividing the property's square footage by 900 square feet, the average size for a multi-family unit in Los Angeles County. We compared our estimated numbers to those reported by DataQuick, the Bureau of Census's 2010 Decennial Census, and the 2009-2013 American Community Survey (ACS). DataQuick reports the number of units for each property but has some missing information, which is why we decided to develop a methodology to estimate the number of units for each individual parcel for Los Angeles. The Bureau of Census does not report the number of units at the individual parcel level but does report it at the Census block (contain in the Decennial Census) and at the block group level (contained in the ACS). We compared each of these data sources for the number units within the half-mile radius of a transit station. The results are displayed in Figure 2G.1, Estimated Number of Housing Units for LA County. Our estimated numbers of units are similar to those reported by the other two sources, which allows us to have some confidence in our developed methodology and data construction. However, we do see some discrepancy, particularly in the station areas with the greatest number of housing units. One reason may be temporal, that is inconsistencies in year for the various datasets. The County Assessor's parcel data are for 2012, DataQuick is for 2014, Census block data is for 2010, and the ACS data is the average for years 2009-2013. We also use an average size of a unit across all areas to estimate the number of units for a given parcel; however, certain neighborhoods may have homes with significantly greater or smaller area footprints.

***Identifying and Addressing Outliers***

Outliers can distort the regression results. When an outlier is included in the analysis, it pulls the regression line towards itself. This can result in a solution that is more accurate for the outlier, but less accurate for all of the other cases in the dataset. Prior to removing them, we first had to make the decision about what would be considered unreasonable outliers. First, those identified as being too extreme on either end were removed. We determined this by looking at the distribution of the variable. Next, we looked at how changing the parameters might affect the sample size and

regression results. For example, as described in Section 2F "Modeling Neighborhood Change", we ran our regressions using three different cutoffs to eliminate outliers. Table 2G.1 reports the results for Los Angeles and only includes the coefficients for the variables of interest – Downtown TOD and Other TOD – and the sample size for each. The patterns are fairly consistent, but the level of significance for specific variables and overall sample sizes changes when different parameters are applied. For example, by applying a higher cutoff, the coefficient for the change in less than high school education becomes significant for Downtown TOD, and we are able to get a larger sample size for the Downtown area.

**Table 2G.1: Regression Results for Los Angeles County**

| Parameters | | Δ LTHS | Δ BA+ | Δ NHW | Δ Renter Burden | Δ Low-Income HH (<10K) | Δ High Income HH (<125K) | Δ Median HH Income | Sample Size w/ Cutoffs | Sample Size w/o Cutoffs |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 pp, 300% Change | Downtown TOD | -3.07 | 7.81 *** | 9.57 *** | -3.81 | -3.31 ** | 0.64 | 6,677.86 ** | 11 | 15 |
| | Other TOD | -0.52 | 1.02 *** | 1.46 *** | -0.96 | -0.81 *** | 0.65 * | 2,842.51 *** | 352 | 387 |
| | | | | | | | | | | |
| 40 pp, 300% Change | Downtown TOD | -5.42 *** | 10.17 *** | 11.61 *** | -2.45 | -5.16 *** | 2.33 | 9,232.68 *** | 12 | 15 |
| | Other TOD | -0.47 | 1.04 *** | 1.46 *** | -1.11 | -0.76 ** | 0.69 ** | 2,854.13 *** | 365 | 387 |
| | | | | | | | | | | |
| 40 pp, 350% Change | Downtown TOD | -6.60 *** | 12.19 *** | 12.09 *** | -2.03 | -8.36 *** | 2.81 * | 10,460.00 *** | 13 | 15 |
| | Other TOD | -0.46 | 1.04 *** | 1.46 *** | -1.11 | -0.74 ** | 0.69 ** | 2,848.70 *** | 365 | 387 |

Percentage points (PP) difference for the following variables: LTHS, NHW, Rent Burden, and Low-Income HHs
Percent change for the following variables: Gross Rent (2013 dollars), and Median HH Income

*** P<.01, ** p<.05, *p<.10

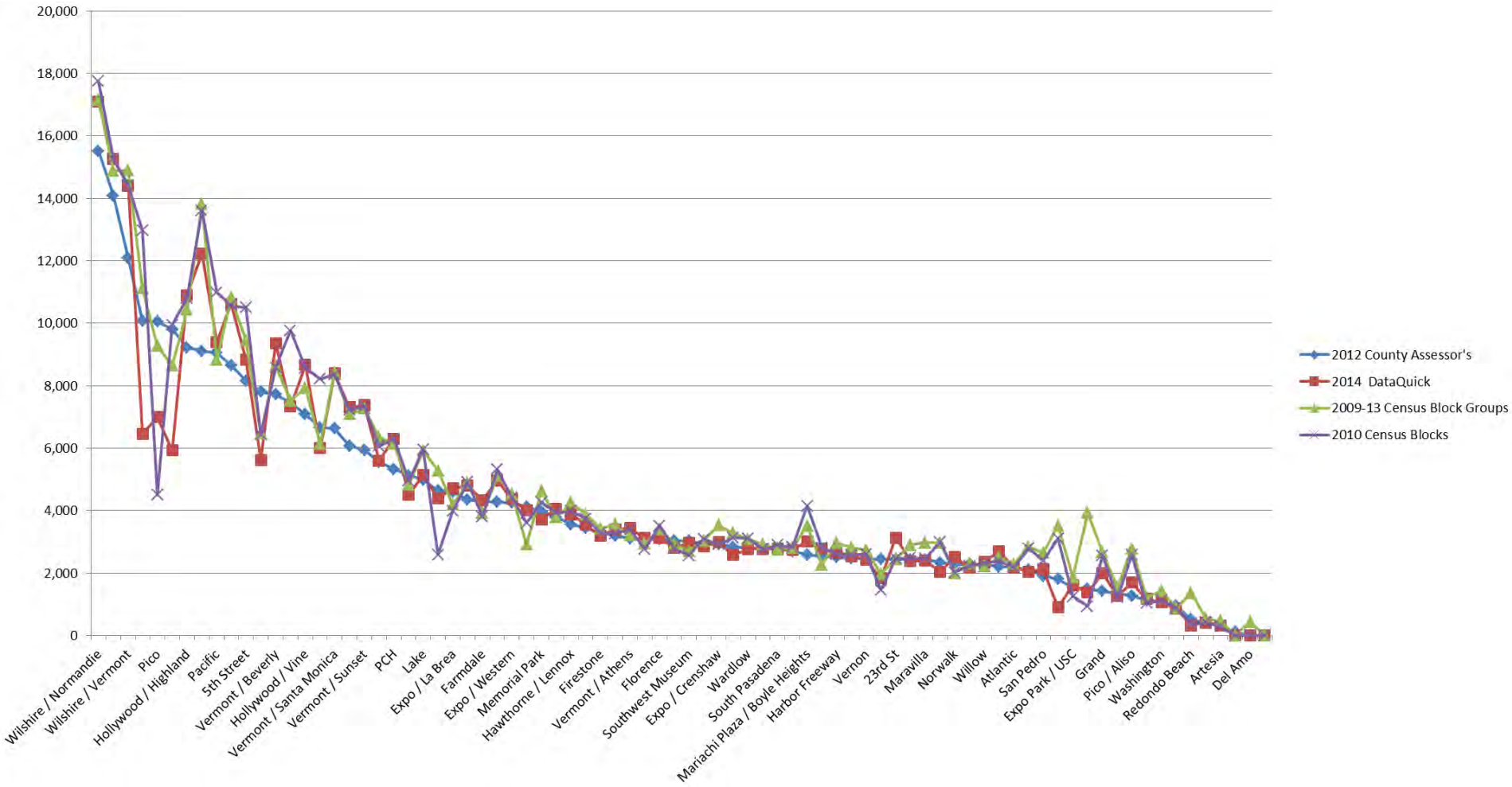



**Figure 2G.1: Estimated Number of Housing Units for LA County**

# Section 2H: Ground-Truthing Secondary Data

The above analyses rely on secondary datasets (e.g. Census), some of which are derived from samples rather than full inventories of the population in question (e.g., people, housing units, jobs, etc.). Because of this as well as delays in data collection, reporting, etc., secondary data may not accurately depict what is currently observed on the ground. We conducted a ground-truthing exercises to assess the level of consistency between real-world observations and secondary datasets. Interviews and visual observation provide a way to verify secondary data. These methods also allow us to garner more firsthand knowledge about the processes at work in gentrification and displacement. We use these ground-truthing methods in three case studies in the SF Bay Area (East Palo Alto, Marin City, and the Mission District of San Francisco) and three case study neighborhoods in Los Angeles (Chinatown, 103rd St/Watts Tower, and Hollywood/Western).

We developed similar visual inspection tools for the two regions with some variation to account for regional differences. Both methodologies involve walking on sample blocks and, using a written checklist, noting signs of investment, disinvestment, and other features of each building on the street. For example, we note the number of units a building appears to have (by counting doorbells, mailboxes, electric boxes, and so on), the apparent use of the building (single-family, multi-family, commercial, and the like), whether the building is well-maintained (through indicators like whether it is recently painted), and how stable or transient the population appears (through indicators like whether curtains/drapes are permanent or temporary). These results are compared on a parcel-by-parcel basis to secondary parcel data, and on an aggregate block-by-block level to Census and other secondary data.

Besides this visual inspection, we also conducted interviews with stakeholders (primarily non-profit advocates) who are familiar with the history and ongoing patterns of change of the case study areas. In some cases, they accompanied us on our block-walking. This insider knowledge helped us to make sense of ambiguous visual indicators. These stakeholders also helped us "ground-truth" our overall understanding of how the area is changing.

## 2H.1. Bay Area Ground-Truthing

The ground-truthing exercise conducted on sample blocks in East Palo Alto, Marin City, and the Mission District of San Francisco showed us that, broadly speaking, secondary data and on-the-ground visual observation tell the same story of neighborhood change. We find, however, that there is greater divergence between the stories emerging from the secondary data analysis and the stakeholders' perceptions of change, than there is between the secondary data and the neighborhood observation.

This process reveals the relative strengths of different datasets: secondary data provides rich descriptions of demographic change, sales turnover, and changes in home values (based on assessed versus sales values). However, unlike secondary data, ground-truthing reveals perceived safety, levels of maintenance (a proxy for investment), and newer trends in investment and change not reflected in secondary data. Finally, stakeholder interviews reveal resident concerns and perceptions, historical context, and also trends too recent for secondary data to capture.

In general, the "broad" story of a block's change as told by primary data is about the same as that told by secondary data. Though there are some discrepancies in parcels' land use and numbers of units between the datasets, these are not significant enough to change the story.

In East Palo Alto, the datasets are generally aligned, and there is minimal variation among the blocks surveyed. However, stakeholders viewed the city as undergoing more displacement than our secondary data analysis indicated.

In Marin City, the same dynamic was at play: while our secondary data analysis would lead us to believe that the neighborhood was not losing low-income households, stakeholders are very concerned about gentrification and displacement. The visual observation generally aligned with secondary data here. A challenge to the methodology on one block was that almost all the homes were identical in design, upkeep, security signage, and more. Assessing the level of investment and perceiving any nuance here was difficult.

In the Mission District, the number of units per building varied considerably from the secondary datasets. The Mission has experienced significant condominium conversion and general turnover. This is a concern for modeling displacement in areas that are rapidly changing: the secondary datasets we often rely on miss a great deal of the changes happening especially in the recent past. This underscores the importance of stakeholder engagement and on-the-ground observation to ascertain the extent of development.

There is a range of accuracy in parcel data's land use and number of units (Table 2H.1). However, even with these discrepancies, the overall story from visual observation was the same as secondary data.

**Table 2H.1: Comparisons of Secondary Data and Ground-truthing Data in Three Case Study Areas**

| Case | Land Use Match Percentages for Blocks | Unit Number Match Percentages for Blocks | Discrepancy in Total number of Units on Blocks |
|---|---|---|---|
| East Palo Alto | 87% - 100% | 94% - 100% | 5-60 units |
| Marin City | 74% - 97% | 65% - 100% | 1-28 units |
| Mission District | 71% - 96% | 32% - 44% | 0-46 units |

In Appendix J, we outline the basic methodology and the visual survey tools used, followed by a basic overview of each case study's history and recent changes, secondary and visual observation data for each case, and a comparison of the results of our quantitative models with stakeholder perceptions. Overall we find alignment between the secondary data analysis and the observations on the ground. Interviews, however, reveal perceptions of change or anticipation and anxiety about gentrification and displacement in response to more subtle observations on the ground and in surrounding neighborhoods.

## 2H.2. Los Angeles Ground-Truthing

There are 80 Metro rail stations in Los Angeles County. Metro also operates buses. Our analysis, however, focuses on three Metro station areas: Chinatown, Hollywood/Western, and 103rd St./Watts Towers. These areas were selected with input from our Southern California Advisory

Board, and each is on a different Metro rail line. Diversity of station-area conditions also influenced the selection of the three case studies, as each of the case studies represents a different typology, as described below.

(1) Chinatown is a mixed-use, ethnic neighborhood at risk of gentrification with few formal transit-specific planning efforts to mitigate the changes taking place;
(2) Hollywood/Western is a mixed-use, regional destination at risk of gentrification but mediated by formal planning efforts; and
(3) 103rd St./Watts Towers is a residential commuter neighborhood that is not gentrifying.

We focus on the area within a half-mile radius of each station. When possible, we present secondary data for the 80 stations as an aggregate group. Our analysis is done in two parts. Using results from field observations, Part I examines the validity of underlying Census and assessor data that was used to model gentrification and displacement as described in Section 2E. Part II compares the results of models in 2E with information gathered from interviews with community-based organizations (CBOs) and public agencies.

## Part I: Assessment of Data Ground-Truthing in Los Angeles

The team selected parcels for observation based on land use and recent sale transactions or activity requiring a permit. A total of 123 residential and commercial parcels were observed in the three case study areas (See Table 2H.2). Detailed description of the methodology can be found in Appendix L.

**Table 2H.2: Count of Parcels and Blocks Surveyed in Specific Los Angeles Neighborhoods**

| | Chinatown | Hollywood/Western | 103rd/Watts |
|---|---|---|---|
| **Total Parcels** | 26 | 48 | 49 |
| Residential | 19 | 46 | 46 |
| Commercial | 7 | 2 | 3 |
| **Total Block Segments** | 21 | 20 | 31 |

*Source: Tabulated by authors from observational data collected between March and August 2015.*

### *Model Results for All Three Case Studies in Los Angeles*

Figure 2H.1 presents the results of our gentrification model at the Census tract level from 1990 to 2013. Tracts were classified as either eligible or not eligible for gentrification based on population size and indicators of vulnerability (income, educational attainment, rentership rate and rent costs, race). The eligible tracts where then classified into one of four categories: (1) experiencing gentrification between 1990 and 2000; (2) experiencing gentrification between 2000 and 2013; (3) experiencing gentrification in both decades (1990-2000, and 2000-2013); or (4) eligible (disadvantaged communities) but not gentrifying. For more information on the model and tract classification, see Section 2E.

As shown in Figure 2H.1, the 103rd St./Watts area is "eligible" for gentrification as defined in section 2E.1. However, while the area is a disadvantaged community, not much development has occurred. For Chinatown and Hollywood/Western, our model indicates that the areas have undergone significant changes in the past decade. Most of the change in Chinatown can be seen along the

outskirts of the half-mile buffer. On the other hand, change in the Hollywood/Western TOD area has occurred in close proximity to the transit station.

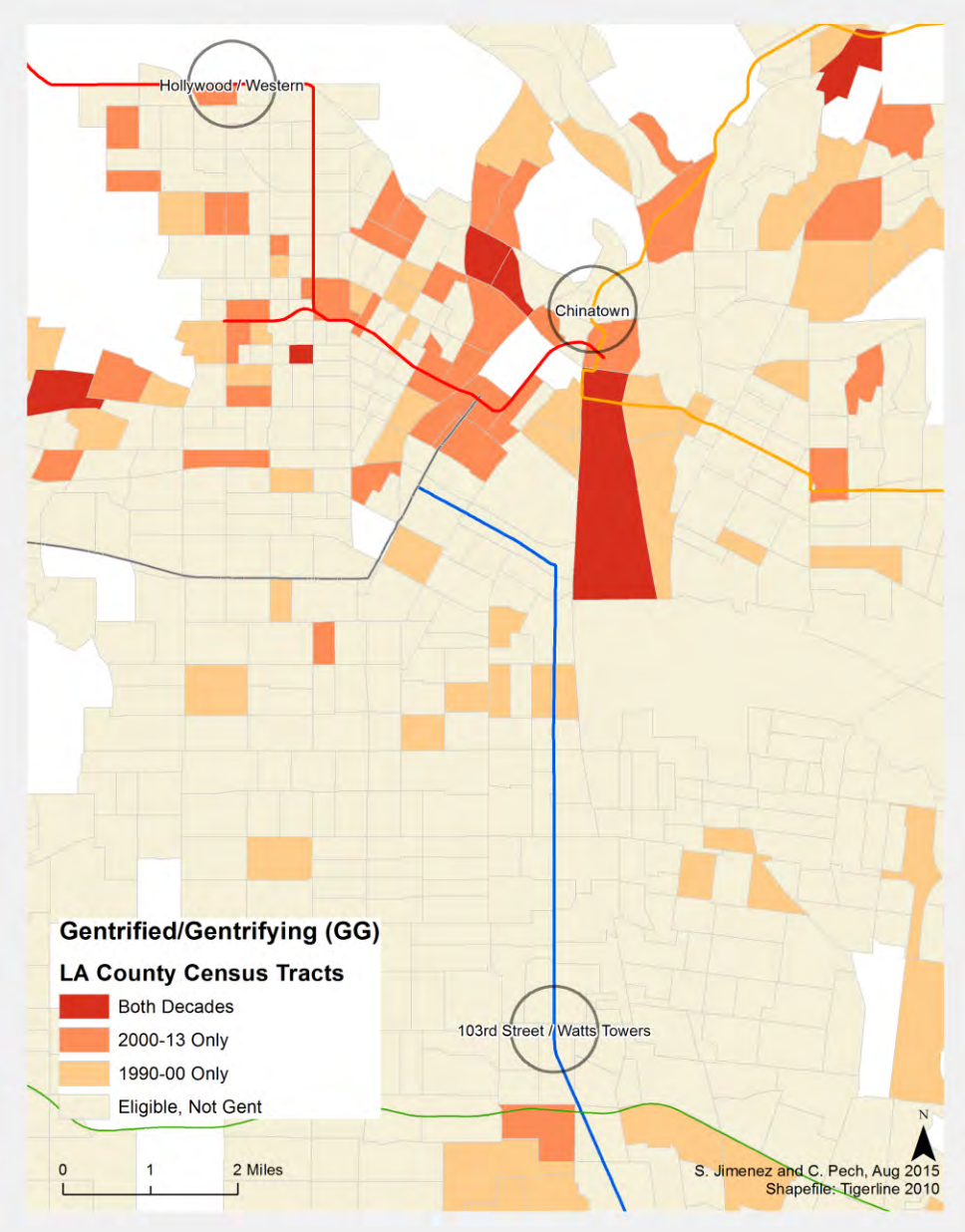



**Figure 2H.1:** ***Gentrifying and Gentrified Census Tracts, Los Angeles County, 1990-2013***

***Assessment Results***

Table 2H.3 ranks the three case studies along four composite indicators of neighborhood change: 1. sociodemographic changes, 2. job changes, 3. physical signs of residential change, and 4. physical signs of commercial change. The ranking allows us to compare the results of the gentrification model to what is happening on the ground. For the most part, we find moderate consistency when comparing the secondary data, field observations, and model results, particularly in areas where there is little development.

The sociodemographic indicators are derived from readily available Census data used in the model discussed in Section 2E. They measure greater-than-expected change (or z-score)[3] in each case study area relative to all TOD areas in Los Angeles County.[4] The higher and more positive the z-score for an individual station, the higher the signs of gentrification. Three variables are used for this indicator: average household income, average rent, and number of non-Hispanic whites. For each station, we examined the change for each variable from 1990 to 2013. Greater changes in income, rent, and number of non-Hispanic whites correlate with more signs of development.

**Table 2H.3: Comparison of Indicators of Neighborhood Change in Los Angeles Case Studies**

| Station | Rank (from most change to least) | | | |
|---|---|---|---|---|
| | Δ Sociodemographic | Δ Jobs | Δ Residential | Δ Commercial |
| Chinatown | 1 | 3 | 2 | 2 |
| Hollywood/Western | 2 | 2 | 1 | 1 |
| 103rd St/Watts Towers | 3 | 1 | 3 | 3 |

*Source: Tabulated by authors from 1990 decennial Census data and 2013 ACS; LEHD 2002-2012; and observational data collected in March and June, 2015.*

For Chinatown, the z-score total is -0.247, while for Hollywood/Western it is -0.437 and for 103rd St./Watts Towers -0.561.The negative scores indicate that the three case study areas are gentrifying less than all TODs as a whole, with the Watts station showing the least indication of gentrification of the study areas.

We use job growth to measure changes in economic activity and commercial gentrification.[5] Chinatown had a 12.3% increase in jobs from 2002-2012, Hollywood/Western a 115.1% increase, and 103rd St./Watts a 194.4% increase. While Watts ranks first, its base is the lowest of the case study areas, having started in 2002 with only 484 jobs. In absolute numbers, Watts and Chinatown

[3] A z-score is essentially a standardized score that indicates how many standard deviations an observation or a data point is from the mean.

[4] To compare a specific station's change in each variable relative to all TOD stations, we compute a z-score for each of the three variables (income, rent, and race) to see how much it deviates from the average of all stations. This z-score is calculated by taking the specific station's change (in household income, for example), subtracting it by the mean change for all TOD stations, and dividing it by the standard deviation of change for all TOD stations. After finding the z-score for each of income, rent, and race, we add these z-scores to create a composite z-score.

Where

$$zscore\ composite = zinc + zrent + zrace$$

$$zinc = \frac{\Delta income for specific station - mean \Delta income of all TOD stations}{standard deviation in \Delta income of all TOD stations}$$

$$zrent = \frac{\Delta rent for specific station - mean \Delta rent of all TOD stations}{standard deviation in \Delta rent of all TOD stations}$$

$$zrace = \frac{\Delta nhw * for specific station - mean \Delta nhw for all TOD stations}{standard deviation in \Delta nhw for all TOD stations}$$

*nhw = non-Hispanic whites

[5] The percent change in jobs is from the 2002 – 2012 Longitudinal Employer-Household Dynamics (LEHD) survey for "all jobs" in blocks within ½ mile of the TOD station.

experienced similar growth in jobs while the increase in Hollywood/Western was more than four times that of the other two areas (an increase of 941,995, and 4,292 jobs, respectively).

The data on residential and commercial gentrification is based on observed signs of "upscaling" and physical signs of gentrification collected as part of ground-truthing.[6] Upscaling includes extensive renovations, changes in building characteristics, as well as a building appearance that looks more "upscale" and dissimilar to the surrounding parcels. Ground-truthing observations indicate that Hollywood/Western has undergone the most residential and commercial upscaling, followed by Chinatown, with 103rdSt./Watts last.

For the most part, we find moderate consistency amongst the four indicators, particularly in areas where there is little development. However, there are mixed results in areas undergoing development. For example, while the observations rank Hollywood/Western as having the most physical changes, Chinatown has experienced the greatest sociodemographic shift.

Assessed land-use vs. observed (at parcel level)

Land use designations between assessor data and ground-truth observations are for the most part consistent: about a 90% match for residential uses (See Table 2H.4). Chinatown had the highest consistency at 95%. The only large discrepancy is in the single-family units in the Hollywood/Western TOD area.[7]

One limitation of the land-use comparison is that it is not possible to visually distinguish whether a unit is a condo or part of a larger apartment complex. Additionally, commercial parcel matches were not noted because commercial properties comprised less than 10% of the surveyed parcels.

**Table 2H.4: Percent land use matched in Los Angeles Case Study Areas**

| | **Chinatown** | **Hollywood/Western** | **103rd St/Watts Towers** |
|---|---|---|---|
| Single Family | 89% | 50% | 100% |
| Condo | 100% | 100% | None surveyed |
| Multi-family | 100% | 88% | 95% |
| **Total Residential** | 95% | 93% | 89% |

Source: Tabulated by authors from County Assessor's data; and observations collected in March and June, 2015.

Local Roll Housing Unit Counts vs. Census Counts

We compare housing units estimated from the County Assessor's data (See Appendix L for methodology) with the total housing units reported in the 2009-2013 five-year ACS. We focused on parcels with a residential land-use for this comparison.

[6] For residential, we used questions 4, 6, and 7 from survey instruments (shown in Appendix M). For commercial, we used questions 5, 7, and 8.

[7] As part of the 2015 UCLA Master's in Urban and Regional Planning Capstone project, observations in three other case studies also took place. Of the 193 total residential parcels surveyed in all 6 areas, 165 of the parcels (or about 85%) matched with the assessor data. See Appendix J.

Table 2H.5 shows some differences in housing units between assessor and Census data. The difference between the two datasets in Chinatown is about 600 units. For 103rd St./Watts, the difference is about 400 housing units. The greatest discrepancy appears in the housing unit counts between the datasets for Hollywood/Western. The Census estimates more than 2,000 units more than the assessor data does.

**Table 2H.5: Estimated Housing Units from Assessor and Census Data in Los Angeles Study Areas**

| | Assessor Data | | | | | ACS 2009-2013 Data | |
|---|---|---|---|---|---|---|---|
| | Total Parcels | Total Residential Parcels | Total SF Parcels | Total Other Residential | Estimated Residential Units | Total Housing Units | Total Households |
| Chinatown | 1,498 | 644 | 139 | 505 | 2,337 | 2,965 | 2,700 |
| Hollywood / Western | 1,515 | 1,262 | 591 | 671 | 8,656 | 10,818 | 9,937 |
| 103rd St / Watts Towers | 2,129 | 1,946 | 1,468 | 478 | 2,828 | 3,269 | 2,894 |
| **Total** | 5,142 | 3,852 | 2,198 | 1,654 | 13,821 | 17,052 | 15,531 |

*Source: Tabulated by authors from ACS 2009 – 2013 and County Assessor's data*

Reported Recent Major Improvements vs. Observed Major Investments

A "major improvement" in our field observations was defined as an improvement where extensive renovation was apparent, which would have likely required a building permit; for instance, a structural improvement.[8] Reported improvements are those reported to the County Assessor.[9] We focused on residential parcels for the comparison.

Table 2H.6 shows that the percent of major improvements is similar to each other in the two datasets. For Chinatown and 103rd St./Watts Towers, the percentages only differ by about 1%. The greater discrepancy is for Hollywood/Western, where the observations found only about 2% (51 parcels out of 591) with major improvements while the assessor data indicates about 9%.

**Table 2H.6: Percent of Major improvements for Observed and Assessor Parcels In Los Angeles Study Areas**

| | Observed Parcels | Assessor Data for All Parcels in Area | |
|---|---|---|---|
| | % with Major Improvements | % Reported Improvements [2007 - 2012] | Median Improvement Value, 2013$ |
| Chinatown | 0.0% | 1% | $64,291 |
| Hollywood / Western | 2.2% | 9% | $238,742 |
| 103rd Street / Watts Towers | 2.2% | 3% | $93,398 |

*Source: Tabulated by authors from County Assessor's data; and observations collected in March and June, 2015.*
*Note: Data are for single family parcels*

[8] For our observations, this refers to Question 6 on the Residential Parcel Observations form (See Appendix M for instrument). Percentages for % major improvements for each study area were calculated by taking the total numbers of parcels marked with "extensive" recent renovations and dividing it by the total number of observed parcels.

[9] Extensive rehabilitation work may involve "substantial changes to the plumbing system, electrical system, framing, or foundation and can extend the usable life of a building." Only when a building becomes "substantially equivalent to new" does it become categorized as new construction. See http://assessor.lacounty.gov/bwl-faq/.

Reported Recent Constructions vs. Observed Construction (at parcel level)

Table 2H.7 shows the match between reported and observed construction for single-family parcels.[10] Within both datasets, there is consistency in the Hollywood/Western station, whereby there is no reported or observed new constructions for single-family homes. There appears to be a larger inconsistency in Chinatown (31.6% observed new construction compared to 4% in secondary data), but this inconsistency is likely due to the methodology of selecting areas with above-average transaction activity. More importantly, we looked at matches between our observed data and the assessor data in terms of new construction. Of the parcels that we selected to observe, all that were marked as having new construction were also reported similarly in the assessor data.

**Table 2H.7: Percent of Constructions for Observed and Assessor Parcels in Los Angeles Study Areas**

| | Observed Parcels | Assessor Data for All SFH Parcels in Area | |
|---|---|---|---|
| | %New SF Construction | % Reported New SF Construction | Observed vs. Reported Match |
| Chinatown | 31.6% | 4% | 100% |
| Hollywood / Western | 0.0% | 0% | 100% |
| 103rd Street / Watts Towers | 13.0% | 5% | 100% |

*Source: Tabulated by authors from County Assessor's data; and observations collected in March and June, 2015.*

# Part II: Comparison of Model, Street and Observations, and Interviews

Research on neighborhood change often relies on quantitative demographic and real estate data to evaluate trends and the trajectory of neighborhoods. However, subtle changes that may point to gentrification are rarely captured by quantitative data. Often times, it is the local community-based organizations and groups that notice the small changes that are difficult to quantify and track. The following compares the results of the models described in Section 2E with information gathered through street observations as well as interviews with representatives from CBOs and public agencies.

### *Overview of Street Observation Method*

A similar method of ground-truthing as the one reported in Part I was also employed to observe physical changes of gentrification at the Census block/street segment level. We selected Census blocks that were directly adjacent to (or within a quarter-mile radius of) the rail station regardless of their land use. We also chose blocks within a half- mile radius that had above-average transaction activity even if these were not directly adjacent to the rail station. The boundaries for most Census blocks coincided with street block segments. A total of 72 block segments were observed in the

[10] New constructions are defined for the assessor data as any new structures; area added to existing structures; new items added to an existing structure such as bathroom or fireplace; physical changes that result in a change in use; "rehabilitation, renovation, or modernization that converts an improvement to the substantial equivalent of a new improvement"; or land development. See assessor.co.la.ca.us/extranet/list/faqFull.aspx. The percentage of new construction is calculated by taking the number of reported single family home constructions and dividing it by the total number of observed parcels for each station. New constructions are based on Question 1 (if "new constructed") and Question 5 (if "new construction") from the Residential ground-truthing form (See Appendix M). For the percent of reported new construction based off of assessor data, we take the number of reported of single family new constructions & divide it by the total number of single family parcels for each station.

three case study neighborhoods. Detailed description of the methodology can be found in Appendix L.

A semi-structured interview approach was used to guide a series of interviews with representatives of various CBOs and public agencies. Organizations and agencies were selected because of their location and activity in a study area or their previous experience with other aspects of TODs in Los Angeles. We identified and contacted planners, elected officials, and CBO staff. More information on the interview protocol can be found in Appendix N and detailed results comparing the street observation method with interviews and secondary data analysis can be found in Appendix O.

## Los Angeles Ground-Truthing Conclusions

In general, we found a higher consistency among data sources in areas that have not experienced major changes such as in 103rd St./Watts Towers, and a lower consistency in areas experiencing more changes such as in Hollywood/Western.

This assessment indicated that the quantitative models reported in other sections of this report do not capture all the complexities and nuances of neighborhood change. At the same time, the quantitative models do identify factors and patterns that cannot be observed through primary fieldwork. Researchers and analysts should not assume, however, that secondary data are precise. Ideally, secondary data should be carefully evaluated for anomalies and other problems (e.g., discrepancies in housing unit counts) before being incorporated into models.

There are clear discrepancies in indicators and beliefs about the nature and extent of neighborhood change. This can be due in part to differences in the sources of information. Those on the ground may see patterns not captured by secondary data. Data from observations and interviews are also subjective and may reflect some of the biases, priorities, and broader concerns of the observer, interviewer, and interviewees. For all the above reasons, the utilization of multiple data sources that involve both secondary data as well as empirical work such as direct field observations and stakeholder interviews complement each other and give a more complete picture of neighborhood change.

# Chapter 2 Conclusions

This chapter developed a series of analyses that examine gentrification and displacement in fixed-rail transit neighborhoods. Gentrification in Los Angeles and the Bay Area TODs cannot be attributed to new residential development, as the vast majority of transit neighborhoods in both Los Angeles and the Bay Area experienced relatively little residential development from 2000 to 2013. In the Bay Area, over half of market rate residential development occurred in tracts that did not gentrify.

Analyzing household moves into and out of neighborhoods, we find that transit neighborhoods in Los Angeles have higher rates of high income in-movers and lower rates of low income in-movers, consistent with previous findings on the relationship between proximity to transit and higher housing prices. A similar relationship is found when analyzing the education level of in-movers to transit neighborhoods in the Bay Area, who are more likely to have a bachelor's degree or higher and less likely to have less than a high school diploma. Yet, in the Bay Area, people in poverty were more likely to move into transit neighborhoods in the core cities (San Francisco, Oakland, and San Jose), but not in other cities. For Los Angeles, in-movers to transit neighborhoods were more likely

to be non-Hispanic white, which is only true in the Bay Area for transit neighborhoods located in the core cities.

Our models of neighborhood gentrification suggest that proximity to transit matters in both regions, but effects vary across time periods. In Los Angeles, proximity to transit is most clearly associated with gentrification in Downtown, and proximity to recently opened transit stations seems to have the most significant effect. The Bay Area results also indicate that proximity to fixed rail transit stations has a significant impact on gentrification.

When we look at less aggregate demographic measures and zoom in specifically on affordable housing, we find a much stronger effect of proximity to rail transit. For Los Angeles we find that proximity to rail transit significantly predicts a loss of affordable rental units and an increase in condominium conversions. For the downtown rail transit neighborhoods, we also find a significant increase in Ellis Act evictions and for transit neighborhoods outside of the downtown we find a significant decline in Section 8 vouchers. There was, however, an increase in subsidized units using the Low-Income Housing Tax Credit (LIHTC) program for transit neighborhoods both in and outside of Downtown Los Angeles. For the Bay Area, the impact of rail transit neighborhoods was not significant for the change in affordable rental units and Section 8 vouchers. Similar to Los Angeles, however, rail transit neighborhoods were more likely to increase the number of LIHTC units in the Bay Area's core cities, but less likely in other Bay Area cities. Rail transit neighborhoods outside of the core cities were more likely to lose low-income households. In San Francisco, proximity to rail transit was positively related to increased eviction rates.

Another set of analyses looks at changes in neighborhood composition by income classes, racial/ethnic groups, and rent burden. Confirming the analysis of gentrification, the results for both Los Angeles and the Bay Area showed a decline in the share of low-income residents and residents with a bachelor's degree were higher in transit neighborhoods.

To verify the secondary data analyzed in our models and to learn more about the process of change, we used visual observation in the field as well as in-depth interviews with key informants. The findings of the field observations were generally consistent with the secondary data, except that there was often a discrepancy between the number of housing units found in the County Assessor's database and those observed in the field. Often, local observers pointed to displacement processes currently underway that are not reflected in the secondary data. At the same time, interviews occasionally suggested a level of anxiety about displacement that is not supported by empirical data.

# Chapter 3: Developing Tools for Analyzing Potential Displacement Impacts in Sustainable Community Strategies (SCS)

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# Acronyms Used in This Chapter

- AA (Activity Allocation)
- ABAG (Association of Bay Area Governments)
- ACS (American Community Survey, U.S. Census)
- ARB (California Air Resources Board)
- AMI (Area Median Income)
- BMR (Below Market Rate)
- CSA (Community Statistical Area)
- FAR (Floor Area Ratio)
- ED (Economic/Demographic)
- EIR (Environment Impact Report)
- GIS (Geographic Information System)
- GHG (Greenhouse Gas)
- HCD (California Department of Housing and Community Development)
- HUD U.S. Department of Housing and Urban Development)
- LIHTC (Low-Income Housing Tax Credit)
- MNL (Multinomial Logit)
- MPO (Metropolitan Planning Organization)
- MTC (Metropolitan Transportation Commission)
- NPH (Non-Profit Housing Association of Northern California)
- PECAS (Production Exchange Consumption Allocation System)
- PUMS (Public Use Microdata Sample, U.S. Census)
- RHNA (Regional Housing Needs Allocation)
- ROI (Return on Investment)
- RTP (Regional Transportation Plan)
- SCAG (Southern California Association of Governments)
- SCS (Sustainable Communities Strategy)
- SD (Space Development)
- TAZ (Transportation Analysis Zone)
- TOD (Transit-Oriented Development)
- TR (Transportation)
- VMT (Vehicle Miles Traveled)

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# Chapter 3 Introduction

In Chapter 3, we first present our analysis on what we believe are requirements for regional models to represent displacement, and we use this information along with findings presented in previous chapters to evaluate the suitability of the integrated land use and transportation models used by the metropolitan planning organizations (MPOs) in the Bay Area (the Metropolitan Transportation Commission, MTC) and Los Angeles (the Southern California Association of Governments, SCAG) to address displacement. To adapt the urban simulation model used in the Bay Area—UrbanSim—researchers analyzed the role of race, income, household size, rent, and rent burden on household location decisions and made adjustments to it. Researchers are working with MTC to integrate these modifications into their modeling for the next sustainable communities strategy (SCS). After analyzing how the integrated land use and transportation model used in Los Angeles—PECAS—could analyze displacement, researchers concluded that the current version is not capable of analyzing displacement issues at the desired level of detail.

In an effort to provide more streamlined and less resource-intensive modeling options, we present several different approaches to an off-model displacement assessment methodology. The off-model approaches build on the modeling results found in Chapter 2. All of the models are able to predict gentrification with results ranging from 50% to 86% accuracy.

## Effects of Transit Investments and Upzoning on Prices and Rents

There is growing concern that there may be unwanted side effects of well-intentioned planning efforts to intensify development around transit stations, often referred to as transit-oriented development (TOD). The added transit accessibility from new stations, lines, and improved levels-of-service represents a local amenity that is of value to households and firms that are able to locate in close proximity to those amenities. In fact, accessibility is one of the primary influences on land values, and consequently on housing prices and rents, as well as on rents and prices of non-residential buildings.

The reason accessibility translates to higher property values is that amenities such as accessibility translate to higher willingness-to-pay for locations with such amenities. In short, increased transit accessibility increases demand for locations whose accessibility has increased as a result of public investment, and this increased demand is capitalized into land and property values. This is both intuitively obvious, and backed by a large empirical and theoretical literature.

If the real estate market were able to respond to increases in demand for those locations with new construction, one might expect that it could offset this increase in demand, pushing prices downward at least partially. Several factors tend to prevent that from happening. First, local governments may not zone for high enough intensity of development to enable developers to profitably build sufficient new housing and non-residential space to offset the demand effect. This is often due to community resistance to increased density, which pressures the municipality to keep zoning constrained considerably, compared to what the market would support in high-demand locations.

A further consideration on the supply side of the market is that higher-density development, at certain thresholds, increases construction cost substantially. Once developers move from a frame-on-podium construction appropriate for low-rise construction of two to three stories to higher

densities, it may precipitate numerous changes in construction technology, such as structure parking, steel frame construction, and elevators, all of which increase costs considerably. The end result is that, in order to realize sufficient profit to attract investment capital for construction loans, developers have to target a higher price segment of consumers, by moving to higher-quality materials and amenities. The result of these changes can be reasonably expected to put upward pressure on prices and rents.

A third factor that can contribute to both a diminished supply response to increased demand is that any upzoning done by the local jurisdiction to enable higher-density development might in fact drive up development costs for developers by increasing the reservation prices of current property owners. This arises because the zoning on each parcel confers an entitlement to the property owner to develop the parcel up to the limits imposed by the zoning. When the city upzones selected parcels around transit, the current property owners essentially receive a windfall of increased entitlement value. Assuming that these property owners are aware of this change in zoning, they are likely to demand a higher price for their property when a developer seeks to acquire it for development, since they fully appreciate that the developer could build to a higher intensity based on the change in zoning. Some jurisdictions have implemented value capture or community benefits policies to attempt to redirect some of this entitlement windfall from the public investment in transit towards public objectives. But most jurisdictions have not implemented such policies, which means that the full entitlement value gain is transferred to current property owners and translates to a higher cost for developers in these locations.

## Effects of Increased Prices and Rents on Displacement

Through a combination of increased demand, constrained supply, and increased development costs, it is not unreasonable to anticipate upward pressure on prices and rents associated with transit investments and localized upzoning intended to stimulate TOD around these investments. The next issue to consider is how these pressures translate to risks of displacement and a consideration of who is at risk of such displacement.

The first, essential distinction to consider when considering the issue of displacement is how households in different circumstances might be affected. Households fortunate enough to own property, whether still paying a mortgage or owning it in full, will derive a windfall benefit of increased property values. Equity in housing is one of the main sources of wealth accumulation by households, notwithstanding the devastating effects of the global housing recession that began in 2007 and the large number of foreclosures that ensued. Still, on the whole, any amenity value that is generated by public investments such as transit, or any increases in entitlement value generated by increases in zoned development capacity, translate to increases in equity value for current property owners. As a result, the current project does not need to be concerned about any harmful effects of transit investments on the current property owners in those locations receiving additional transit service, or being upzoned to increase denser development.

These price pressures raise concerns about the potential impacts on renter households. For these households, price pressure could result in increased rents and therefore increases in the rental cost burden or potential eviction if building owners decide to convert apartments to condominiums. We would refer to these two circumstances as involuntary displacement, though the term involuntary might be subject to interpretation in the event that a household's rent increases to the point of being intolerable, and they "voluntarily" decide to relocate to a lower-cost location. We still consider this to be a hardship, and relevant to consider, so will use the term involuntary to include

those who would have preferred to stay, but either were evicted or chose to move out due to an excessive cost burden.

Another relevant population who could be harmed are low-income renters who might be able to consider moving into these locations before the transit investment or upzoning, but whose income constraints prevent them from locating there once rents increase. We could refer to this circumstance as exclusionary displacement. It is more nuanced, in the sense that we cannot directly observe which households would have considered specific neighborhoods before and after a change in rents. Nevertheless, the combination of exclusionary and involuntary displacement could combine to rapidly change the composition of transit-oriented neighborhoods toward the elimination of low-income households.

## Requirements for Regional Models to Represent Displacement

Models used by MPOs were initially designed almost exclusively to address the evaluation of alternative packages of transportation projects, in order to develop a regional transportation plan (RTP) under assumptions that land use patterns should be considered as fixed, exogenous inputs. Later, these models evolved to evaluate the of potential induced demand effects that could arise from transportation projects influencing real estate markets — increasing demand for locations advantaged by increased accessibility, and increased supply in response to the demand and price effects, and subsequent increases in household and firm travel resulting from new development and new household and firm locations. UrbanSim is one of the model innovations that emerged to address this induced demand effect (Waddell 2011).

Concerns about housing affordability have only recently begun to intersect the regional transportation planning process. In particular, SB375 is one of the first legal tools to require coordination of the regional housing needs allocation (RNHA) process with the transportation and land use plans in the SCS planning process. The current project extends the consideration of housing affordability to more directly address the question of displacement associated with transit investments.

From the foregoing discussion, several requirements can be identified for making regional models responsive to displacement-related concerns.

***Representation of Renter and Owner Markets Separately***

As discussed above, displacement is a concern for low-income households who rent, rather than own, their homes. While homeowners receive a windfall from increasing property values, renters receive a higher rent bill, or worse, an eviction notice. Regional land use models have often used a simplification of the housing market to generalize over, or abstract away, this difference between renter and owner housing markets, often relying on a rule-of-thumb "cap rate" (capitalization rate) conversion between rents and prices, to enable a representation in the models of only one tenure type. For purposes of analyzing displacement risks, it is a fundamental requirement that rental and owner markets be treated separately. Without this distinction, it would be meaningless to attempt to discuss impacts of any market or policy change on displacement.

So the first and most essential requirement for regional models is to represent the housing stock as two fundamental market types: rental and owner. Building types, such as multi-family and single-family, townhouse, duplex, and the like, are useful in understanding the market, but do not

substitute for the tenure distinction. Single-family houses can be in the rental or the owner market, and the outcomes will be very different for the occupants when prices and rents increase.

***Representation of the Influence of Rent Burdens on Moving Out***

A second fundamental requirement for these models to be useful for analyzing displacement is the representation of the cost burden for renters in a model component reflecting the probability that a household will move out of their current unit. As already mentioned, this is less relevant for owner-occupants since they generally acquire a mortgage to finance their home purchase, thus payments are not influenced by market pressures on prices.

Some land use models do not attempt to represent the probability that a household will move. These models do not represent the way cities evolve over time through annual changes in the movement of households and firms and the construction of new buildings.. While a static equilibrium approach like that used in PECAS is plausible for some kinds of questions, it is not particularly well-suited to address dynamic questions such as how transit investments and upzoning might conspire to increase rents, and induce low-income renters to move out. Representing the renter market as a distinct market is a prerequisite, as is a representation of the decision to move out during a specific time frame such as over the following year.

***Representation of the Influence of Rent Burdens on Moving In***

A third requirement relates to the rent burdens of households who might be able to consider a neighborhood prior to increased transit services or upzoning, but are unable to afford the location after such changes. This is the exclusionary displacement circumstance.

This is a challenging issue to address since it requires making assumptions about how binding budget constraints are in households' choices of a residence. As we explore in a subsequent section, the empirical data on rent burdens suggests that this is not as simple as assuming that housing units above a specific rent burden would never be an option for locating households, since in fact, we observe large numbers of low-income households in units that impose an extremely high cost-burden.

***Representation of Parcel-Level Demand and Supply***

TOD involves increasing the zoning capacity for higher-density and often more mixed-use development in locations within close proximity (usually walking distance, e.g., one-quarter to one-half mile), of transit stations. The zoning changes are generally implemented in a special area plan that applies upzoning on a parcel-by-parcel level of detail, based on proximity and connectivity to the transit station. Models cannot capture the effects of these policies if they are not working at a parcel level of detail to represent, in a consistent way, both the demand side and the supply side of the models.

Some modeling approaches abstract the demand side considerably and use very large zones or districts, much larger than walking scale, to simulate market demand. They may or may not represent the supply side of the model at a parcel level or at a more aggregate level, but often encounter internal inconsistencies if the models are not structured to work consistently at the same scale and in close coordination. In order to capture localized policies and the micro-scale effects of walk access to transit, models need a consistent representation of both demand and supply at the parcel level of geography.

### *Representation of Affordable Housing Development Feasibility*

Representing the influences of market demand on rents, and the interaction of these with zoning constraints and other policies (such as inclusionary housing), can be best represented using a financial model that mimics the decision analysis used by real estate developers. This model enables a parcel-level assessment of how increased rents, increased prices, and changes in development costs influence return on investment (ROI) as a result of the following:

- zoning constraints,
- the building program on a site,
- building technology, and
- the effects of policies such as inclusionary housing, which require developers to incorporate some fraction of affordable units into a project on site, or pay an in-lieu fee to the city to support the construction of affordable housing elsewhere in the city.

### *Representation of Individual Households and Housing Units*

To analyze the impacts of housing affordability challenges on households, it is important to distinguish between many characteristics of households, including their income, household size, and stage of life. For example, a small unit may be inappropriate for a large family, even if the rent appears to be affordable. Our assessment is that it is necessary to represent not only individual households in the model, but also individual housing units, so that the characteristics of both can be used to analyze how households with different characteristics choose housing units with different characteristics.

Moving toward full-scale microsimulation on both the household and the housing supply sides of the model also makes the model much more transparent and reflective of the real world.

### *Representation of Income and Race/Ethnicity*

Housing markets are heavily segregated by income, race and ethnicity, and other forms of clustering characteristics like household size and stage of life. Models tend to suppress consideration of race and ethnicity, in spite of a large body of theoretical and empirical research that documents how important these dimensions are to understanding the nature of housing markets. Common sense and experience generally confirm the magnitude of these influences in large, diverse metropolitan areas such as the San Francisco Bay Area. Further, federal and local environmental justice and equity policy mandates motivate the need to at least assess how displacement pressures might disproportionately impact low-income households and households containing black or Hispanic individuals.

Based on prior research and the need to be sensitive to equity concerns, it is therefore a final requirement that models reflect the influences of race and ethnicity on location outcomes of households.

# Section 3A: Addressing Displacement in the Bay Area UrbanSim Application

## 3A.1. Introduction

In this section we explore the potential of the UrbanSim model system to better address displacement concerns and to provide new capacity for MPOs to consider these effects and policies to mitigate them, as part of their operational planning process. We begin by describing the prior application of UrbanSim (Waddell 2011) in the San Francisco Bay Area, as a foundation for the current project. Following this is a discussion of the requirements for adapting UrbanSim to effectively meet the research objectives of the current project to address displacement concerns related to transit investments, and a discussion of the overall strategy for making these adaptations in UrbanSim. We turn next to a more detailed discussion of the design and implementation of UrbanSim and to the changes in model structure, data, and model specification and estimation to address the current research objectives. We close with an assessment of the status of these innovations and a summary of next steps. For a detailed description of the models used in the Bay Area application of UrbanSim that were modified for this project, see Appendix P.

### Prior Use of UrbanSim in Plan Bay Area

This effort builds on the prior development and application of UrbanSim in the San Francisco Bay Area, and its deployment and operational use by MTC and the Association of Bay Area Governments (ABAG). UrbanSim was used in coordination with the MTC activity-based travel model system to analyze the Environmental Impact Report (EIR) alternatives for the Plan Bay Area Sustainable Communities Strategy planning process, which ended in 2013 and is now being updated for use in the next SCS planning process.

UrbanSim is designed to support analysis of the potential effects of land use policies and infrastructure investments on the development and character of cities and regions. Its application in the Bay Area was used to update land use forecasts under alternative EIR scenarios, with differing assumptions such as aggregate economic growth targets, transportation system investments and policies, and local land use plans and policies to focus development around transit. UrbanSim was adapted to run at a parcel level and to interface with the MTC travel model. UrbanSim is designed to run as a microsimulation, at the individual household and person level of detail, so that it consistently represents choices of individuals and housing market and local land use policies at the building and parcel levels.

## 3A.2. Overview of UrbanSim

### Design Objectives and Key Features

UrbanSim is an urban simulation system developed over the past several years to better inform deliberation on public choices with long-term, significant effects.[1] A key motivation for developing such a model system is that the complexity of the urban environment makes it is infeasible to

[1]This chapter draws in part on reference (Waddell et al. 2008).

anticipate the cause-and-effect interactions that could have both intended and possibly unintended consequences.

UrbanSim was designed to reflect the interdependencies in dynamic urban systems, focusing on the real estate market and the transportation system, initially, and on the effects of individual interventions, and combinations of them, on patterns of development, travel demand, and household and firm location. The basic features of the UrbanSim model and software implementation are highlighted in Table 3A.1. The model is unique in that it departs from prior operational land use models based on cross-sectional, equilibrium, aggregate approaches to adopt an approach that models individual households, jobs, buildings, and parcels (or gridcells), and their changes from one year to the next as a consequence of economic changes, policy interventions, and market interactions.

**Table 3A.1: Key Features of UrbanSim**

| | |
|---|---|
| **Key Features of the UrbanSim Model System** | • The model simulates the key decision makers and choices impacting urban development; in particular, the mobility and location choices of households and businesses, and the development choices of developers<br>• The model explicitly accounts for land, structures (houses and commercial buildings), and occupants (households and businesses)<br>• The model simulates urban development as a dynamic process over time and space, as opposed to a cross-sectional or equilibrium approach<br>• The model simulates the land market as the interaction of demand (locational preferences of businesses and households) and supply (existing vacant space, new construction, and redevelopment), with prices adjusting to clear market<br>• The model incorporates governmental policy assumptions explicitly, and evaluates policy impacts by modeling market responses<br>• The model is based on random utility theory and uses logit models for the implementation of key demand components<br>• The model is designed for high levels of spatial and activity disaggregation, with a zonal system identical to travel model zones<br>• The model presently addresses both new development and redevelopment, using parcel-level detail |
| **Key Features of the UrbanSim Software Implementation** | • The model and user interface is currently compatible with Windows, Linux, Apple OS X, and other platforms supporting Python<br>• The software is implemented in the Open Platform for Urban Simulation<br>• The software is open-source, using the GPL license<br>• The system is downloadable from the web at www.urbansim.org<br>• The user interface focuses on configuring the model system, managing data, running, and evaluating scenarios<br>• The model is implemented using object-oriented programming to maximize software flexibility<br>• The model inputs and results can be displayed using ArcGIS or other GIS software such as PostGIS<br>• Model results are written to binary files, but can be exported to database management systems, text files, or geodatabases |

## Model System Design

The overall architecture of the UrbanSim model system is depicted in Figures 3A.1, 3A.2, and 3A.3. Most of the early applications of UrbanSim used gridcells of 150 by 150 meters in resolution as the

basic unit of spatial analysis. More recent applications have adopted the use of parcels and buildings, but the overall logic remains intact. What differs is the configuration of specific models.

The models used in the parcel version of UrbanSim differ in some obvious respects from the earlier gridcell versions, and these differences are summarized in Table 3A.2. In addition to the substitution of parcels for gridcells as the unit of analysis, the real estate development model was completely restructured to take advantage of the availability of parcel geography in representing actual development projects, which do vary in size and shape in the real world, in ways that are difficult to reconcile with gridcell geography. The explicit use of buildings is also fairly new in UrbanSim, and allows a clear mapping of occupants to buildings and buildings to parcels.

**Table 3A.2: Specification of UrbanSim Model Components Using Parcel Data Structure**

| Model | Agent | Dependent Variable | Functional Form |
|---|---|---|---|
| Household Location Choice | Household (New or Moving) | Residential Building With Vacant Space | Multinomial Logit |
| Employment Location Choice | Establishment (New or Moving) | Non-residential Building With Vacant Space | Multinomial Logit |
| Building Location Choice | Building | Parcel (With Vacant Land) | Multinomial Logit |
| Real Estate Price | Parcel | Price | Multiple Regression |

UrbanSim simulates the real-world actions of agents in the urban system. Developers construct new buildings or redevelop existing ones. Buildings are located on land parcels that have particular characteristics such as value, land use, slope, and other environmental characteristics. Governments set policies that regulate the use of land, through the imposition of land use plans, urban growth boundaries, and environmental regulations, or through pricing policies such as development impact fees. Governments also build infrastructure, including transportation infrastructure, which interacts with the distribution of activities to generate patterns of accessibility at different locations that in turn influence the attractiveness of these sites for different consumers. Households have particular characteristics that may influence their preferences and demands for housing of different types at different locations. Businesses also have preferences that vary by industry and size of business (number of employees) for alternative building types and locations.

The model system contains a large number of components, so in order to make the illustrations clearer, there are three “views” of the system. In Figure 3A.1, the focus is on the flow of information related to jobs. Figure 3A.2 provides a household-centric view of the model system. Finally, Figure 3A.3 provides a view with a focus on real estate.

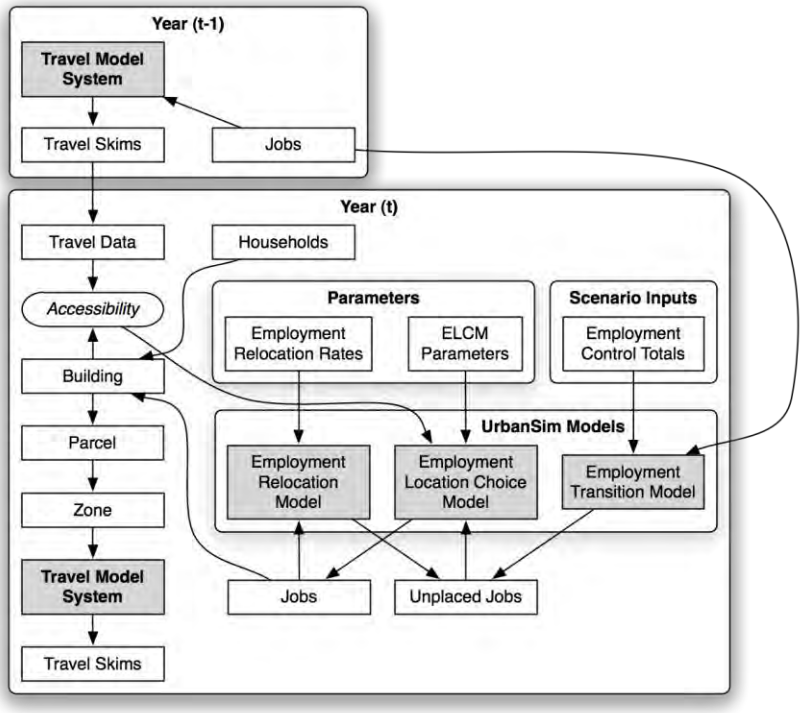



**Figure 3A.1: UrbanSim Model Flow: Employment Focus**

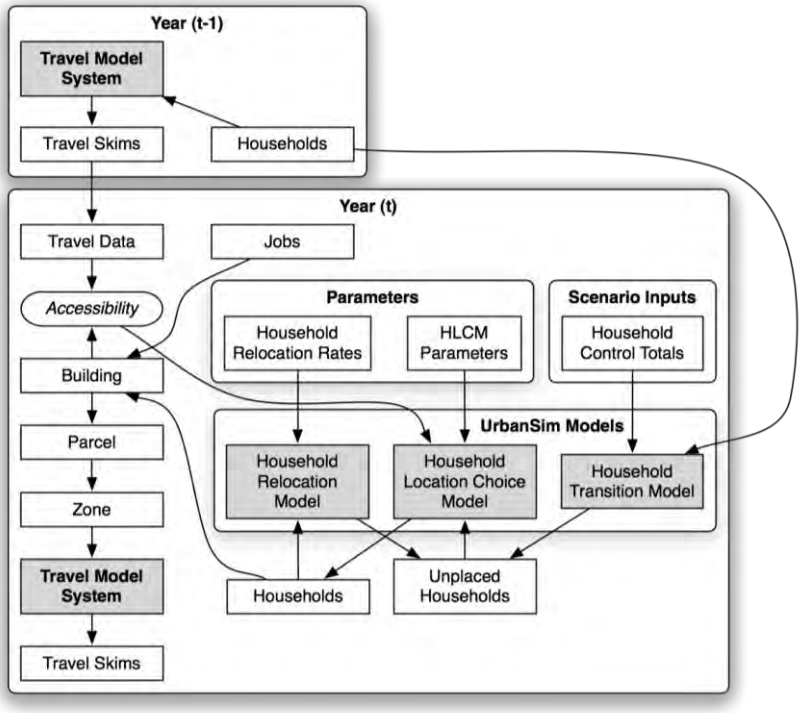



**Figure 3A.2: UrbanSim Model Flow: Household Focus**

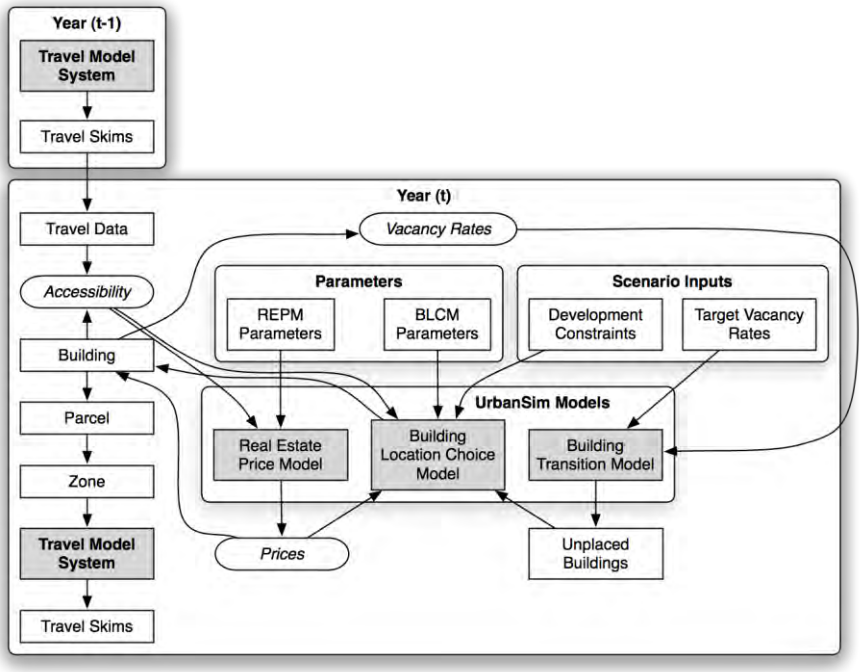



**Figure 3A.3: UrbanSim Model Flow: Real Estate Focus**

UrbanSim predicts the evolution of these entities (employment, households, and real estate) and their characteristics over time, using annual steps to predict the movement and location choices of businesses and households, the development activities of developers, and the impacts of governmental policies and infrastructure choices. The land use model is interfaced with a metropolitan travel model system (e.g., an MPO's travel demand model) to deal with the interactions of land use and transportation. Access to opportunities, such as employment or shopping, are measured by travel time or cost of accessing these opportunities via all available modes of travel.

The data inputs and outputs for operating the UrbanSim model are shown in Table 3A.3. Developing the input database is challenging, owing to its detailed data requirements. A geographical information system (GIS) is typically used to manage and combine these data into a form usable by the model, and can also be used to visualize the model results. Fortunately, freely available open-source GIS tools such as Quantum GIS and PostGIS are now generally robust enough to handle these needs. Once the database is compiled, the model equations must be calibrated and entered into the model. A final step before actual use of the model is a validation process that tests the operation of the model over time and makes adjustments to the dynamic components of the model. The steps of data preparation, model estimation, calibration, and validation will be addressed in later sections. In the balance of this chapter the design and specification of UrbanSim, using a parcel-based approach adapted for use in the Bay Area, is presented in more detail.

## Policy Scenarios

UrbanSim is designed to simulate and evaluate the potential effects of multiple scenarios. We use the term "scenario" in the context of UrbanSim in a very specific way: a scenario is a combination of input data and assumptions to the model system, including macroeconomic assumptions regarding

the growth of population and employment in the study area, the configuration of the transportation system assumed to be in place in specific future years, and general plans of local jurisdictions that will regulate the types of development allowed at each location.

In order to facilitate comparative analysis, a model user such as an MPO will generally adopt a specific scenario as a base of comparison for all other scenarios. This base scenario is generally referred to as the 'baseline" scenario, and this is usually based on the adopted or most likely to be adopted regional transportation plan, accompanied by the most likely assumptions regarding economic growth and land use policies. Table 3A.3 summarizes both the inputs and the outputs of UrbanSim.

**Table 3A.3: Data Inputs and Outputs of UrbanSim**

| | |
|---|---|
| **UrbanSim Inputs** | • Employment data, usually in the form of geocoded business establishments, but alternatively from zonal employment by sector<br>• Household data, merged from multiple census sources<br>• Parcel database, with acreage, land use, housing units, non-residential square footage, year built, land value, improvement value, city and county<br>• City and County General Plans and zoning<br>• GIS overlays for environmental features such as wetlands, floodways, steep slopes, or other sensitive or regulated lands<br>• Traffic Analysis Zones<br>• GIS overlays for any other planning boundaries<br>• Travel model outputs<br>• Development costs<br>• Real estate transactions |
| **UrbanSim Outputs (by Building, Parcel or Gridcell), Generally Summarized by Zone** | • Households by income, age, size, and presence of children<br>• Employment by industry and land use type<br>• Acreage by land use<br>• Dwelling units by type<br>• Square feet of nonresidential space by type<br>• Real estate prices |
| **Travel Model Outputs (Zone-to-Zone) Used in UrbanSim** | • Travel time by mode, by time of day, by purpose<br>• Trips by mode, by time of day, by purpose<br>• Composite utility of travel using all modes by purpose<br>• Generalized costs (time + time equivalent of tolls) by purpose |

## Discrete Choice Models

UrbanSim makes extensive use of models of individual choice. A path breaking approach to modeling individual actions using discrete choice models emerged in the 1970s, with the pioneering work of McFadden on Random Utility Maximization theory (McFadden 1974, 1981). This approach derives a model of the probability of choosing among a set of available alternatives based on the characteristics of the chooser and the attributes of the alternative, and proportional to the relative utility that the alternatives generate for the chooser. Maximum likelihood and simulated maximum likelihood methods have been developed to estimate the parameters of these choice models from data on revealed or stated preferences, using a wide range of structural specifications (see Train 2003). Early applications of these models were principally in the transportation field, but also included work on residential location choices (Quigley 1976; Lerman 1977; McFadden 1978), and on residential mobility (Clark and Lierop 1986).

Choice models are implemented in UrbanSim in a modular way, to allow flexible specification of models to reflect a wide variety of choice situations. Figure 3A.4 shows the process both in the form of the equations to be computed, and from the perspective of the tasks implemented as methods in software.

For each model component within the UrbanSim model system, the choice process proceeds as shown in Figure 3A.4. The first steps of the model read the relevant model specifications and data. Then a choice set is constructed for each chooser. Currently this is done using random sampling of alternatives, which has been shown to generate consistent, though not efficient, estimates of model parameters (Ben-Akiva and Lerman 1987).

The choice step in this algorithm warrants further explanation. Choice models predict choice probabilities, not choices. In order to predict choices given the predicted probabilities, we require an algorithm to select a specific choice outcome. A tempting approach would be to select the alternative with the maximum probability, but unfortunately this strategy would have the effect of selecting only the dominant outcome, and less frequent alternatives would be completely eliminated. In a mode choice model, for illustration, the transit mode would disappear, since the probability of choosing an auto mode is almost always higher than that of choosing transit. Clearly this is not a desirable or realistic outcome. In order to address this problem, the choice algorithm used for choice models uses a sampling approach. As illustrated in Figure 3A.4, a choice outcome can be selected by sampling a random number from the uniform distribution in the range 0 to 1, and comparing this random draw to the cumulative probabilities of the alternatives. Whichever alternative the sampled random number falls within is the alternative that is selected as the "chosen" one. This algorithm has the property that it preserves in the distribution of choice outcomes a close approximation of the original probability distribution, especially as the sample size of choosers becomes larger.

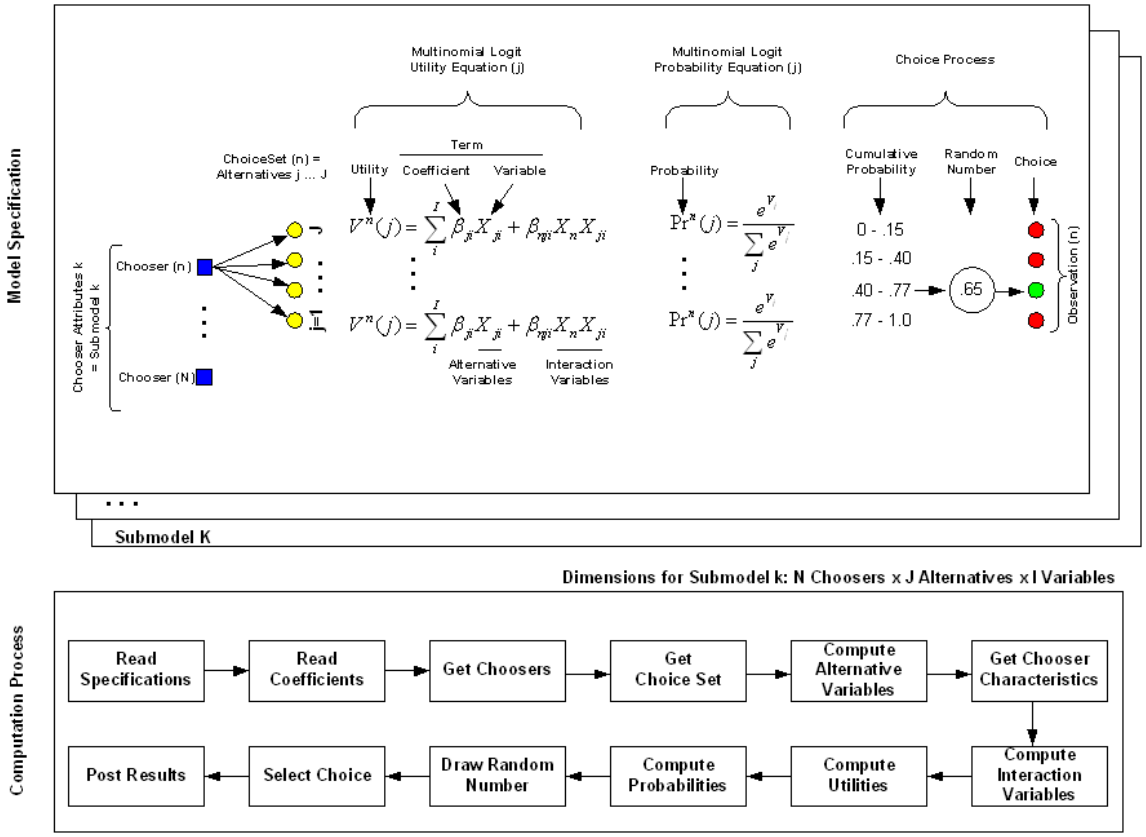



**Figure 3A.4: Computation Process in UrbanSim Choice Models**

# 3A.3. Adapting UrbanSim to Address Displacement

## Representation of Individual Households and Housing Units

A prerequisite for many of the enhancements to UrbanSim required for this project was to represent individual households and individual housing units. While UrbanSim already used individual households (and persons) in the previous implementation for the Bay Area, it used parcels and buildings as the smallest representations of housing supply. In this project, we have extended the data schema to represent each residential unit in the region, in addition to buildings and parcels. The combination of microsimulating households and residential units simplifies the accounting of which units are for rent (and which households are renting) as well as enabling more detailed tracking of households of different incomes, household structures, and racial and ethnic composition, which are found to be important in exploring the core questions in this research project.

## Representation of Renter and Owner Markets Separately

In order to separately represent renter and owner housing markets, several changes have been implemented in data structures and model specifications.

Model structures were modified in the following ways:

- Household relocation models were modified to separately model the move-out probabilities of renters and owners
- Hedonic regression models were modified to separately predict owner-occupied housing sales prices and rental rates for rental housing
- Household location choice models were modified to separate renters from owners, with renters only choosing from vacant rental units, and owners only choosing from among vacant owner units
- Supply-demand price adjustment models were adapted to separately treat the adjustment of rents and prices in the respective components of the housing market
- The real estate development model was modified to evaluate pro forma return on investment for both rental and owner options for relevant housing types, using prices and rents from the relevant hedonic regressions

Data structures were changed in the following ways:

- A housing-unit-level table was added, disaggregating from parcels and buildings, representing each individual housing unit in the region
- Tenure status (rent or own) was imputed for each housing unit from census-block-level tenure composition
- Tenure status was added to each household record in the synthetic population, from the relevant Public Use Microdata Sample (PUMS) record

These changes to models and data structures capture the most essential changes to address the requirement of separately representing the owner and renter markets.

We used rental listings from Craigslist to estimate the rental hedonic model presented in Table 3A.4, using the log of monthly asking rent per square foot as the dependent variable. Housing rents were collected by scraping rental listings from the Bay Area Craigslist website over a period of several months. Only records that were sufficiently complete, and included a geocoded location, were used.

Figure 3A.5 shows the distribution of rent per square foot for the collected listings. We tested a combination of structural, neighborhood, and accessibility variables as independent variables in the model. Neighborhood variables were computed as queries of parcels that were within a half-kilometer along the local street network, to better reflect the localized nature of neighborhood effects. The accessibility variables are from the MTC Travel Model, and reflect composite utilities (logsums) that are intended to capture the full set of influences on accessibility to specific modes, across destinations. The estimation results for the rental hedonic model reflect that not only do standard structural characteristics such as square footage and structure type influence rents per square foot, but so too do socioeconomic characteristics of the neighborhood around the units, including their income and racial composition, as well as broader accessibility from the location by auto and transit.

**Table 3A.4: Hedonic Regression Estimation Results for Rental Listings**

| Dependent Variable: Log of Price Per Sq. Ft. | coef | std err | z | P>\|z\| |
|---|---|---|---|---|
| Intercept | 6.6031 | 0.079 | 84.012 | 0.000 |
| Log of average sq. ft. per unit | -0.3266 | 0.002 | -148.469 | 0.000 |
| Average lot size per unit | -0.0406 | 0.001 | -34.985 | 0.000 |
| Average income | 0.0473 | 0.001 | 32.935 | 0.000 |
| Poverty rate | -0.5245 | 0.013 | -39.223 | 0.000 |
| % Black | -0.0068 | 9.46e-05 | -71.538 | 0.000 |
| % Hispanic | -0.0028 | 0.000 | -27.751 | 0.000 |
| % Asian | 0.0057 | 9.77e-05 | 58.724 | 0.000 |
| % Renters | 0.0009 | 0.000 | 5.159 | 0.000 |
| Single family dwelling unit | -0.0718 | 0.001 | -79.909 | 0.000 |
| Auto Peak Total Accessibility | -0.5061 | 0.014 | -36.533 | 0.000 |
| Transit Peak Total Accessibility | 0.0166 | 0.001 | 30.635 | 0.000 |
| Auto Off Peak Retail Accessibility | 0.2103 | 0.015 | 14.046 | 0.000 |
| Total non-residential units | 0.0279 | 0.001 | 41.777 | 0.000 |
| Total residential units | 0.1467 | 0.002 | 82.811 | 0.000 |
| Observations | 73,134 | | | |
| Adj R-squared.: | 0.562 | | | |

*Data Sources: Bay Area UrbanSim Synthetic Population (derived from PUMS), MTC Travel Model, Craigslist*

*Note: Neighborhood variables are averages within 0.5 to 3 km*

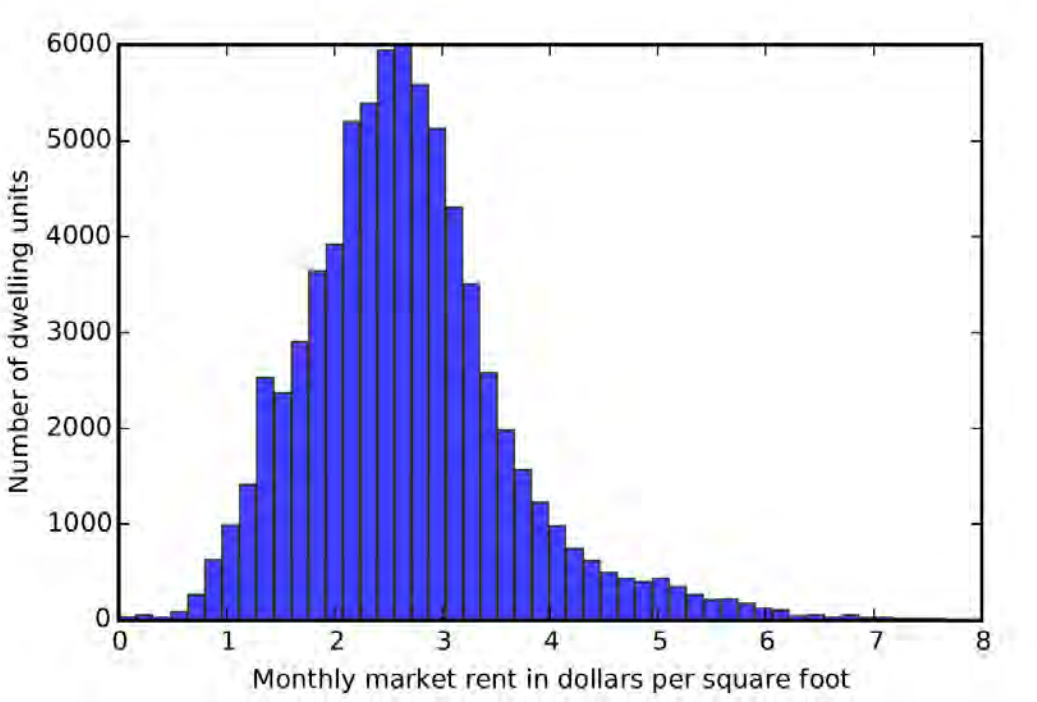



**Figure 3A.5: Rent per Square Foot from Craigslist Rental Listings**

Size of units is of course relevant to housing affordability, and the size distribution of the rental listings is shown in Figure 3A.6.

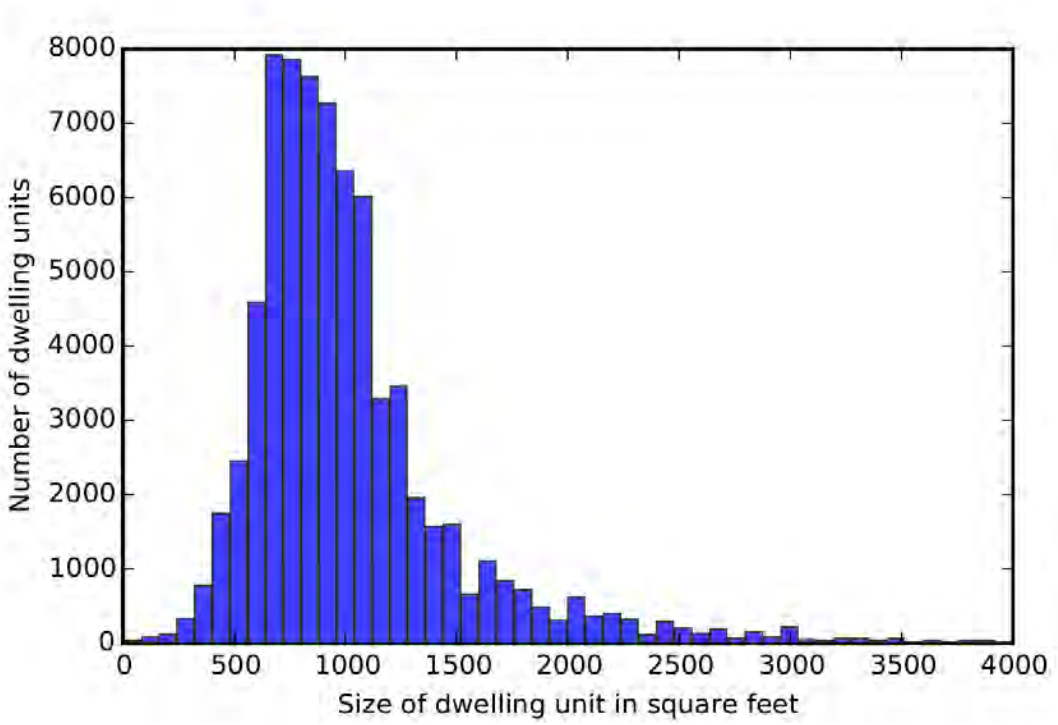



**Figure 3A.6: Square Footage per Unit from Craigslist Rental Listings**

## Representation of Income and Race/Ethnicity

Income, racial and ethnic composition of households was incorporated into the data and several models. It was added to the hedonic regression models as shown above in Table 3A.4, in addition to the move-out models and the location choice models. Results were mainly significant in the location choice models (housing demand), and not surprisingly, therefore also in the hedonic models of housing rents and prices. Income and race/ethnicity were not generally found to be significant in the decision to move out.

## Representation of the Influence of Rent Burdens on Moving Out

UrbanSim's household relocation choice model prior to this project was a rate-based model in which the probability that a household moves out of its residence in a given year (independent of housing tenure) depended on the age of the head of the household and household income. This model was modified to a binary logit model, with the probability of moving as the outcome variable.

The hedonic regression for rents was used to predict rents for all units. For renters in the synthetic population, the rental cost burden was calculated as the annualized rent divided by household income, and used as an independent variable and presented in Figure 3A.7.

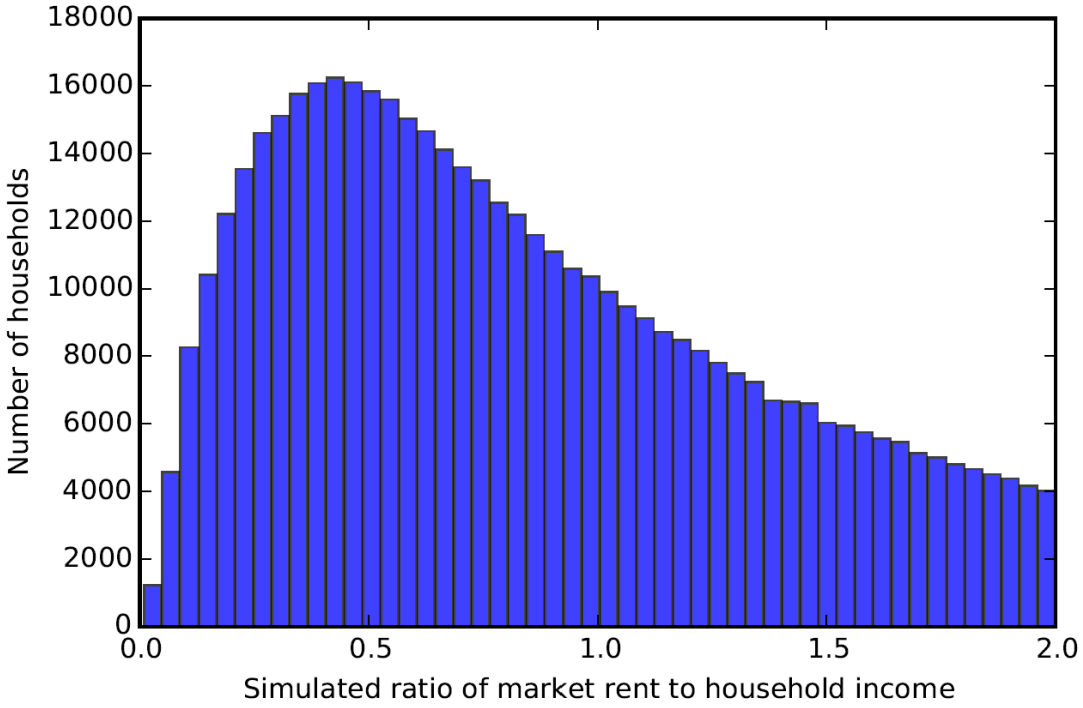



**Figure 3A.7: Rent Burdens for Bay Area Households**

These estimation results in Table 3A.5 show that there is a systematic change in the coefficients on rent burden as the income of the household increases, with higher coefficients for higher-income households. While this might initially appear counter-intuitive, it is entirely consistent with the observed data: households with lower incomes are forced to spend a higher fraction of their incomes on housing. We also test for any impacts of race of household on move-out propensity, but find these to be largely insignificant, with only Asian households having a measurable difference in their propensity to move. The lack of race effects on move-out behavior is also consistent with the hypothesis that the move-out decision is mostly driven by the economics of rent burdens and other factors such as age, household size, and the presence of children.

**Table 3A.5: Relocation Choice Model Estimation Results for Renters**

| Dependent. Variable: Moved During Last Year | coef | std err | z | P>\|z\| |
|---|---|---|---|---|
| Intercept | 0.3159 | 0.134 | 2.365 | 0.018 |
| Rent Burden ($10,000 income bracket) | 0.0121 | 0.001 | 8.707 | 0.000 |
| Rent Burden ($20,000 income bracket) | 0.0114 | 0.001 | 7.679 | 0.000 |
| Rent Burden ($40,000 income bracket) | 0.0176 | 0.002 | 9.873 | 0.000 |
| Rent Burden ($60,000 income bracket) | 0.0257 | 0.003 | 9.593 | 0.000 |
| Rent Burden ($80,000 income bracket) | 0.0379 | 0.003 | 11.099 | 0.000 |
| Rent Burden ($100,000 income bracket) | 0.0432 | 0.004 | 10.253 | 0.000 |
| Rent Burden ($120,000 income bracket) | 0.0566 | 0.005 | 11.064 | 0.000 |
| Rent Burden ($150,000 income bracket) | 0.0582 | 0.006 | 9.545 | 0.000 |
| Rent Burden ($200,000 income bracket) | 0.0803 | 0.008 | 10.575 | 0.000 |
| Rent Burden ($300,000 income bracket) | 0.0976 | 0.012 | 8.317 | 0.000 |
| Rent Burden (top income bracket) | 0.1607 | 0.029 | 5.553 | 0.000 |
| Income\($ thousands) | 0.0003 | 0.001 | 0.442 | 0.659 |
| Age of householder | -0.0429 | 0.002 | -23.155 | 0.000 |
| Persons in household | -0.2380 | 0.020 | -11.727 | 0.000 |
| Presence of Young Child | 0.1953 | 0.081 | 2.424 | 0.015 |
| Hispanic householder | -0.0927 | 0.072 | -1.294 | 0.196 |
| Black householder | 0.0337 | 0.094 | 0.357 | 0.721 |
| Asian householder | 0.1312 | 0.064 | 2.047 | 0.041 |
| Public assistance income ($ thousands) | -0.0087 | 0.030 | -0.288 | 0.774 |
| San Francisco householder | -0.8309 | 0.073 | -11.458 | 0.000 |
| Observations | 10,014 | | | |
| Pseudo R-squared: | 0.09712 | | | |
| *Data Source: American Community Survey 2013* | | | | |

## Representation of the Influence of Rent Burdens on Moving In

The effects of rent burdens on households considering a location to move into are captured in the household location choice models in UrbanSim. These have been structured for this project to segment households by income quartile, with separate model estimation for each income quartile, from 1 (lowest) to 4 (highest)[2]. The models are estimated using PUMS. The models are also segmented by owner and renter households. Table 3A.6 displays the results are for renters in income Quartile 1.

These estimation results still require further calibration in order to adjust for the potential influence of variables not measured in the model. In particular, we do not observe numerous internal quality characteristics of housing units, and as a result of this omission, the coefficients on rent are positive rather than negative, though this must be interpreted in the context of other variables such as income, which is a powerful variable in these location choice models. Note that the coefficient for average nearby income increases from -1.45 for quartile 1 (Table 3A.6), to -0.839 for quartile 2 (Table 3A.7), -0.155 for quartile 3 (Table 3A.8), and finally to 1.197 for quartile 4 (Table 3A.9). Rents and average incomes are of course correlated, so in this case the income coefficient for renters is negative for low income renters since they cannot afford to locate in higher income neighborhoods. As incomes for renters increase, this negative correlation is reduced, and

[2] Quartile 1: $0-$30,000, Quartile 2: $30,000-$60,000, Quartile 3: $60,000-$100,000, Quartile 4: $100,000 +

**Table 3A.6: Location Choice Model Estimation Results for Renters in Income Quartile 1**

| Dep. Var: Location Choice | Coefficient | Std. Error | Z-Score |
|---|---|---|---|
| Log of rent | 0.488 | 0.076 | 6.396 |
| Log of nearby sq. ft. per unit | 0.084 | 0.024 | 3.554 |
| Log of nearby lot size per unit | 1.063 | 0.117 | 9.059 |
| Average nearby income | -1.454 | 0.032 | -46.069 |
| Log(persons * avg. household size) | 0.198 | 0.020 | 9.965 |
| White * Log(1 + % White) | 9.169 | 0.007 | 1318.078 |
| Black * Log(1 + % Black) | 5.386 | 0.009 | 619.337 |
| Hispanic * Log(1 + % Hispanic) | 6.267 | 0.006 | 1001.648 |
| Asian * Log(1 + % Asian) | 5.374 | 0.008 | 641.331 |
| Nearby Jobs | 0.022 | 0.008 | 2.685 |
| Auto Peak Total Accessibility | 0.463 | 0.054 | 8.634 |
| Transit Peak Total Accessibility | 0.048 | 0.006 | 8.139 |
| Auto Off Peak Retail Accessibility | -0.437 | 0.059 | -7.425 |
| Pseudo R-squared: | 0.077 | | |

*Data Sources: Bay Area UrbanSim Synthetic Population (derived from PUMS), MTC Travel Model*

*Note: Neighborhood variables are averages within 0.5 to 3 km*

The comparison of the rent coefficients across income quartiles reveals that it drops slightly from 0.488 for quartile 1 (Table 3A.6), to 0.174 for quartile 2 (Table 3A.7), before climbing to 0.768 for quartile 3 (Table 3A.8), and to 1.011 for quartile 4 (Table 3A.9). Taken as relative measures, this indicates that from quartile 2-4, there is declining sensitivity to rents, which is consistent with households at higher incomes being more willing and able to pay for amenities and higher-quality finishes. Why the lowest income quartile is slightly less sensitive to rents than the second income quartile is less obvious, but most likely is due to an inability to escape higher rent burdens due to the absence of lower-cost housing options.

Aside from control variables for accessibility and neighborhood job density, the interaction of household characteristics with the socioeconomic characteristics of neighborhoods also appears to be very important in understanding spatial segregation patterns. We find very significant clustering effects when interacting the characteristics of households making a location choice with the fraction of households in a neighborhood that share the same characteristic. This applies for household size, with larger households preferring locations in which other households are also larger (more children, generally). It also applies to the racial and ethnic composition of households independent of the income effect. Clustering of whites, blacks, Hispanics, and Asians is clearly evident in the coefficients for these location choice models. One intriguing pattern emerges when comparing across income quartiles: the coefficient on same-race interaction decreases markedly from the lowest to higher income quartiles for blacks, and declines somewhat less for Hispanics, whereas it does not decline much at all for whites or Asian renter households. This suggests that as their income increases, blacks and Hispanics are more likely to move into more integrated neighborhoods.

**Table 3A.7: Location Choice Model Estimation Results for Renters in Income Quartile 2**

| Dep. Var: Location Choice | Coefficient | Std. Error | Z-Score |
|---|---|---|---|
| Log of rent | 0.174 | 0.076 | 2.276 |
| Log of nearby sq. ft. per unit | -0.017 | 0.024 | -0.721 |
| Log of nearby lot size per unit | 0.202 | 0.106 | 1.908 |
| Average nearby income | -0.839 | 0.032 | -26.212 |
| Log(persons * avg. household size) | 0.474 | 0.019 | 24.471 |
| White * Log(1 + % White) | 9.244 | 0.006 | 1464.798 |
| Black * Log(1 + % Black) | 3.924 | 0.009 | 448.839 |
| Hispanic * Log(1 + % Hispanic) | 5.820 | 0.006 | 965.782 |
| Asian * Log(1 + % Asian) | 4.598 | 0.008 | 587.814 |
| Nearby Jobs | -0.000 | 0.008 | -0.037 |
| Auto Peak Total Accessibility | 0.459 | 0.054 | 8.422 |
| Transit Peak Total Accessibility | 0.015 | 0.006 | 2.794 |
| Auto Off Peak Retail Accessibility | -0.359 | 0.059 | -6.067 |
| Pseudo R-squared: | 0.041 | | |

*Data Sources: Bay Area UrbanSim Synthetic Population (derived from PUMS), MTC Travel Model*

*Note: Neighborhood variables are averages within 0.5 to 3 km*

**Table 3A.8: Location Choice Model Estimation Results for Renters in Income Quartile 3**

| Dep. Var: Location Choice | Coefficient | Std. Error | Z-Score |
|---|---|---|---|
| Log of rent | 0.768 | 0.082 | 9.404 |
| Log of nearby sq. ft. per unit | 0.130 | 0.025 | 5.222 |
| Log of nearby lot size per unit | -0.758 | 0.111 | -6.846 |
| Average nearby income | -0.155 | 0.039 | -4.005 |
| Log(persons * avg. household size) | 0.940 | 0.020 | 47.245 |
| White * Log(1 + % White) | 8.908 | 0.008 | 1182.424 |
| Black * Log(1 + % Black) | 3.636 | 0.010 | 349.770 |
| Hispanic * Log(1 + % Hispanic) | 5.094 | 0.007 | 762.927 |
| Asian * Log(1 + % Asian) | 4.854 | 0.009 | 565.542 |
| Nearby Jobs | -0.027 | 0.008 | -3.506 |
| Auto Peak Total Accessibility | 0.934 | 0.058 | 16.201 |
| Transit Peak Total Accessibility | -0.019 | 0.005 | -3.657 |
| Auto Off Peak Retail Accessibility | -0.617 | 0.063 | -9.762 |
| Pseudo R-squared: | 0.032 | | |

*Data Sources: Bay Area UrbanSim Synthetic Population (derived from PUMS), MTC Travel Model*

*Note: Neighborhood variables are averages within 0.5 to 3 km*

**Table 3A.9: Location Choice Model Estimation Results for Renters in Income Quartile 4**

| Dep. Var: Location Choice | Coefficient | Std. Error | Z-Score |
|---|---|---|---|
| Log of rent | 1.011 | 0.075 | 13.517 |
| Log of nearby sq. ft. per unit | 0.175 | 0.024 | 7.451 |
| Log of nearby lot size per unit | -1.132 | 0.109 | -10.389 |
| Average nearby income | 1.197 | 0.036 | 33.641 |
| Log(persons * avg. household size) | 0.030 | 0.020 | 1.448 |
| White * Log(1 + % White) | 8.032 | 0.009 | 928.342 |
| Black * Log(1 + % Black) | 3.253 | 0.013 | 258.123 |
| Hispanic * Log(1 + % Hispanic) | 3.792 | 0.008 | 486.235 |
| Asian * Log(1 + % Asian) | 4.310 | 0.010 | 449.356 |
| Nearby Jobs | -0.028 | 0.007 | -3.917 |
| Auto Peak Total Accessibility | 1.622 | 0.061 | 26.596 |
| Transit Peak Total Accessibility | -0.008 | 0.005 | -1.673 |
| Auto Off Peak Retail Accessibility | -1.268 | 0.069 | -18.390 |
| Pseudo R-squared: | 0.06 | | |

*Data Sources: Bay Area UrbanSim Synthetic Population (derived from PUMS), MTC Travel Model*

*Note: Neighborhood variables are averages within 0.5 to 3 km*

## Representation of Parcel-Level Demand and Supply

As noted in the above section, "Requirements for Regional Models to Represent Displacement," the need to reflect detailed zoning and walk-scale access to transit imposes a requirement that parcel- and building-level representation be used to capture these effects. In this application of UrbanSim, we have exploited the use of local street network-based accessibility, and moved to a representation not only of parcels, but of individual residential units within buildings. This enables appropriate measurement of localized policies and amenity effects in the location choice models (demand), real estate development models (supply), and hedonic models (prices).

## Representation of Affordable Housing Development Feasibility

We have explored alternative strategies to address affordable housing construction in the real estate development model using pro forma analysis. The affordable housing component is made up of two subcomponents, inclusionary housing development and multi-family housing built with assistance from the Low-Income Housing Tax Credit (LIHTC) program, which we believe will capture a majority of all new subsidized affordable housing developed in the coming decades. We have developed a working add-on to the developer model to simulate inclusionary housing development, using San Francisco as a prototype. This can be expanded to the rest of the Bay Area with some data collection about the particular aspects of different jurisdictions' inclusionary housing ordinances. After pursuing several options of how to operationalize a model of LIHTC-assisted developments, we have developed a potential blueprint for how to address this in the UrbanSim developer model.

### *Inclusionary Housing*

For the past 10 years or so, recognizing the difficulty of providing housing at prices affordable to low and moderate-income households, the City and County of San Francisco, among other

jurisdictions in the Bay Area, have required developers of market-rate housing to provide housing affordable to low-income households. The developer can choose to:

- Provide affordable housing on site;
- Provide affordable housing off site;
- Pay an in-lieu fee on a per-unit basis, providing funds the Mayor's Office of Housing can use to support affordable housing development.

The program applies to all housing development above 10 units, which is the vast majority of development projects (counted in terms of units provided) in San Francisco.
Affordability levels:

- Per Planning Code Sections 415.6 (c) and 415.7 (d), initial rental below market rate (BMR) Rental Units will be priced to be Affordable to Qualifying Households at 55% of area median income (AMI).
- Per Planning Code Section 415.6 (c), initial sale BMR Ownership Units that are provided on the site of the Principal Project will be priced to be Affordable to Qualifying Households 90% of AMI on average.
- Off-site BMR Ownership Units must be affordable to Qualifying Households earning no more than 70 percent of AMI.
- Off-site BMR Rental Units must be affordable to Qualifying Households earning no more than 55 percent of AMI.

UrbanSim has a ROI-type developer model which is separated into the following: a) a feasibility calculation for all parcels for a number of building types, and b) a model selecting the most promising projects. The feasibility model returns a list of parcels where projects could pencil out. When the simulation is actually run, development is randomly chosen among such feasible projects, weighted by profitability, favoring financially stronger projects.

We incorporate inclusionary housing into the developer model on the feasibility side, such that jurisdictions whose planning codes contain inclusionary housing would be, all other things being equal, more expensive places in which to develop, assuming some portion of the cost for renting or selling units at less than their market value is carried by the developer. The implication from a policy perspective would be that the geography of development would, all other things equal, be impacted by the presence or absence of inclusionary ordinances, allowing for somewhat explicit testing of the effect of their introduction, and the provisions they contain. From a modeling perspective, adjusting the feasibility calculation is a quite direct and explicit way of achieving this end.

An important component in the feasibility calculation is the revenue side of potential development projects, which, compared with the cost estimate, make up the basics of the feasibility. Potential revenues come from an aggregation of hedonic sales prices for nearby or similar projects. The basic idea behind the implementation of inclusionary housing is to enter the calculation where expected sales prices are calculated. This takes place in the variable function known as "parcel-average-price." Instead of relying strictly on zone-level hedonic quantiles for expected sale price, the parcel-average-price function now performs a county-level lookup of a U.S. Department of Housing and Urban Development (HUD)-derived table on low-income limits, which is used to calculate upper threshold values for how much housing can cost and remain affordable to households earning 50% of the AMI. The developer must be able to break even, while providing these units at these much lower levels of revenue.

The following lists assumptions made to simulate inclusionary housing development in UrbanSim for the San Francisco prototype:

- We assume inclusionary units are built for this target income level, which is true for the San Francisco program but not necessarily for other jurisdictions.
- We assume inclusionary units are only built in jurisdictions with actual ordinances on the books, ignoring any voluntary arrangements.
- Placeholder values exist at the jurisdiction level (city-id), assuming 12% for all jurisdictions with an inclusionary ordinance.
- We also assumed a two-person household for the purpose of determining the target rent level, which is the closest integer to the average San Francisco household size. It may be advisable to parameterize this choice as a constant, or allow it to vary geographically to better fit actual local variations.
- We have set aside for now the complexities of off-site provision, as well as in-lieu fees.
- Concretely, this would mean that while a hedonic model may provide $600 per square foot as a revenue assumption, 12 percent of the units now come with a much smaller, around $200-per-square-foot assumption. The overall project revenue is then the weighted sum of the two.
- A significant deficiency here is that no accounting is done of BMR units produced pursuant to the program. Ideally, there would be explicit accounting of any BMR units produced, over time changing the geography of affordable housing as the simulation progresses. The reason for this is mainly because of a pending migration of the unit of analysis to individual housing units away from the current square footage representation of built space. Once that is in effect, individual units should be flagged as deed-restricted units, and, importantly, the household location choice model should be segmented to select BMR vs non-BMR units. This would entail schema changes as well as model changes.

### *LIHTC-Assisted Projects*

We have explored several possibilities for modeling 100% affordable multi-family units, which make up a majority of all income-restricted housing units in the Bay Area, developing rough conceptual models for each, and discussing their plausibility with specialists from the San Francisco Mayor's Office of Housing, ABAG, the San Francisco-based Non-Profit Housing Association of Northern California (NPH), and Mercy Housing California (a large statewide developer of non-profit housing).

The initial concept was a "layering" approach, whereby affordable housing projects would compete with market-rate development for land in the developer model. Their ability to compete would be based on layers of subsidies from various public sources (LIHTC, remaining redevelopment funds, and other sources) as well as streamlined entitlement processes that would reduce friction and allow these projects to be completed in less time. Housing practitioners acknowledged that affordable housing would be developed in this manner in an ideal world, but in reality, land in San Francisco has become so expensive that it only gets set aside for affordable developments if it is dedicated by public agencies, donated by developers through one-off agreements with elected officials, or is made available through other types of arrangements that would be impossible to model.

The next iteration was based on an assumption that the vast majority of 100% affordable multi-family developments would receive LIHTCs, which is supported by our interviews with housing experts. Based on this assumption, if we could model the location of LIHTC-assisted projects (in

addition to the inclusionary housing units) we could approximate locations of the new income-restricted units that will be built in the region. Although we have a dataset of all of the developments built in past years with tax credits, our goal was to use the locational criteria established by the California Tax Credit Allocation Committee to forecast where future developments might go. Unfortunately, this approach proved infeasible as locational criteria have a relatively small effect on the likelihood that a proposed project will receive 9% LIHTC, which are competitively allocated by the California Tax Credit Allocation Committee. The official 2015 regulations for assessing 9% LIHTC applications, for example, provide applicants with a maximum of 15 points for neighborhood amenities, a small percentage of the total possible score of over 120 points.[2]

We have, however, come up with a filtering mechanism that may allow us to narrow the range of total possible parcels to one in which affordable housing developments may be located. Municipalities are required to submit their housing elements to the California Department of Housing and Community Development (HCD). Housing elements must include a listing of parcels already entitled for residential development that will allow cities to meet their Regional Housing Needs Allocation (RHNA). ABAG intends to compile this list of suitable housing sites from all Bay Area jurisdictions in the near future. We believe that the combination of sites deemed suitable through the housing elements (which will have already cleared the political hurdles of public hearings and entitlement process) and the locational criteria of LIHTC may give a reasonable approximation of where 100% affordable multi-family housing developments are likely to occur.

## Summary of Status and Next Steps

This project has explored strategies for addressing questions around displacement related to transit investment and has made substantial progress in first, identifying requirements for making such adjustments in the modeling, and second, implementing these requirements. Significant changes have been made in the data structures and models to address the challenges of modeling displacement and modeling the impacts of alternative policies intended to mitigate these problems. We have not fully incorporated these changes into the operational models at MTC and ABAG, though most are in a condition that they could be easily incorporated at this point. This should be the case for the changes in data structures, household relocation model, hedonic models, and household location choice models. Estimation for these models has been completed.

What remains before full implementation and operational use is the following:

- Completion of proposed changes to the real estate supply model to simulate alternative policies designed to address affordable housing supply
- Testing and calibration of the combined changes to ensure reasonable predictions with the fully integrated model system
- Sensitivity testing of the updated, calibrated model system
- Running alternative scenarios with the calibrated model system to compare the effects of alternative policy strategies on displacement outcomes

As of early 2017, MTC has begun integrating most of the research innovations added to UrbanSim as part of this project and through a separate project funded by the MacArthur Foundation into their operational version of UrbanSim. The UrbanSim modeling methodology and platform has also recently been adopted for operational use by SANDAG, and efforts are now underway to generalize

[2] See http://www.treasurer.ca.gov/ctcac/programreg/regulations.asp for details on the regulations.

these changes to make them readily usable by any metropololitan area without extensive customization.

# Section 3B: Addressing Displacement in the SCAG PECAS Model

## 3B.1. Introduction

In this section we present enhancements to the land use model used in the Los Angeles by the Southern California Association of Governments (SCAG) known as the PECAS Land Use Model. First, we review the types of displacement categorized by previous research (Chapple, Chatman, and Waddell 2014) and assess how to implement the causality within PECAS;s general equilibrium framework (Hunt and Abraham 2005). Second, given empirical findings concerning the displacement near TOD areas outlined in Chapter 2, the SCAG PECAS model was updated to incorporate incomes and rents. This update allows the analysis of the regional economic benefit of TOD that took place in Los Angeles County, which is presented in the Appendix Q. Lastly, it provides possible options for further enhancement.

The SCAG PECAS model is designed as a sketch tool to provide an overview of the impact of planning alternatives for the SCAG region, which consists of six counties with over 5 million households and 18 million people. The SCAG PECAS model was developed from 2008-2010 via a cooperative arrangement with the UC Davis Team charged with developing the statewide PECAS version.. The SCAG region was "carved" out from the statewide database as a sub-regional model. Then, the model was recalibrated with available data for the SCAG region at that time, including travel skim matrices and land use inventory. Its relevancy was somewhat compromised by not fully being calibrated with genuine SCAG regional data. However, by taking such an expedited development path, SCAG was able to operate the model internally to produce cursory impact analyses for the 2012 RTP/SCS.

In its core, PECAS estimates the amount of goods, services, labor, and building floor space produced and consumed. As an output, it generates snapshots of household and job allocation in the region at 302 zones defined by Community Statistical Areas (CSA). While PECAS estimates land use transition for 4.5 million individual parcels in the SCAG region in its space development (SD) model (described in more detail in Section 3B.2), the model's main focus is to summarize regional economic performance of various policy assumptions at a manageable scale.

Given this modeling framework, the SCAG PECAS model is equipped to answer the question, "how does the region look when TOD is implemented compared to when TOD is not implemented?" It is not, however, equipped to answer the question, "what are the characteristics of the residents or households that move into or out of the TOD area?" This is because the sketch model searches for a spatial equilibrium state and uses relatively coarse geographic units of analysis (the CSA zone) and simplified stratification of economic agents (e.g., categories of households, not individual households). This simple model specification allows SCAG to review various planning alternatives in a relatively short analysis period and on a small budget.

The SCAG PECAS models is only partially adequate to explain the dynamic and disaggregated nature of displacement presented in the discussions in previous chapters and sections of this report. The SCAG PECAS model is a quasi-dynamic model in which a momentary state depends on the previous state, and it calculates the "changes" by comparing the two states at different times. Thus, it presents the net changes instead of identifying individual effects separately. The current SCAG PECAS model is without a mechanism that associates individual agents (e.g., households) to residential units at parcel level. Thus, the current SCAG PECAS model is not capable of analyzing potential displacement at the level of detail desired for this project.

Without major investment planned for the foreseeable future, this project gives SCAG an opportunity to review the new requirements for modeling potential displacement and to consider how these requirements compare to the SCAG PECAS model's current capabilities. It also gives SCAG the opportunity to evaluate methods that could be used in the future to incorporate additional information and to marginally update the model with the latest statistical findings related to TOD investment.

Modification of modeling dimensions, like reclassification of households/industrial sectors or changing zone systems, is considered a major update. In the general equilibrium states on which the PECAS is formulated, every variable is inter-related. Changing the model's dimension means almost all model coefficients should be re-estimated for the new structure. The current project does not aim for such a major update. The updating process summarized in the following sections demonstrates a possible method for enhancing existing PECAS-like land use models that represent economic actors and activities in aggregated form with very limited resources.

The following discussion consists of three sections: 1) an overview of the SCAG PECAS model, 2) a review of how it can be updated to model the types of displacement under consideration by recalibrating the zonal utility constant (but without radically re-framing the model structure) and applied to show the impact of TOD, and 3) a summary and recommendation with options for further enhancement, including major updates.

# 3B.2. PECAS and SCAG PECAS Model Overview

PECAS (Hunt and Abraham 2005) is a land use forecasting and policy analysis system used for comprehensive planning and transportation planning. It is a time-series (year-by-year) simulation of the evolution of the spatial form and the contribution of the transportation system to the future development of the economy and spatial patterns.

It consists of two internal modules—activity allocation (AA) and space development (SD)—and two external modules—economic/demographic (ED) and transportation (TR) (J.E. Abraham and Hunt 2007).

The AA module represents two elements: (1) the relationships between the people of the region—their interaction with businesses and other establishments in the region (and in the world) through markets for labor, goods, and services and (2) the relationships between businesses and establishments. The module allocates the region's households and production (employment) (called "activities") to the region's buildings (and other land improvements). It uses the region's travel demand models (TDM) to allocate "activities" according land uses and "skims" the TDM for travel conditions between transportation analysis zones (TAZs). The word "PECAS" is an acronym for "Production Exchange Consumption Allocation System," since AA represents the production of

goods, services, and labor (collectively called "commodities") in one location, and the exchange (and transportation) of these items to consuming entities in other locations, with a spatial price search mechanism at the point of exchange in order to clear the markets for each commodity in each short-term equilibrium time period (each year of the simulation).

PECAS' AA module estimates the production and consumption of commodities and building floor space, with consideration of three types of equilibrium states: 1) given the regional control of households and jobs, the estimated regional production is identical to consumption, and there is a set of market clearing prices in zones; 2) each type of household and business has a set of substitution technology, which determines the amount of input and output to maximize their gain at a given set of commodity prices according to the technology; 3) given the transportation system (and its capacity) as supply for transportation activity, the zone-to-zone travel demand for exchange of commodities from the produced zone to the finally consumed zone determines travel time and travel cost. The market clearing commodity price includes this endogenously determined travel cost.

The SD module represents developers (private or public) as they change the built form of the region (Hunt et al. 2007; Hunt and Abraham 2009). SD represents the land and buildings in the region via a parcel database; development conditions are represented via construction costs, zoning regulations, fees, servicing costs, etc. SD also represents the detailed appropriateness of specific parcels for specific uses through proximity functions, and is thus able to respond to the price signals (received from AA) indicating neighborhood demand/supply in a way that respects and responds to the specific arrangement of developable land, roads, buildings, transit stations, etc. SD inputs are largely GIS files that describe the land and parameters that represent developer behavior and ROI functions.

An aggregate version of SD is often developed in complex regions with missing or inconsistent data. This aggregate version contains a simplified inventory of the quantity of developed and vacant land in each land use zone, categorized by current development and zoning category. The aggregate version of SD converts quantities of vacant land into quantities of developed land in each TAZ in each year of the simulation, in response to the price signals from the AA module (higher rents indicating unsatisfied demand), and other demand signals that are region specific. In the SCAG region, there is both an aggregate SD model and a disaggregate SD model, with the disaggregate SD model not yet fully calibrated.

AA and SD work together with a spatial economic forecasting model of ED and TR to represent the state of a spatial economy over time.

Figure 3B.1 depicts the flow of information in the PECAS system. The system runs year-by-year. The ED module forecasts the size of the total economy given outputs from the AA module. Note that AA allocates by TAZ based on transportation system performance and the inventory of buildings and other space. Within the SD module, the inventory of buildings and space is modified per AA's price signals. The TR model develops measures of transportation system performance given the locations of business and household activity from AA.

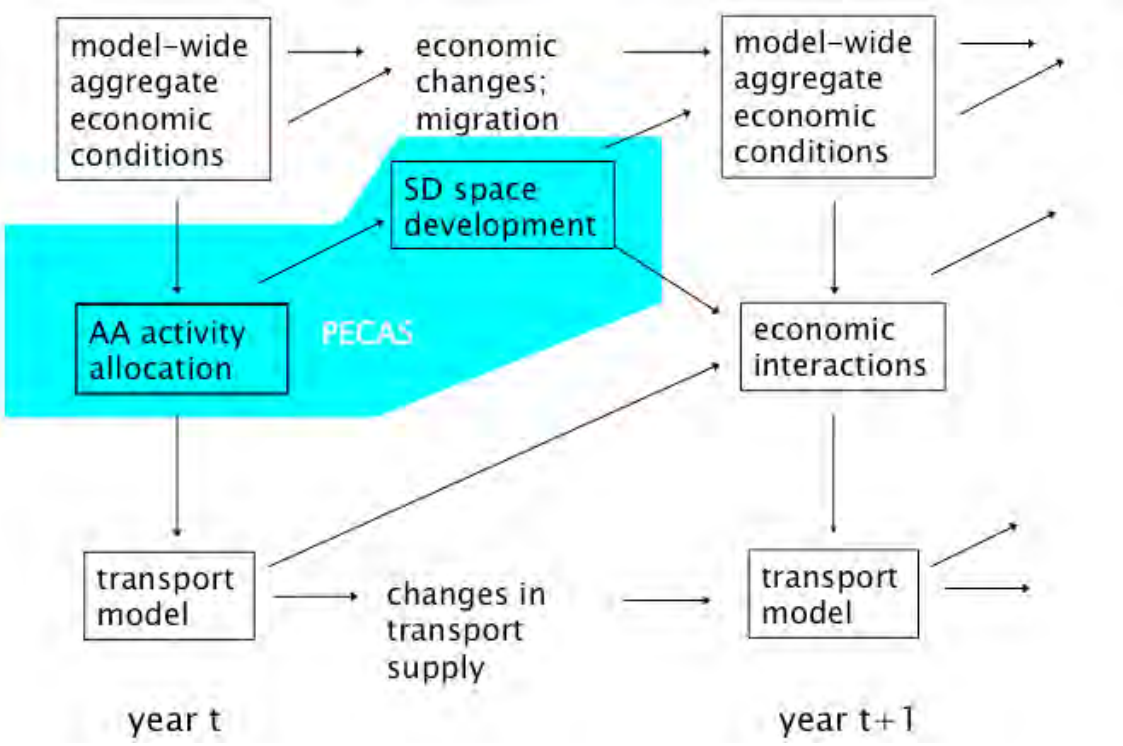



**Figure 3B.1: Information flows in the PECAS framework**

In the SCAG region, the PECAS model is currently operational with a simplified TR model, which relies on the skim matrices (average zone-to-zone travel time and distance by all modes including bus and rail transit, weighted by the ridership) produced by the regional travel demand model. The ED model is represented by forecasts, guided by a group of experts' economic outlook. The feedback process from PECAS to ED has not yet been established since, in SCAG's practice, the regional forecast is considered to be fixed during an RTP cycle.

# 3B.3. Modeling TOD and Displacement in PECAS

## Rent in Modeling TOD using PECAS

In the context of TOD, it is generally expected that the lower-density and older uses will be replaced by newer, higher-density uses. Each of the housing categories shown in Table 3B.1 represents a range of densities, with the upper (and lower) value of floor area ratio constrained by both 1) the definition of the category, and 2) the zoning regulations that prohibit or allow specific ranges of densities.

Real estate developers modeled in the PECAS SD module are motivated by future profit, and thus are blind to specific social issues (e.g., race and ethnicity) and spatial issues (e.g., proximity to transit), *unless* those factors are included in the calculation of rent or construction costs. Such issues are more directly related to households' decision process and housing demand, which is modeled in the AA module. Within PECAS's general framework, TOD should directly impact rent in two ways: (1) in the AA module, via the estimation of the zonal average rent as the equilibrium market

clearing price, and (2) via the SD module, whereby parcel-specific rents are determined within a zone, depending on the local condition where the parcel is located.

**Table 3B.1: Dwelling type categories in the SCAG PECAS Model**

| Dwelling Type | Description |
|---|---|
| ResType1-VL Luxury | Very low-density (acreage style homes, high value) |
| ResType2-VL Economy | Very low-density (acreage style homes, low value), includes rural mobile homes |
| ResType3-L Luxury | Low-density (subdivision style homes), high value |
| ResType4-L Economy | Low-density (subdivision style homes), low value |
| ResType5-MD Separate Entrance | Duplexes, attached single-family, townhomes |
| ResType6-MD Shared Entrance | 3,4,5 or 6 units per structure |
| ResType7-Higher Density | More than 6 units per structure, but not high rise |
| ResType8-Highrise | More than 6 units per structure, high rise |
| ResType9-Urban MH | Mobile home in an urban area |

### *Zonal Rent Impacts*

The zonal average rent for each of the space types in each zone is calculated in the PECAS AA module (J. Abraham and Hunt 2007), based on the ability of people to depart from (or arrive to) the zone to exchange labor, goods, services, or other items of tangible or intangible value. The travel attributes are calculated in the SCAG transportation demand model and are used by PECAS to represent "how travel on the transportation system fulfills economic needs," such as travel to work to sell labor, travel to schools to obtain an education, and so on.

The zonal rent is established through a supply/demand relationship in the housing market, with households in the PECAS categories making location and housing choices to optimize their access to the labor markets (to sell their labor as a product of the household) and to goods, services, and other PECAS commodities (to buy and to consume), based on their chosen economic interactions. In their choice process, the "zonal attractiveness factor" is considered as representing a base attractiveness of a zone to the household based on the zone's categorization. This factor includes both economic and non-economic terms, but the existing SCAG PECAS model does not include any non-economic attractiveness term at this time. Typical economic terms—which are included in the SCAG PECAS model—are price of goods and services, travel impedance, and amount and variety of available commodities including transit services.

The economic terms for the PECAS's "zonal attractiveness factor" have been developed using two key data sources: (1) economic input-output tables, which show household consumption relationships, (2) and Census micro-sample data, which show labor force participation and housing choices in terms of dwelling size and type. It is not expected that an analysis of displacement data and literature will significantly contradict the spatial economic interactions that drive spatial behavior in the SCAG PECAS model. Therefore, further analysis of displacement data is not expected to add much value to improve rent estimation from an economic aspect. Of course, recalibration of the model upon the availability of better and more recent data should enhance the model.

However, as new data and information emerges, model updates may be warranted to reflect non-economic aspects of household choice behavior, particularly if these new findings might affect PECAS's rent model. In PECAS, the "zonal attractiveness factor" represents how certain types of households are drawn to certain neighborhoods independent of the housing and the accessibility provided by the transportation system, which is considered part of economic attractiveness. Social proximity effects, wherey households more attracted to neighborhoods with matching or desirable attributes of current residents, can be represented in these factors.

In the current SCAG PECAS model, household categories—denoted by income range and household size—are shown in the Table 3B.2. The empirical findings could be included as a zone-by-zone modifier to the zonal attractiveness measures to target households with certain characteristics as long the findings are in a form of specific quantitative metrics about how neighborhood attractiveness changes for households as a function of household attributes and neighborhood attributes.

**Table 3B.2: Household Categories in the SCAG PECAS Model**

| Household Category | Income Range | Household Size |
|---|---|---|
| INC0010 2 or less | Less than $10K | 2 or less |
| INC0010 3 or more | Less than $10K | 3 or more |
| INC1025 2 or less | $10K ~ $25K | 2 or less |
| INC1025 3 or more | $10K ~ $25K | 3 or more |
| INC2550 2 or less | $25K ~ $50K | 2 or less |
| INC2550 3 or more | $25K ~ $50K | 3 or more |
| INC5075 2 or less | $50K ~ $75K | 2 or less |
| INC5075 3 or more | $50K ~ $75K | 3 or more |
| INC75100 2 or less | $75K ~ $100K | 2 or less |
| INC75100 3 or more | $75K ~ $100K | 3 or more |
| INC100150 2 or less | $100K ~ $150K | 2 or less |
| INC100150 3 or more | $100K ~ $150K | 3 or more |
| INC150m 2 or less | $150K or more | 2 or less |
| INC150m 3 or more | $150K or more | 3 or more |

In the PECAS model, neighborhood attractiveness influences would have to be treated as average amounts for each of the above household categories, either model-wide or zone-by-zone. The method of aggregation could make use of the relationship between PECAS household categories and household attributes in the measured relationships. There are few data options to support the method. The census PUMS data provides the information to enable an aggregation based on regional relationships, or the synthetic population representation could be used to aggregate within specific TOD zones. Individual households and population were synthesized based on the controls of household size/income/housing type distributions, as well as population age/race/worker status at 11,268 TAZs for the base and planning years (2012, 2020, 2035 and 2040) of the 2016 RTP/SCS in various land use scenarios.

The most important aspect of using observed neighborhood attractiveness in the PECAS model is the monetization of attractiveness into an annual willingness-to-pay measure, since zonal attractiveness households in PECAS are currently measured dollars of annual expenditure. Statistical estimations in location choice models should include, as a variable, a measure of housing

cost as annual rent. Otherwise, the units will be ambiguous and not translatable into the PECAS context. There is currently no explicit representation of race or ethnicity in the SCAG PECAS model, and a statistically sound relationship of race/ethnicity composition to the annual willingness-to-pay as rent has not yet been established.

The SCAG PECAS model is being developed using an "agile and incremental" development approach (Beck et al. 2001). This means that SCAG is continuously interested in potential improvements to the PECAS model. Recommendations regarding adjustments or enhancements to the system of categorization of households in Table 3B.2 could result from the displacement study described throughout this report, especially as quantifiable measures of neighborhood desirability are a produced. A microsimulation version of the PECAS AA module is also planned, allowing additional socioeconomic variables or location variables to be included in utility functions, removing the need for zonal based variables. The study could recommend that SCAG adopt this PECAS enhancement.

***Within-Zone Parcel Rent Adjustments (Local Level Effects)***

Within each zone, certain parcels are more desirable for certain uses. PECAS uses a two-level hedonic model to modify parcel-level expected rents by development type to account for the characteristics of each parcel. This allows PECAS to represent particular parcel-specific development probabilities.

An example in the statewide model (as well as in the SCAG PECAS model) is the rent modifier that considers the distance to the nearest transit station. The average zonal rent estimated in the AA module based on economic and non-economic terms of attractiveness is further modified for each parcel and each space type, based on the distance to a major transit stop by multiplying factors from the shifted exponential function shown in Figure 3B.2.

Using the same distance to the transit station example, the distance to the transit service would have both positive and negative influences on rent, when all other factors are controlled. With ease of access to the transit service, the shorter distance from a residential parcel should be a positive impact on rent. But if the distance is too far, its influence diminishes. On the other hand, due to nuisance factors such as noise from train operation, shorter distance could negatively affect rent, but this negative influence also diminishes with distance. The adjustment factor to a parcel is 1 when the rent of the parcel is exactly the same as the zonal average, and its distance from the station is the "reference distance value" for local effect of g, $\text{RefDValue}_g$. The local effect factors are then modeled as increasing functions for positive influences and decreasing functions for negative influences of observable measures, such as distance to certain amenity or age of property ($\text{DValue}_g$) with one known point on the Figure 3B.2 of ($\text{RefDValue}_g$, 1). Negative values for $\theta_g$ in the exponential function result in values of $\text{LEFac}_{g,h}$ that decrease from 1 as $\text{DValue}_g$ decreases from $\text{RefDValue}_g$ to 0. Thus, rents decrease down from the zonal-level value as the effect gets closer to the parcel.

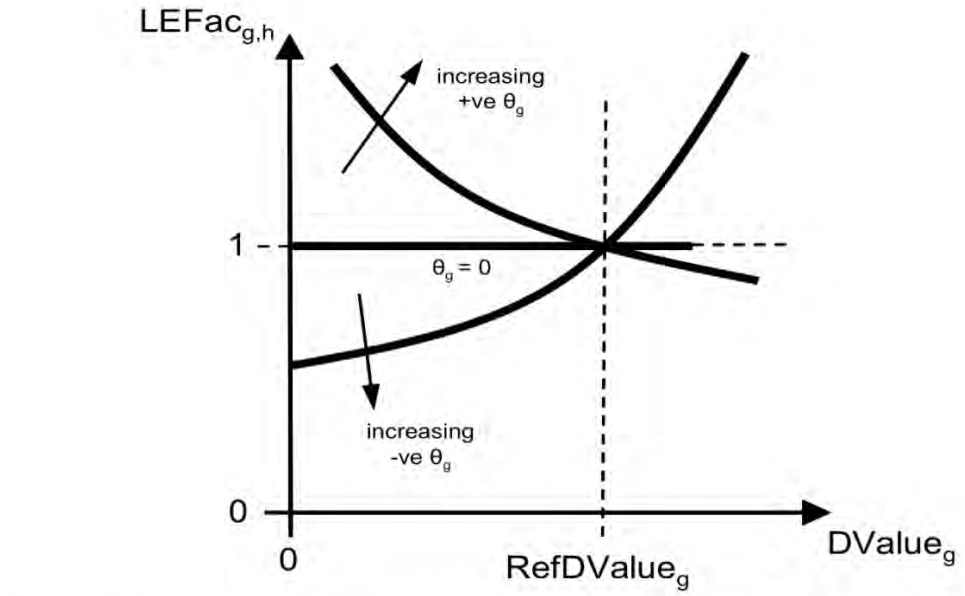



**Figure 3B.2: Shifted Exponential Function used in Transit Local Rent Modifier**

$LEFac_{g,h}$ : Factor adjusting proportional change in rent for space type h as a function of values on dimension relevant for local-level effect g

$DValue_g$ : Values on dimension relevant for local-level effect g. Typically this represents the distance from the parcel to the source of the local-level effect, the local-level density for the parcel, or the age of the space on the parcel

$RefDValue_g$ : Reference value on dimension relevant for local-level effect g

$\theta_g$ : Parameter for function calculating values for $LEFac_{g,h}$

g : Index of local-level effects on rent

In the SCAG PECAS model, the coefficients were estimated locally, using Orange County data. Table 3B.3 shows the empirically estimated rent modifier function coefficient by household categories. Higher-density housing shows increased value within the zone when it is located closer than one mile from a major transit stop, while non-residential uses increase even more substantially. Within the single-family housing categories, the nuisance effects of proximity to major transit (noise, litter, traffic) at the sub-zone level causes rents to decrease (although rents could still increase in total due to the zonal average impact). See (Wang et al. 2011) for details regarding the technique and the estimations that were performed using 58,000 residential parcels, and statewide (California) GIS representations.

These local rent coefficients could be updated based on the findings from the literature review and analysis of this project that provides additional information about the localized impact on the desirability of developments (separate from the neighborhood effect). Any analysis of changing rent patterns that occur due to major transit development should be careful to separate neighborhood uplift effects from parcel-specific effects, and should attempt to classify rental properties using the above categorical definitions. In this way, the displacement study could provide a major enhancement to the SCAG PECAS model, by improving this representation of rental proximity effects, and hence improving the representation of housing demolition and reconstruction. In

general, the *a priori* expectation is as follows, and these hypotheses should be tested and confirmed with a rigorous statistical analysis.

**Table 3B.3: Rent Modifier Coefficients in the SCAG PECAS Model for Distance to a Transit Station**

| Space type | RefDValue | θ |
|---|---|---|
| ResType1-VL Luxury | 5280 | -0.116 |
| ResType2-VL Economy | 5280 | -0.116 |
| ResType3-L Luxury | 5280 | -0.116 |
| ResType4-L Economy | 5280 | -0.116 |
| ResType5-MD Separate Entrance | 5280 | -0.116 |
| ResType6-MD Shared Entrance | 5280 | 0.056 |
| ResType7-Higher Density | 5280 | 0.056 |
| ResType8-Highrise | 5280 | 0.056 |
| ResType9-Urban MH | 5280 | 0.056 |
| Manufacturing space | 1320 | 0.993 |
| Commercial High space | 5280 | 0.713 |
| Commercial Low space | 2640 | 0.252 |

- Multi-family residents are protected from nuisance effects by the structure type (they may live on higher stories, do not have to maintain a yard, and can secure the outside entrance to the building in addition to the entrance to their own residential unit) and have already chosen housing that causes them to interact with others as they come and go from their residence. Thus, the households bidding for multi-family housing will place a much higher value on the reduced walking time to transit, over the privacy and nuisance effects of transit stations and multi-family dwellings near transit will have an increased value.

- Single-family residents are more affected by the nuisance effects of transit, yet still value the reduced walk time of the closer locations, so the effect of major transit station proximity on rent could be positive or negative depending on which element is stronger.

- Users of commercial space value the visibility and access to pedestrian and change-mode (park-n-ride, bus transfers) users, and, all other things being equal, should bid the rents in the closest locations higher.

The other local effect modifiers in the current SCAG PECAS model are:

- Distance from schools
- Distance from coastline
- Distance from major roads
- Distance from freeway link (negative effect primarily due to noise)
- Distance from freeway access ramp (positive effect, especially for commercial uses, due to access)
- Distance from parks (positive effect for residential uses)

Analysis of parcel-specific rents or parcel-specific desirability for specific uses should attempt to include (or control for) the proximity effects of these other variables. For instance, if a major transit facility is built on an existing road right-of-way, turning a former major road into a local road,

commercial rents along the right-of-way could decrease, as the positive impact of the transit stop could be more than offset by the negative impact of the loss of a major road.

Analysis of parcel-specific rents or desirability could also suggest additional proximity measures affecting rents, for eventual inclusion in an enhanced PECAS model. Adding or changing these local-level effect modifiers in the PECAS SD module is a potential stand-alone enhancement that could have high modeling value for a potentially reasonable cost.

## Modeling of Displacement in PECAS

This section reviews types of displacement in focusing on the possible methods to incorporate in PECAS model. According to the previous research referenced in the project scope (Chapple, Chatman, and Waddell 2014):

> "Transit investment and TOD may result in either direct displacement, when residents are forced to move when new development replaces their housing units, or indirect displacement, which may occur as property values in the area increase due to its new desirability. Indirect displacement may be voluntary, if property owners elect to sell their residences (typically for a profit), or involuntary, occurring in any of three forms: (1) economic, in which housing becomes prohibitively costly (because of high rent or, outside of California, property tax increases); (2) physical, in which the landlord evicts the tenant or induces departure through harassment or persuasion; and (3) exclusionary, in which low-income and/or minority households no longer have the opportunity to move into the neighborhood."

This categorization of displacement provides the organizational framework for this section, explaining how the PECAS model in Southern California can represent displacement.

***Direct Displacement***

Direct displacement is defined as "when residents are forced to move when new development replaces their housing units." In PECAS, this category represents the demolition of existing housing units, potentially for two reasons: government demolition and private demolition.

<u>Direct Displacement due to Government Demolition</u>

Housing could be purchased for civic use and demolished by government authority. For example, housing can be demolished so the land can be used as a right-of-way for transit, for new access roads to transit stations, for park-n-ride transit lots, or for a new school provided together with new transit.

Since PECAS is designed to represent how the spatial economic and social economic system responds to government policy, the impact of forced displacement by direct government policy should be understood directly, analyzed outside of PECAS. Instead of letting the model decide future land use of the parcels in the TOD area, it is directly edited into the database for the SD module. In this situation, PECAS could be used to help understand how the system may adapt by the externally given land use change through second-order effects.

<u>Direct Displacement due to Private Demolition</u>

Housing can be demolished and replaced by private developers, who are pursuing the *Highest and Best Use* of existing land. The PECAS model for SCAG provides a direct representation of this

phenomenon, especially if the microsimulation SD module is calibrated and used. It contains a parcel-by-parcel representation of developer decisions, with developers motivated by expected future rent streams by type, age, and intensity of development. The space types in the SCAG PECAS model, representing types of development, are the same as in the California statewide PECAS model, and as Table 3B.1 shows. Within each category, the cost of constructing new space is calculated based on a commercial construction costing model, adjusted for zip code and for the slope of land (Circella et al. 2011).

***Voluntary Indirect Displacement***

Voluntary indirect displacement occurs if property owners elect to sell their residences. This category involves owner-occupied residences being sold for the benefit of the owner. The representation of this phenomenon in PECAS relates to the specific representation of rents, as already discussed in the previous section, direct displacement due to private demolition. The opportunities discussed in the section to better understand the TOD-related rent impacts in the context of demolition and redevelopment also apply to the understanding of voluntary displacement.

The PECAS model represents housing value as a rent stream regardless of whether housing is owner- or tenant-occupied, representing the direct rent paid by tenants and the opportunity cost of not renting forgone by owners. Typically, tenant vs owner analysis in PECAS has relied on the segregation by household income (Table 3B.2). Given the strong tendency of higher-income households to own their own homes, prior analysis along this dimension has been appropriately successful. Analysis of data for this category of displacement should attempt to understand the characteristics of households choosing to sell their homes to take advantage of upward rent pressures, to help assess the appropriateness of the existing income- and size-based classification system.

Owners usually have a longer-term mortgage with payments set based on purchase price. This allows them to make longer-term decisions, but they are less mobile in searching for a new residence than renters. The opportunity of increased revenue due to selling (or renting out) a residence with increased desirability may not be something that households are initially aware of, or initially consider, and because it represents an increase in value (rather than an increase in costs subject to a budget constraint), it does not force immediate lifestyle changes, or immediate decisions in a general equilibrium state of the economic system. The PECAS model has terms (called "inertia terms") that serve to adjust the rate of locational response, if it is shown through the displacement research that households who own their dwellings respond more slowly to increased housing value, the PECAS inertia terms could be adjusted.

Analysis of displacement data could support this household categorization, as long as the rates of response are highly correlated with income or household size in the manner represented in the current SCAG PECAS model. Or it could suggest a more detailed categorization, or supplementary variables to be included in a future microsimulation version of PECAS AA, when the rates of response are highly correlated with many different variables, which are not part of the current SCAG PECAS household classification variables. Statistical analysis presented in Chapter 2 show that race/ethnicity and housing tenure are important variables in the explanation of demographic changes near TOD areas of Los Angeles County. Unfortunately, the current SCAG PECAS model does not include those variables to represent households explicitly.

### *Involuntary Displacement due to Rent Impacts*

This category of displacement is economically similar to the category above, "Voluntary Indirect Displacement," with the difference being that the residents of the household are not the owners of the residence. It is implied in the literature that this displacement is less desirable than voluntary displacement, because the displaced households do not themselves receive the benefit of property uplift.

In the current SCAG PECAS model, no tenure distinction is included. The location choice and space consumption behavior is mainly modeled by rent or rent-related accessibility, assuming the household mobility is already incorporated implicitly in the model by the income category as a proxy, owing to the high correlation between the proportions of renters and income category (from ACS PUMS 2007-2011 in SCAG region, it is 0.995). Such an assumption might be reasonable for the purpose of the current SCAG PECAS model, in which specificities are aggregated into totals or averages. But, if the model should be revised in a way to maintain the individual specificities, it would be desirable to expand the household classification given by Table 3B.2.

### *Involuntary Displacement due to Physical Evictions / Harassment / Persuasion*

This category of displacement refers to non-market-based representations of displacement, with some person or entity forcing people out of the home. The general assumption is that landlords would be the ones trying to force out existing tenants, so that they can increase rents on new tenants or redevelop the property to a higher-profit use. From an economic theory perspective, this implies one of following:

- an "economic agent" who, by definition, acts on profit motivation, would simply increase the rent on existing tenants, and let them decide whether to leave or stay,
- an attempt by monopolistic landlords (or a landlord cartel) to change the character of the neighborhood due to perceived benefits (and eventual higher rents) associated with a dominant socioeconomic characteristic, or
- an undesirable tenant, whether due to landlord discrimination or tenant behavior.

The empirical research should explore, or potentially identify, situations where individuals felt compelled to leave. In the case when the compeller was a landlord, the research could explore why the landlord didn't simply raise rents. As this category of displacement is identified as a common one, different possible constrained choice frameworks should be investigated for future inclusion in an enhanced PECAS model. It can only be represented in the current SCAG PECAS model in a calculation (for calibration) of adjusted zonal specific constants, as discussed in the context of neighborhood rent in the section on Zonal Rent Impacts. This could be adequate to represent the non-economic attractiveness, but may not be adequate to represent the non-free-market motivations of this category of displacement.

### *Exclusionary Displacement*

"Exclusionary Displacement" refers to situations where households no longer have opportunities to move into the neighborhood. This could be due to overly high rents as already discussed in previous sections, or characteristics of the neighborhood that make it less desirable to future residents. If this is not related to high rent, then the observed rent does not explain the composition of household characteristics in a certain community. Thus, the mechanisms for neighborhood desirability and exclusivity should be explored and quantified in terms of willingness-to-pay to

convert the effect of non-economic terms to economic. Any measures of willingness-to-pay in equivalent annual rent can be included in the PECAS zone specific attractiveness measures. For example, if an exclusionary characteristic of a zone causes low-income households to avoid the zone to the same degree as a $500 higher annual rent, this can be represented in PECAS directly for zones that acquire the characteristic, through a modification of the zonal attractiveness variable for low-income households by -$500.

## Representing Displacement Mitigation Measures in PECAS

There are policies that can be undertaken to mitigate displacement by allowing existing residents (or new residents matching the income, ethnicity, or other characteristics of existing residents) to live in areas that are affected by improved transit service. Some examples are listed in this section, but other possibilities should be further identified to determine how they can be best represented in the PECAS model.

***Low-Income Housing Tax Credit (LIHTC)***

SCAG may consider a future enhancement to PECAS that adjusts the housing types in the model (Table 3B.1) to separate LIHTC properties from other properties. In general, space types in PECAS represent physically different types of space, but the LIHTC works through the investment and capital formation phases of development. Since abandoning LIHTC status in favor of renting to higher-income households affects developer profitability as represented through the corporation or investor syndicate, this program is also best represented in PECAS's SD module.

Any program under consideration that impacts developers' costs in a conditional-use way, so that the housing is classified and its use or tenancy is restricted in the future based on the payments or fees at the time of development, are best represented as enhancements to the housing categorization in the SD module. However, this must be balanced against the availability of data to accurately represent such housing.

***Changes to Rent Stabilization Ordinance, Ellis Act, and the like***

Rent controls in a city affect the ability of landlords to increase rents. This limits the response of the market to changes in desirability induced by the improved transit services. The Ellis Act allows building owners to evict tenants if they wish to demolish their building or change its use. Any proposed changes to these or similar ordinances could be analyzed with the existing PECAS model as they are targeted towards housing types in Table 3B.1 or household types in Table 3B.2.

Future enhancements to PECAS's household categorizations (Table 3B.2) should be necessary as housing is built that restricts particular households from occupancy. For instance, if a program of providing housing without any on-site parking in the vicinity of major transit stops is being considered, further household category segmentation based on auto ownership should be included. Programs based on racial or ethnic characteristics are unlikely to be proposed due to anti-discrimination laws, so housing supply policies are unlikely to suggest further segmentation of household categories based on race and ethnicity variables. Despite this, however, the effectiveness of the policy may not be diminished due to the certain existing conditions. To better analyze impact of policy, future versions of the SCAG PECAS model need to be flexible enough to incorporate various household types.

Enhancements to housing type categories (Table 3B.1) could reflect any revealed market segmentation variables that cause differences in rents and opportunity costs. For example, dwellings that can freely and easily be converted from owner-occupied to tenant-occupied dwellings could continue to share a category (since owner-occupiers are clearly foregoing a rent stream through their occupation) while dwellings that are required, through agreement or legislation, to remain tenant-occupied, could be included in a separate categorization.

# 3B.4. Representation of Empirical Research Findings in PECAS

This section describes the use of the model to represent displacement in the SCAG region, in the context of the empirical research findings. The method presented in this section demonstrates the possibility of further calibration of the SCAG PECAS model to better represent the impact of TODs on displacement when new findings are available without requiring a major re-framing of the model.

## Findings Reported

The PECAS modeling team was tasked with incorporating the empirical results from Chapter 2 into the existing regional forecasting and policy analysis models. It was also tasked with considering adjustments and enhancements for future model versions.

For the Southern California region, the primary empirical research made available to the PECAS modeling team took the form of a regression equation relating the changes in 2,224 census tract-level attributes in Los Angeles County between the years 2000 and 2013, to census tract attributes from the year 2000. These results are shown in Table 2F.2. We present them again in Table 3B.4 below, since the remainder of this section relies heavily on the regression coefficients presented. Table 3B.5 defines terms shown in Table 3B.4.

**Table 3B.4: Effects of neighborhood characteristics on neighborhood change**

| | Δ LTHS | Δ BA+ | Δ NHW | Δ Renter Burden | Δ Low-Income HH (<10K) | Δ High Income HH (<125K) | Δ Median HH Income | Δ Gross Rent |
|---|---|---|---|---|---|---|---|---|
| Constant | -5.544 *** | 3.230 * | -19.66 *** | -4.181 | 2.129 | 2.938 | 6006.842 * | 266.135 *** |
| Median Household Income (/10,000) | 1.212 *** | 0.137 | 0.11 | 1.333 *** | 0.366 ** | -0.841 *** | -410.652 | 28.163 *** |
| Median Household Income Squared | -0.049 *** | -0.003 | 0.03 *** | -0.049 *** | -0.022 *** | 0.016 ** | -75.488 *** | -2.745 *** |
| % Asian | -0.034 *** | 0.021 ** | 0.08 *** | 0.024 | -0.039 *** | 0.001 | -40.271 ** | -1.875 *** |
| % NHBLK | -0.006 | -0.036 *** | 0.12 *** | 0.055 *** | -0.024 *** | -0.038 *** | -88.725 *** | -1.246 *** |
| % Hispanic | -0.108 *** | -0.055 *** | 0.09 *** | 0.120 *** | -0.011 * | -0.044 *** | -95.379 *** | -1.240 *** |
| Downtown TOD | -4.975 *** | 9.028 *** | 11.31 *** | -3.361 | -4.596 *** | 1.591 | 7703.347 ** | 166.895 *** |
| Other TOD | -0.440 | 0.897 ** | 1.42 *** | -1.186 | -0.696 ** | 0.611 * | 2679.065 *** | 17.775 |
| % Renters | -0.023 ** | 0.045 *** | 0.13 *** | 0.057 *** | -0.008 | 0.017 ** | 0.671 | 0.184 |
| Δ Gross Rent | -0.003 *** | 0.005 *** | 0.00 ** | 0.006 *** | -0.003 *** | 0.004 *** | 9.520 *** | - - |
| Adjusted R-Squared | 0.359 | 0.133 | 0.258 | 0.071 | 0.055 | 0.144 | 0.279 | 0.156 |
| n | 2,224 | 2,224 | 2,224 | 2,224 | 2,224 | 2,224 | 2,224 | 2,224 |

***<.01 **<.05 *<10

Parameters with a p-value of > = .10 are not denoted with asterisks

With the exception of change in gross rent and median household income, all other changes represent percentage point changes

Values for gross rent and median household income are in 2013 dollars

Data Source: 2000 Census, 2009-2013 5-year ACS

Tabulations by P. Ong & C.Pech

**Table 3B.5: Legend of measured effects from Table 3B.4**

| Effect | Meaning |
|---|---|
| Δ LTHS | Change of proportion in individuals with less than high school education |
| Δ BA+ | Change in percent non-Hispanic black |
| Δ NHW | Change in percent non-Hispanic white |
| Δ Renter Burden | See Chapter 2 Sections E and F for the definition |
| Δ Low-Income HH (<10K) | Change in percent low-income households, adjusted to inflation to less $10,000/year 2013 dollars income |
| Δ High-Income HH (>125K) | Change in percent high-income households, adjusted to inflation to more than $125,000/year 2013 dollars income * |
| Δ Median HH Income | Change in median household income, inflation-adjusted to 2013 dollars |
| Δ Gross Rent | Change in average gross rent paid per month, inflation-adjusted to 2013 dollars |

The regressions controlled for accessibility via a variable that measured location within a transit station area. However, they did not analyze changes in accessibility provided by the transportation network operations over time, and so have a limited ability to explain how transportation infrastructure and services impact the socioeconomic arrangement of households in the region. Also, PECAS would benefit from information on real estate development for recalibration of the SD. Overall, however, the very strong statistical significance of some of the coefficients shows correlations that could be represented in regional land use models, in particular, as the causal nature of the correlations can be explained through further investigation.

## Implications of Findings on PECAS Model Scenarios

For modeling TOD and possible subsequent displacement in the SCAG PECAS model, it was anticipated that the fine representation of the detailed development pattern would focus on the PECAS SD module, representing developers' attempt to provide appropriate housing types and densities in desirable locations, within the constraints of zoning, to maximize profits (J.E. Abraham et al. 2015b). However, the empirical analysis presented in Table 3B.4 is more focused on neighborhood-level changes over 13 years. As a result, the PECAS AA module is more appropriate to be updated.

Households are represented in the PECAS model using an aggregate categorical system, as shown in Table 3B.2. Categorizing households in this way—by income and size—makes it possible to link them to economic information via economic input-output tables, which is why this categorization method was chosen for both the SCAG PECAS model and the statewide version of PECAS. The division into income categories is based on the earnings and expenditure patterns of households, as well as their participation in different labor markets according to the predominant wages paid in different occupational categories. The partition into size categories is done specifically to represent the consumption of different housing types/rates in the real estate model, the differing trip rates per household in the travel model, and to further support the spending and consumption patterns on a per-capita (rather than per-household) basis.

### *Mechanism for Representing Displacement in PECAS*

We stated above that the quantitative metrics about how neighborhood attractiveness changes for households is a function of household attributes and neighborhood attributes and could be included as a zone-by-zone modifier to the zonal attractiveness measures in the PECAS AA module.

Instead of the empirical results that are presented as zonal attractiveness measures, it showed the changes in the rent and income distribution around TOD zones (separated into Downtown and Other TOD zones), controlling for other influences, and thus implying that the TOD nature of the zone caused such changes. Changes in zone-by-zone modifiers for each household category were planned to best reproduce the reported shift in neighborhood characteristics.

## Scenario Development and Calibration

### *Parameter Change Methodology*

The overall approach was to develop a small set of parameters for the SCAG PECAS model that represent the effect of TOD on housing location choice in a simple but realistic way. This was done using linear relationships that modify the utility constants on each zone for each household type (distinguished by income level and household size). These parameters were then calibrated so that they reproduced the currently representable findings from the empirical research.

The pool of parameters to calibrate was based on the following conceptual relationships:

- TOD makes neighborhoods more attractive in general because of the improved accessibility.
- TOD has a greater attractive effect on higher-income households when expressed as a monetary value because money is less valuable to them. They are willing to pay more for amenity value because they can afford it, e.g., they have a higher value of time in transportation.
- In addition, households with fewer members could be more or less attracted to TOD than those with more members, due, for example, to differing preferences for housing types and different labor force participation rates.

To represent these relationships, three types of parameters were examined:

- a constant utility adjustment applied to all household types equally,
- an income-sensitive utility adjustment applied to each household type in proportion to its income, and
- a “small household” utility adjustment that applied only to household types with one or two members.

Each of these parameter types had one variant for downtown TOD and another for non-downtown TOD, for a total of six parameters.

Thirteen model scenarios were formulated with different combinations of these parameters to test their ability to help match the correlations in the metrics from Table 3B.4. Based on the results of these test runs, the “small household” utility adjustments were dropped because they had a minimal impact on the metrics, while the income adjustments were coalesced into one parameter for both downtown and non-downtown TOD areas. This left three parameters to calibrate:

- a downtown TOD constant for all household types,

- a non-downtown TOD constant for all household types, and
- a household income TOD adjustment.

Once the values of the three parameters are chosen, the following formula produced the changes in the utility constants for each zone needed to represent the effect in the SCAG PECAS input files:

$$K_{zh} = p_{DTz}k_{DT} + p_{NDz}k_{ND} + (p_{DTz} + p_{NDz})i_h s$$

where $K_{zh}$ is the value added to the zonal utility constant for household type $h$ in zone $z$;
$p_{DTz}$ is the percentage of zone $z$ that is in a downtown TOD area, while $p_{NDz}$ is the percentage that is in a non-downtown TOD area, to translate census tract TOD binary categorical variables into portions of PECAS LUZ Zones;
$i_h$ is the midpoint of the income range represented by household category $h$;
$k_{DT}$, $k_{ND}$, and $s$ are the downtown constant, non-downtown constant, and income adjustment.

The calibration runs were then made and the differences in various metrics from the base condition were calculated. Table 3B.6 shows the metrics used in the calibration process.

**Table 3B.6: Metrics used to calibrate TOD scenario**

| Metric | Description |
|---|---|
| DT % low-income | Change in the percentage of the households that are low-income in the downtown TODs |
| DT % high-income | Change in the percentage of the households that are high-income in the downtown TODs |
| DT median income | Change in the median income of households in the downtown TODs |
| DT average rent | Change in annual rent in the downtown TODs |
| ND % low-income | Change in the percentage of the households that are low-income in the other TODs |
| ND % high-income | Change in the percentage of the households that are high-income in the other TODs |
| ND median income | Change in the median income of households in the other TODs |
| ND average rent | Change in annual rent in the other TODs |

The differences in these metrics were compared to the changes found by the empirical research. By changing one parameter at a time, the approximate effect of each parameter on the metrics could be calculated. A least-squares optimization was then solved for the best set of parameter values to use. Each metric was weighted according to its statistical significance in Table 3B.4. The metrics with a correlation significant at $p < 0.01$ were given the highest weight, while those at $p > 0.1$ were given the lowest weight. In addition, the "average rent" metrics were given lesser weights than their significance would imply, since a price investigation revealed unreasonably high residential space prices for some uncommon space types in many zones of the SCAG PECAS model. Insisting on an accurate match on the rent metrics would distract from matching the more reliable income-based metrics.

***Description of Calibration Scenarios***

Six of the 13 calibration scenarios are described here. They are the ones that were relevant to finding the final set of parameter values. The scenarios are:

- **The constrained base scenario.** This scenario was done in the way that is normal for the base year in a SCAG PECAS time series run: the number of households in each zone was constrained to be equal to the observed amounts to establish the zonal constants. It represents the control case that does not account for TOD and its effects on the neighborhood income mix.

- **"SDBU", the unconstrained base scenario.** This model run was designed to reproduce identical results to the constrained base scenario, but without the option to constrain the allocation to the controls. Instead, the zonal constants found in the constrained base scenario were given to the SCAG PECAS model as a direct input, to open up the possibility of changing these constants in future scenarios. Since no adjustments were made to the zonal constants in this run, it represented the case where all three parameters were zero ($k_{DT} = 0, k_{ND} = 0, s = 0$).

- **Test scenario 1: downtown TOD constant.** This run was the same as the unconstrained base scenario, but with a constant of $10,000 added to each zone containing the downtown TOD, in proportion to the fraction of the zone that is located in the downtown TOD. This constant would make all households willing to spend an extra $10,000 per year on living expenses in order to gain the accessibility benefits of locating in a downtown TOD neighborhood. The choice of this number was somewhat arbitrary, since it served only for exploration purposes and was not intended to be realistic. The other two parameters were zero ($k_{DT} = 10{,}000, k_{ND} = 0, s = 0$).

- **Test scenario 2: non-downtown TOD constant.** This scenario had a constant of $10,000 added to zones containing non-downtown TOD zones, in proportion to the fraction of the zone located in the non-downtown TOD. The other two parameters were zero ($k_{DT} = 0, k_{ND} = 10{,}000, s = 0$).

- **Test scenario 3: income adjustment.** This scenario had an income adjustment of 0.2, representing each household being willing to pay an extra 20% of its income to locate in a TOD neighborhood. The other two parameters were zero ($k_{DT} = 0, k_{ND} = 0, s = 0.2$).

- **"SD10": Scenario with optimal parameters.** This scenario used the parameter values found from the least-squares optimization; as discussed below, these values were $k_{DT} = -3{,}110, k_{ND} = 2{,}530$, and $s = 0.0176$.

***Parameter Exploration***

For each of the above scenarios, the eight metrics were calculated, with the differences between the metrics for each test scenario and those for the unconstrained base scenario. Table 3B.6 defines the metrics for the unconstrained base scenario and the test scenario. Table 3B.7 shows the changes caused by the parameter values in the test scenarios, i.e., the difference between the metric in the test scenario and that in the base scenario. With the addition of $10,000 to downtown TOD zones, Test Scenario 1 shows an increase of high-income households to 6.56% from 4.93% in the same zones. Interestingly, this additional utility in the downtown TOD area also affects the proportion of high-income households and median income, as well as the average rent in the non-downtown TOD zones. On the other hand, the SCAG PECAS model responded very little to the additional utility in the non-downtown TOD zones of Test Scenario 2.

These differences are compared to the empirical values, which are derived from Table 3B.4. Since all of the scenarios were run for one year, while the targets were calculated from changes between 2000 and 2013, the targets were divided by 13 for the comparisons. It would be desirable to extend this approach to a run over time, so that the parameters could be increased in each successive year to simulate the long-term effects captured by the empirical findings.

**Table 3B.7: Results of the parameter test scenarios**

| Metric | Unconstrained base | Test Scenario 1: Downtown constant | Test Scenario 2: Non-downtown constant | Test Scenario 3: Income adjustment |
|---|---|---|---|---|
| DT % low-income | 32.69% | 30.22% | 32.86% | 32.71% |
| DT % high-income | 4.93% | 6.56% | 4.69% | 4.89% |
| DT median income | $15,003 | $18,049 | $14,780 | $15,007 |
| DT average rent | $4,149 | $4,408 | $4,232 | $4,170 |
| ND % low-income | 14.29% | 13.45% | 14.29% | 14.39% |
| ND % high-income | 14.16% | 15.85% | 14.15% | 13.79% |
| ND median income | $41,704 | $44,844 | $42,217 | $41,986 |
| ND average rent | $5,237 | $5,502 | $5,239 | $5,329 |

The size of the effects from Table 3B.8 provides an estimate of the derivative (or marginal differences) of each metric with respect to each parameter. From these results, a set of optimal parameters were derived using a least-squares optimization. In this optimization process, the targets were given tolerances (desired closeness of match) based on the statistical significance of the correlation found between that outcome and the presence of TOD.

**Table 3B.8: Effect of parameter changes compared to the empirical targets**

| Metric | Unconstrained base | Test Scenario 1: Downtown constant | Test Scenario 2: Non-downtown constant | Test Scenario 3: Income adjustment |
|---|---|---|---|---|
| DT % low-income | -2.48% | +0.17% | +0.01% | -0.35% |
| DT % high-income | +1.63% | -0.24% | -0.03% | +0.12% |
| DT median income | +$3,046 | -$223 | +$3 | +$593 |
| DT average rent | +$259 | +$84 | +$21 | +$13 |
| ND % low-income | -0.84% | -0.01% | +0.09% | -0.05% |
| ND % high-income | +1.69% | -0.00% | -0.36% | +0.05% |
| ND median income | +$3,139 | +$513 | +$282 | +$206 |
| ND average rent | +$265 | +$2 | +$93 | +$1 |

The approach for the weights was to assume that the parameter effect was a Gaussian random variable with a mean equal to the target and a standard deviation equal to the tolerance. A tolerance was chosen so that the chance of this random variable reaching zero (and therefore the correlation does not actually exist) was equal to the stated $p$ value. For example, at the $p < 0.01$ statistical significance level of the empirical study, the tolerance was set to about 43% of the

absolute value of the target, since at that standard deviation, the probability of the target reaching zero was about 1%. The targets that showed no statistical significance were assumed to have a $p$ value of 0.3.

In addition, the tolerances on the rent targets were multiplied by 15, since the rents produced by the current SCAG PECAS model were not believed to be reliable. The resulting tolerances are shown in Table 3B.9.

**Table 3B.9: Change resulting from the optimal parameters**

| Metric | Empirical target | Tolerance | Actual change |
|---|---|---|---|
| DT % low-income | -0.35% | 0.15% | -0.27% |
| DT % high-income | +0.12% | 0.23% | +0.21% |
| DT median income | +$593 | $360 | +$338 |
| DT average rent | +$13 | $83 | +$2 |
| ND % low-income | -0.05% | 0.03% | -0.05% |
| ND % high-income | +0.05% | 0.04% | +0.06% |
| ND median income | +$206 | $125 | +$188 |
| ND average rent | +$1 | $39 | +$46 |

The actual changes in the metrics produced by these parameters are also shown in Table 3B.9. As expected, the changes of rent were not close to the targets, although they had the correct sign. However, the other metrics showed a good match to the targets. Therefore, the method outlined in this section is a viable way to reproduce the empirical effects of TOD on neighborhood change.

The optimal parameters derived from this approach were: $k_{DT} = -3{,}110$, $k_{ND} = 2{,}530$, and $s = 0.0176$. Households, in general, were willing to spend $2,530 per year to locate in a non-downtown TOD, $3,110 to *avoid* a downtown TOD, and 1.7% of their income to locate in any TOD.

The parameters in the PECAS AA model inputs are constants by zone type (TOD, Downtown TOD), which are then modified in an alternative scenario based on the optimal "meta parameters" discussed above. The changes in the PECAS model inputs are shown in Table 3B.10.

**Table 3B.10: Changes in Zone Constants**

| Household Category | DT TOD Mod | Other TOD Mod |
|---|---|---|
| **INC0010 2 or less** | -3,019.27 | 2,616.29 |
| **INC0010 3 or more** | -3,019.27 | 2,616.29 |
| **INC1025 2 or less** | -2,799.27 | 2,836.29 |
| **INC1025 3 or more** | -2,799.27 | 2,836.29 |
| **INC2550 2 or less** | -2,447.28 | 3,188.28 |
| **INC2550 3 or more** | -2,447.28 | 3,188.28 |
| **INC5075 2 or less** | -2,007.29 | 3,628.27 |
| **INC5075 3 or more** | -2,007.29 | 3,628.27 |
| **INC75100 2 or less** | -1,567.30 | 4,068.26 |
| **INC75100 3 or more** | -1,567.30 | 4,068.26 |
| **INC100150 2 or less** | -907.32 | 4,728.24 |
| **INC100150 3 or more** | -907.32 | 4,728.24 |
| **INC150m 2 or less** | -27.34 | 5,608.22 |
| **INC150m 3 or more** | -27.34 | 5,608.22 |

In this section, a set of parameters was estimated for the SCAG PECAS model to best reproduce the empirical findings on changes of households by income category, median household income and gross rent in downtown TOD and non-downtown TOD areas. For the zones identified as TOD zones, the zonal accessibility factors in the AA module were updated during its run with the parameters in Table 3B.10 for each household category. For downtown TOD zones, the annual changes of low and high-income households are -0.3% and +0.2%, respectively. For non-downtown TOD area, the annual changes of low and high-income households are -0.05% and +0.06% respectively, as Table 3B.9 shows.

This study did not attempt to incorporate the existing conditions, such as proportion of Asian or black, or proportion of renters. It could be possible to calculate the willingness-to-pay rent depending on the zonal conditions with racial/ethnic proportion in year 2000, just as demonstrated in this section. However, it would be more desirable to be able to update such conditions with endogenous variables and express displacement through the relationship between variables, rather than keep referring to a fixed set of input data. To make this possible, fine-scaled household/population segmentation is required.

In spite of the limitation of being incapable of dealing with existing conditions, the updated SCAG PECAS model with the optimized parameters still gives an opportunity to examine system-wide changes. Although the SCAG PECAS model is not able to pinpoint the origin of the 0.2% high-income households who relocate in the downtown TOD area, it shows changes of households by income/size categories and cascading effects from all of the zones in the region. The following section briefly summarizes the zonal differences created by inclusion of the TOD-related parameters. Appendix Q summarizes the region-wide impact of TOD by household types, industries, and housing types.

## Displacement Impact

This section analyzes the region-wide zonal changes of household location and rent estimated by the updated SCAG PECAS model with and without the TOD-related parameters. The model run with this optimized set of parameters is labeled “SD10.” The equilibrium state estimated by the SD10 scenario is compared to the unconstrained base scenario, called “SDBU.” The difference of the two states is caused by the parameters estimated from the empirical findings of Table 3B.4, which shows the displacement as the changes of household proportion by income group.

### *Location Changes*

The calibration of model behavioral constants described in the previous section was able to reproduce the change in income that occurred in the TOD zones. Average incomes in TODs went up compared to the model run SDBU, without TOD consideration, and the percentage of people in TODs who are low-income went down, as Table 3B.9 shows in the “Actual Change” column. However, Table 3B.4 also shows that the absolute number of low-income households in TODs generally went up, even though the percentage went down, with the exception of the low- to middle-income groups (0 to $75K). They are being reduced in the downtown TOD zone, as Figure 3B.4 shows. It is also shown that the reduction in the downtown TOD zone is severe (colored by dark red) for households with less than $10K income and of small size, and $10K-$25K income and of large size.

Note that SDBU, the "without" TOD version of the SCAG PECAS model, is also calibrated to the zonal household statistics by income and size categories. In the calibrated "with" TOD version (SD10 in the previous section), the estimated household location deviates from the target statistics. Two separate attempts were made to get the SCAG PECAS model to calibrate, one with targeting of a snapshot of household location in the region, and another one to match the marginal changes in the TOD zones. And the latter one contradicts the former effort. In the ideal situation, the introduction of the TOD-related parameters should maintain the previously calibrated household location, and still should be able to show the marginal changes over simulation time. Along with an "agile and incremental" approach, a comprehensive strategy should be devised to calibrate the model to reproduce not only a static snapshot, but also marginal changes.

***Spatial Changes in Rent***

The spatial changes in rent for the "L Luxury" category (ResType3) and "L Economy" (ResType4) are shown in Figures 3B.5 and 3B.6. There are increases in rent in most of the TOD zones, but decreases in rent in the non-TOD zones.

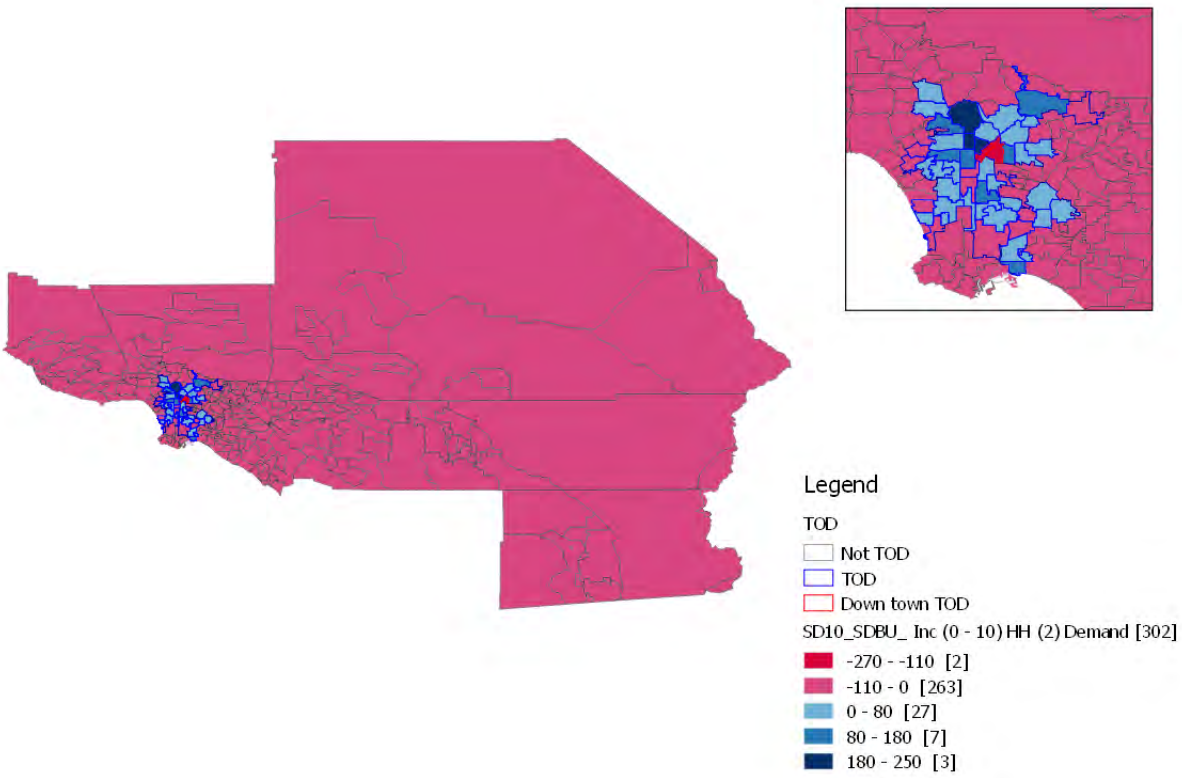



**Figure 3B.3: Change in number of households <10k, 2 or less person**

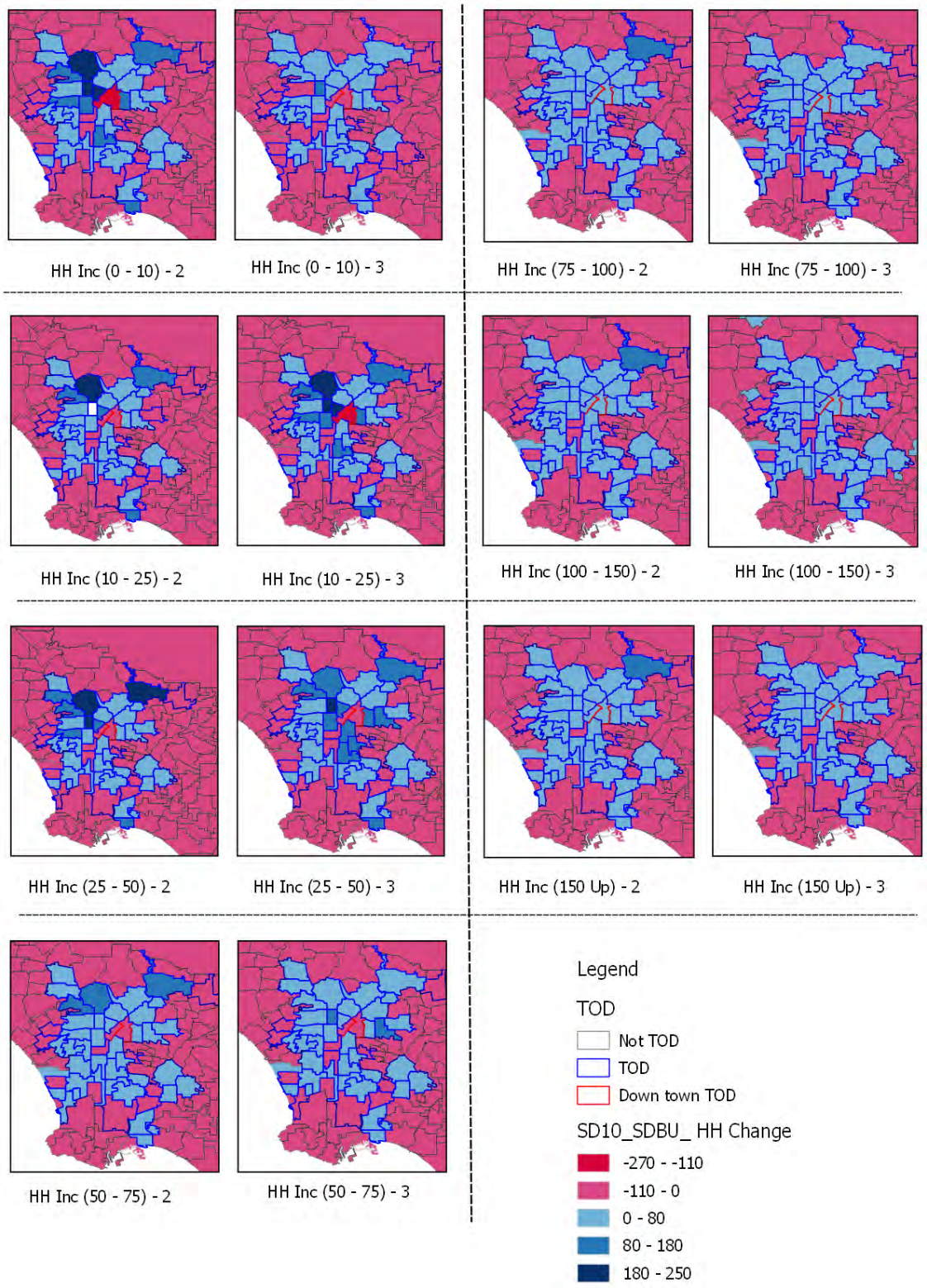



**Figure 3B.4: Change in Households by Category and Zone**

The shift in the demand for location towards TOD zones allows for an overall decrease in housing prices in the region with a corresponding benefit to residents and loss to landowners. However, the increase in some TOD zones is much larger than the decreases elsewhere, and hence much more likely to be measureable and noticed. When TODs are envisioned and developed, the region-wide impacts on rent must also be considered, since they mitigate the TOD-specific changes in rent, and may be larger in aggregate to the region but smaller in each location.

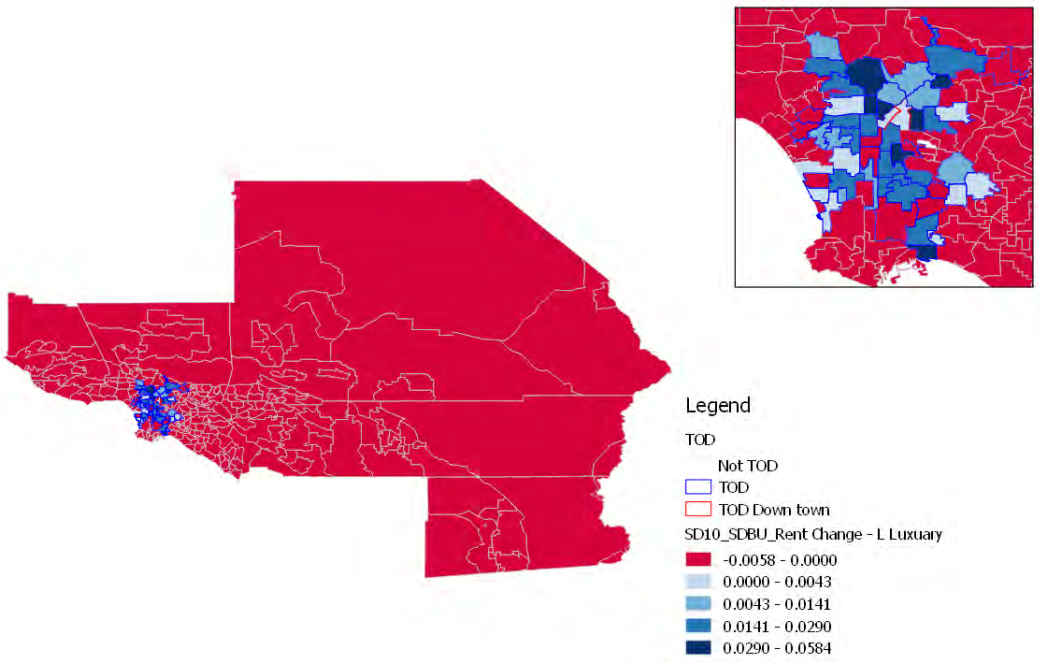



**Figure 3B.5: Relative change in rent in Luxury Single Family Dwelling space (ResType 3)**

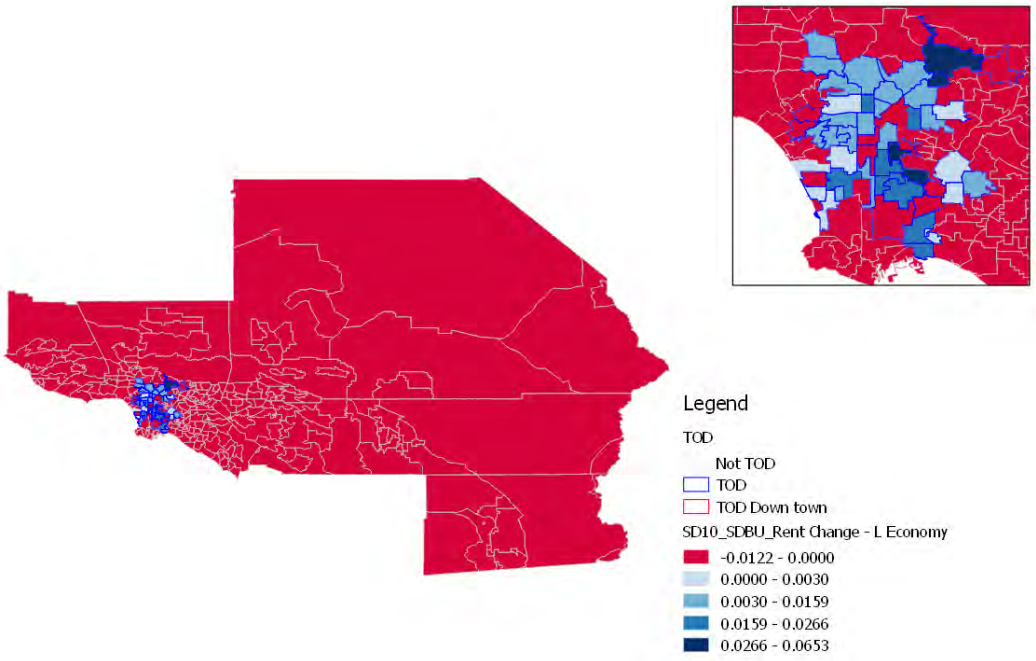



**Figure 3B.6: Relative change in rent in Economy Single Family Dwelling space (ResType 4)**

# 3B.5. Findings and Conclusions

## SCAG PECAS Update and Findings from TOD Scenario

This work explored possibilities for representing TOD and displacement in the SCAG PECAS model, and it proved challenging. The current model design could best represent the real estate development nature relating to TOD as developers demolish, convert, and build housing (or non-residential space) near major transit stations. PECAS, then, represents displacement as the difference of states estimated from with and without TOD-related parameters. Further empirical research on real estate development, especially with a behavioral framework analysis of developer profit motive, could lead to a very rich representation of displacement in the SCAG region in terms of physical changes anticipated in planned TOD areas.

The SCAG PECAS model was modified to best represent the empirical findings regarding displacement around TOD zones that occurred between 2000 and 2013. The attractiveness of the TOD zones was changed for households, with a search process determining the optimum set of parameter shift strategies to represent observed changes (divided by 13 to annualize) in TOD zones in the percentage of low-income households, percentage of high-income households, median household income, and gross (and then) average rent. This scenario was compared to the base scenario to determine the impacts on the spatial economy.

A shift in the desirability of TOD zones brings about changes in the distribution of households in the region. As Figures 3B.5 and 3B.6 show, rent outside of TOD zone decreases as the demand for housing in TOD zones is generally increased. The increase of rent in TOD zones and the decrease in non-TOD zones result in positive net change in rent; in other words, regional net rent increases. In the updated model, the TOD-related parameters work as an increasing factor of rent in the TOD. Within the closed economic system (aka, the input-output analysis framework) that characterizes the SCAG PECAS model, the rent increase in TOD zones is interpreted as a positive direct impact without any leakage to outside the region. Also, its multiplied impact (again, as of Input-Output framework) cascades to every household in the region. Analysis of aggregated economic impact has been traditionally used as one of the most important measures in evaluation of various facility or land use plans. The current SCAG PECAS model shows that TOD in Los Angeles County is economically desirable to every household in the region.

However, this may be an overly simplified assertion in the modeling of displacement. Even at the zonal aggregated level, households of certain types are moving out from the downtown TOD zone, and the resulting rent of certain type of residence decreases as modeled with fixed real estate inventory. Although the total of their surplus or composite utility might be increased, this is not the case for a small group of households, and the degree of negative impact to them might be very acute. Parting from its initial design specification, the SCAG PECAS model might need a radical update so that it can scrutinize the difference in susceptibility to policy at the micro level.

## Caveats and Cautions in Interpreting the TOD Scenario

The scenarios developed here do not include a representation of shifts in developer behavior. The magnitude of observed change in the empirical study was reproduced in the cross sectional portion of the SCAG PECAS model through attractiveness measures to draw households into TOD zones. Without the enabling effect of shifts in development, the attractiveness measures would be too

high. Thus, the total benefit measures calculated may be too high, and the absolute magnitude of those benefits may be overstated.

The proper consideration of transport costs requires a time-series scenario run with full integration with one of the SCAG travel models. This study approximated the improved desirability of TOD zones through a constant neighborhood effect, but the direct travel improvements from transit services would be better represented in changes in the "skims" calculated from the travel demand model. The suggestion in the scenarios that TOD development could lead to higher travel costs for obtaining household services is based on location (home and destination) changes only; a travel model is the appropriate tool for further investigating this concern.

## Consideration for Next Steps

The monitoring and future empirical analysis of TOD in the SCAG region should be expanded to incorporate the motivating factors of developers: notably the costs and profitability of different types of buildings on land with different conditions such as land classified by spatial regulations, fees, and physical geography effects influencing construction costs. Housing desirability, and hence developer profitability, of different building options vary with the exact location. The analysis should include a numerically specific representation of the impact on rent (or willingness pay for housing) of proximity to transit station entrances, transit infrastructure noise effects, and other statistically important effects such as proximity to freeways, parks, beaches, and major arterial roadways. The specific approaches described in (Wang et al. 2011), where California statewide data was used, should be expanded into a time-series analysis with a focus (or oversampling) on changes in the vicinity of transit stations.

The model scenarios developed here show that the undesirable displacement of low-income people from around TOD stations could be the result of changes that are beneficial at the aggregate level to other households. Wealthy people have more freedom and economic power, and so they can take advantage of changes in situations more easily. Their shifts in behavior, however, may open up other opportunities, which low-income people who are sensitive to price changes may be able to take advantage of. Displacement of people of certain ethnic groups could not be analyzed with the current SCAG PECAS model.

The empirical research and the model categorize households by their income. It was found that TODs tend to be associated with higher incomes in the future. This modeling result could happen due to higher-income households moving into TODs, lower income households moving out, or upward mobility. Future empirical research in the SCAG region should attempt to address these possibilities, through panel analysis of TOD residents, or through retrospective surveys of current residents. Time-series census tract data is not generally adequate to identify these possibilities (although the ACS geographic mobility question has proven somewhat useful).

The household-level categorization in the SCAG PECAS model should be refined to add representation of race and ethnicity. The empirical findings showed correlations between race and ethnicity variables over time, and causal hypotheses could be explored using a PECAS model that includes race/ethnicity and housing tenure. Even though current empirical study suggests adding these variables, a more vital improvement would be focusing on making the SCAG PECAS model more flexible. Its tight theoretical structure and use of input-output (and social accounting) matrix makes it hard to expand PECAS to include non-economic variables. Enhancing the flexibility of

PECAS requires fundamental change in the model structure, which would require considerable time and resources.

A few options for expanding the household classification could be explored, including options to incorporate the variables suggested by the empirical study, and options for restructuring the model. Table 3B.11 summarizes the pros and cons to be considered.

The first option is to expand the dimension of household classification in the SCAG PECAS model to three or more from the current 2 dimensions of [7 income group]-by- [2 size group]. In addition to 4 to 7 groups for race/ethnic variables, 2 housing tenure groups (owner/renter) can be considered. Although this is one explicit way to incorporate the empirical findings' variables, the model's flexibility is not improved. In the case when a new finding points to another important variable, the same discussion should be repeated. In the incorporation of the variables mentioned above, the model should be recalibrated for at least 112 (= 7 * 2 * 4 * 2) household types; the scope of that task would be virtually identical to a fresh development of PECAS for the region. Another aspect to be considered is that a change in household classification from the current version also means that the SCAG version would diverge from the statewide one, and there would be no more direct cooperative relationship in its development.

A microsimulation version of the PECAS AA module is the one of the options, respecting the same PECAS utility function, to enable specific coefficient modifiers in the PECAS utility functions for different races and ethnicities, without drastically expanding the number of categories represented in the model. However, adopting microsimulation without caution and respect for the type of analysis undertaken here, and the economic foundations of PECAS, could weaken the ability to show comprehensive distributions of benefit measures by type of household, interaction, location, housing type, etc. Since this option radically changes the model structure as well as the software implementation, existing microsimulation tools should be considered with an open mind. Even though the model structure would be different from the existing one, a new microsimulation model could use data similar to what is already collected for PECAS. Therefore, instead of developing new software with an updated model formulation of PECAS, a fresh start with an existing tool might a way to increase the chance of success.

Recalibration of the hedonic price model and complete development of the disaggregated version of the SCAG PECAS SD module is another option. Since the current SD module includes the zone ID as a dummy variable to capture unexplained price factors, it is also possible to include other neighborhood variables, such as ethnicity. This is not performed in this project, because the empirical finding does not include sufficient evidence to support recalibrating the hedonic model. However, this might be the most feasible among the options examined as additional parcel-level real estate data, including price, becomes available.

Another option in modeling ethnic change is to apply a household joint distribution of income, size, and ethnic composition to the current SCAG PECAS output of household by income and size. This approach assumes that the current ethnic composition is determined by income and size composition at the TAZ level and the relationship is fixed. However, that method just matches the empirical findings without making much economic sense. The ethnic proportion is just calculated without clear causality with TOD and displacement.

As the method demonstrated in the previous section of the recalibration of SCAG PECAS based on the empirical finding, the last option is to recalibrate the zonal utility constant with ethnic variables and the proportion of owners. It could be possible to match more coefficients provided from the

empirical findings shown in Table 3B.4. However, this option still does not improve the flexibility of the ultimate model.

**Table 3B.11: SCAG PECAS Enhancement Options**

| Option | Description | Pro | Con |
|---|---|---|---|
| Expand household classification for AA | Currently household is in [7 income group] X [2 size].<br>Expand to [7 income group] X [2 size] X [4 to 7 ethnic group]<br><br>Re-estimate model within general equilibrium framework.<br>- Consumption (commodity and housing by location) pattern for each household type<br>- Labor supply (occupation) pattern for each type of household. | Explicit modeling of the household by ethnic group | Divert from the State-wide PECAS model<br><br>Requires significant resources and time for data compilation and recalibration.<br><br>Model is still inflexible to add other important/significant variables that are found. |
| Microscopic version of AA | Current model structure is in matrix-represented aggregated form, and calculates the market clearing prices in a closed mathematic way.<br><br>Restructuring it into simulation based model with representation of individual households and business, model resulted from random drawings | Individual representation of economic entities allows flexible model expansion | Details are in discussion. Hard to make a decision to go with it without further estimation of development time and budget.<br><br>Need more concrete evidence of "success" to choose this option |
| Ethnic composition as neighborhood condition for SD (Hedonic price model) | Current model uses ZONE ID as dummy variable to compensate for all of the unexplained price factors.<br><br>Use the ethnic composition in the price model along with the ZONE ID dummy.<br><br>It was has to be done in separate study for the empirical study in this project does not provide the necessary parameters | Technically feasible to incorporate additional zonal level variables to price estimation. | Space development is partially calibrated for the SCAG land use.<br><br>It can be incorporated when the SD is fully calibrated with the proper value data. |
| Ethnic composition comparison before-and-after the calibration with TOD binary variables | Using joint distribution of household [income] X [size] X [ethnic composition], calculating the difference in the ethnic composition before and after the calibration (with TOD variables).<br><br>Further adjust the model to match the estimated parameter (changes of NHW at TOD area) | Technically feasible with relatively small budget and resources. | Ad-hoc application of TOD variables to estimate ethnic composition as DV, not IV. |
| Ethnic composition as neighborhood condition for AA | Adjust AA model further to incorporate ethnic variable as neighborhood condition, as the method described in this chapter.<br><br>Given estimated parameters, adjust the location choice constant to match the gross rent change by proportion of Asian, NHBLK and Hispanic | Technically feasible with relatively small budget and resources | Model is still inflexible to add other important/significant variables that are found.<br><br>Model will depend on 2000 ethnic composition. Then why not the time period out of recession? |

# Section 3C: Development of an Off-Model Displacement Assessment Methodology

In this section we identify neighborhood indicators that significantly predict types of neighborhood change associated with displacement in the models developed in Chapter 2 as related to transit investment. We construct neighborhood indicators from readily available, tract-level ACS data in order to facilitate assessment of displacement risk by city or regional agency staff in a simple spreadsheet analysis. For the Bay Area and Los Angeles cases, we will calibrate these indicators to the extent possible with the findings of the UrbanSim and PECAS models.

The following presents several different approaches to an off-model displacement assessment methodology, reflecting in part the differences between the model structure and results for the Bay Area and Los Angeles. The Los Angeles model builds on the logit regression of gentrification in Chapter 2, section 2E, adding variables to represent change in rent and density. The tool assesses risk by totaling the significant coefficients using data from each tract; to assess future risk, SCAG will need to provide additional inputs that project rent and density. For the Bay Area, we provide two models: one to assess gentrification risk based on risk factors from the built environment and the second to predict displacement specifically (since it is occurring in all types of neighborhoods, not just gentrifying neighborhoods). The tool identifies whether a tract is at risk for each factor, and totals the risk factors to determine the level of risk. All of the variables used can be predicted by UrbanSim in order to assess future risk. All of the models demonstrate a robust ability to predict gentrification and/or displacement, with results ranging from 50% to 86% accuracy.

## Defining a Predictive Model

A predictive model should have the ability to predict future outcomes, and a quantitative predictive model uses a set of observed or anticipated indicators (variables) that influence the projected results. For this task, the objective is to identify neighborhoods (defined as tracts) that will be at risk of gentrification and displacement in the future so that the relevant governments (e.g. counties and cities) and their agencies (e.g. MPOs, housing, transportation, and environmental departments) can take appropriate action to offset negative effects. A predictive model can be based on causal or descriptive models of past patterns and dynamics. A causal model uses causal independent variables or factors, while a descriptive model may also include independent variables that are not necessarily causal but nonetheless correlated with the variable (outcome) of interest. For predictive purposes, we do not necessarily require knowing causal relationships since correlated indicators may be sufficient to forecast the outcome. (An example is the canary in the coal mine, where the bird does not cause poisonous gases but merely serves as an early warning.)

### Specifications of the Off-Model Tool for Los Angeles

The key challenge of creating a predictive model is the availability of input data for the future time period of analysis. We explored whether SCAG's PECAS model can help fill in some of the required projected variables. We focused on three key variables from SCAG's previous efforts, which include: (1) household by income by size, (2) housing types, and (3) land prices. In terms of household by income by size, for Los Angeles, we find that SCAG's projected patterns are not consistent with recent trends. For example, SCAG projects growth of low-income households on the Westside of Los Angeles County, an area of moderate to higher income. We examined the changes in the spatial patterns of low-income households in the past decade using 2000 and 2013 data and find

inconsistencies with SCAG's trajectory of low-income households in the future. We believe that part of the discrepancy is the way SCAG models the spatial distribution of future changes in total housing units and households, and then translates into household by income by size. Unfortunately, we do not have enough information to understand their modeling approach.

The second variable that we examined is SCAG's housing type category. The challenge is that it does not correspond to available ACS information. Perhaps the biggest issue is the fact that the housing type variable does not differentiate between renters and homeowners. This is a severe limitation because displacement mainly affects renters, and renters comprise an overwhelming majority of households around transit stations. We recommend that SCAG should have projections by tenure. This includes building a bridge between housing type and tenure. A related issue is the lack of information on households by race and ethnicity, which is a key element in the debate regarding gentrification and displacement. Our analyses reported in Chapter 2 show that race and ethnicity have an independent effect and could not be captured by mere differences.

The third variable that we assessed is land prices. Land price is the value of the land per square foot. The idea behind looking at land value is that changes in land price, whether historical or projected, can help us understand changes in rent level, which is highly related to displacement and gentrification. SCAG has stated that it has done very preliminary work on land prices in the previous RTP. This work has only been done at the TAZ level, which makes it problematic if we are to focus on smaller-level geographies such as TOD neighborhoods. As part of our assessment of SCAG's land-price data, we did our own estimate of baseline land prices using the county assessor's parcel data. Here, we find discrepancy with the land price data that SCAG provided to us. Upon further investigation and inquiry with SCAG, SCAG responded that they did not estimate land prices but instead were estimating improvement prices (built structure price per square feet). In our opinion, improvement prices are not an adequate proxy for land prices, and thus have limited usefulness in projecting future rent changes.

We also examined what SCAG is planning to do with land prices in their current PECAS model. They stated that they will use different techniques (e.g. hedonic pricing) to estimate land prices and that they will use micro simulation of the market to project market-clearing land prices in the future. SCAG uses an equilibrium approach rather than a marginal change approach. An equilibrium approach maybe appropriate if the time period is very long, but for shorter time periods, a partial adjustment model is more appropriate. Because this effort is ongoing, SCAG has been reluctant to share any preliminary numbers with us, and we did not receive any of the information for our assessment. As such, we cannot assess its current work. We do believe, however, that if it is able to estimate land prices for the base year and adequately project land prices in the future, then there also needs to be a serious effort to determine how land prices are related to rent levels, and how changes to land prices are related to changes in rent levels.

A possible feasible alternative is an off-model module to identify potential areas at risk of gentrifying. The key missing values (e.g., projected changes in rent) can be filled in later when SCAG finalizes its PECAS land price model and estimates how changes in land prices affect rent levels.

### *Off-Model Module: Identifying Potential Areas at Risk of Gentrification*

As previously mentioned, a predictive model should have the ability to predict future outcomes, and a quantitative predictive model uses a set of observed or anticipated indicators that influence the projected results. Below is a basic predictive model that forecast for outcome "O" into the future (time = t +1) from today (time = t).

$$\mathbf{O(t+1)= a + b*X(t-1) +c*Y(t) + d*Z(t,t+1) + g*V(t+1) + error}$$

In this model, a, b, c, d, and g are vectors of parameters (usually based on some cause or descriptive model or models). X is a vector of past factors that have persistent influences on the future (For example, major features of the built environment inherited from the past, which are not likely to change over time). Y is a vector of current factors, Z is a vector of factors that will materialize between today and tomorrow, and V is a vector of factors that will be present in the future. The error term denotes the degree of uncertainty in the prediction. Z can only contain factors that themselves can be predicted over the projection period. This can include policy decisions or major actions within the control of an agency, such as major investments in new infrastructure. Z can also contain variables that have been predicted through other means. For example, some regional economic models use national economic projections as drivers (e.g., the projected growth in GDP). Similarly, V can only contain factors that are predicted at the end of the projection period.

We calibrated the model by examining observed recent trajectory. This is based on analyses reported in Tasks 2D, 2E and 2F. Below is a stylized example model, where t is the current period and t-1 is the previous (baseline) period. The model parallels the above predictive model:

$$\mathbf{O(t)= a + b*X(t-2) +c*Y(t-1) + d*Z(t-1,t) + g*V(t) + error}$$

For example, we estimated whether a neighborhood (tract) was defined as gentrified or gentrifying by 2009-13 (the most recent period with ACS data at the tract level). The baseline year is 2000. X(t-2) includes whether the tract was gentrifying in an earlier period and whether it had pre-existing transit stations (e.g., during the 1990s, prior to the 2000 baseline year). Y(t-1) includes variables for the demographic (race/ethnicity), socioeconomic (income), and housing (tenure) characteristics during the baseline year (2000). Z(t-1,t) also includes the opening of transit stations after 2000. It is important to note that we do not include variables denoting changes in the population between t-1 and t. We exclude them because they are potentially endogenous and because we cannot predict their values in the future. The model does not include V(t). Which factors are important is determined empirically (i.e., the variables that are statistically significant).

We use the empirical results to develop the off-model module, which predicts the risk of gentrifying. Gentrifying includes both direct displacement (socially and economically disadvantaged residents who are forced out) and exclusionary displacement (barriers that make it difficult for disadvantaged residents to move in). Our goal is to identify tracks at risk of being gentrified in the future (roughly 10 years from the base year since our analysis of past trends is roughly by decades). We aim to use only data that are readily available to the public and MPOs (ACS) and outputs from PECAS. In our analysis and spreadsheet, we do the following:

1. We determine which tracts are eligible for possible gentrification in 2000 (baseline), and which have gentrified/gentrifying (G/G) by 2013 (future).
2. We develop a list of variables (based on the data restrictions described above) that can be used to model the odds of gentrifying during the 2000-13 period. This is not a causal model,

but a descriptive one including changes (possibly endogenous) during the period. We also include TOD by type to capture its effects.

3. We estimate the influence/association of the right-hand side variables on the probability of gentrifying using a logit regression with available data. We use only eligible tracts. We only use statistically significant right-hand side variables, determined interactively by eliminating insignificant variables.
4. We then run some basic robustness and efficacy analysis on predicted odds of gentrifying, looking at consistency of actual versus predicted G/G. We have decided on three categories: (1) high predicted odds [predicted>.666]; (2) moderate predicted odds; and low predicted odds [predicted<.333]. We examine the absolute and relative numbers of false positives and false negatives.
5. We incorporate the logit regression model results into a spreadsheet that can be used to calculate the predicted odds and the three categories. We do not know if the estimated coefficients are applicable outside of Los Angeles. If not, then each region would need to run a logit model. The values in the spreadsheet can be replaced with new baseline and predicted data from SCAG when these become available.

***Limitations***

The accuracy of a predictive model varies with a number of factors. For example, the predictive power can be low if the model relies on a causal or descriptive model with little explanatory power (e.g., a multivariate linear model with a low adjusted R-square). The prediction may also be systematically biased if there are fundamental changes in circumstances not captured by the causal/descriptive/predictive models. The accuracy of a predictive model also diminishes when examining detailed outcomes or outcomes further into the future. Because of the inherent variance around a prediction, there will be false positives and false negatives, whose prevalence increases with decreases in predictive accuracy.

Very few models accurately capture the variance and precisely estimate outcomes that are consistent with the actual world. For example, many causal multivariate models have very low r-square which is roughly the percent of the variance explained by the model. Quite often we find r-squares between .10 and .30 which means we are only explaining 10 to 30% of the variance, leaving 70-90% of the variance unexplained. The same is true with a dichotomous model which predicts something happening or not happening. In other words, it can predict false positives and false negatives even if the model overall is statistically significant. For example, our model as a whole is significant but we still have a fair number of false positives and false negatives. Therefore, we should be very cautious on how to use these models. The model, nonetheless, is the best that can be done within the scope of the work that is being funded.

Table 3C.1 displays the crosstabs between the actual and predicted tracts that gentrified or are in the process of gentrifying. Overall, the model is able to predict roughly 93% (867 of the 932) of eligible tracts into their actual category (either did not gentrify or actually gentrified and were predicted as having moderate to high risk). Forty tracts fall into the "false negative" category, that is, these tracts actually gentrified but the model predicts them having a low risk of gentrifying. Fifteen tracts would be considered "false positives," tracts that did not actually gentrify but the model predicts that they did. In terms of predicting tracts that are at risk of gentrifying, the model has about a 50/50 percent chance of doing so.

**Table 3C.1: Actual versus Predicted Gentrification in Los Angeles Tracts**

| | Predicted | | | |
|---|---|---|---|---|
| **Actual, GG 2000-13** | Low (<.33) | Moderate (.33-.66) | High (.66+) | Total |
| No | 825 | 18 | 7 | 850 |
| Yes | 40 | 22 | 20 | 82 |
| | 865 | 40 | 27 | 932 |

***Organization of Off-Model Module Spreadsheet***

The off-model module includes four different spreadsheets where data can be inputted. The purpose of the first ("County Avg") and second ("Gentrification Calcs") spreadsheets is to identify tracts that are susceptible to gentrifying and tracts that actually gentrified between 2000 and 2013. For the first spreadsheet, county-level data are inputted and for the second spreadsheet, individual tract data are inputted. The following definitions from Task 2E are used to define eligible and gentrified/gentrifying tracts:

A tract was eligible if it met all of the following criteria:

1. The tract had a population of at least 500 residents in Year 1
2. Vulnerable (eligible) in year 1 (at least 3 out of 4 of the following indicators):
    - % low-income households (household income below 80% of the county median) is above the county median
    - % college-educated (bachelor's degree or higher) below county median
    - % renters above county median
    - % nonwhite above county median

A tract is said to be gentrified or gentrifying if it meets eligibility and all of the follow criteria:

1. Demographic change between years 1 and 2
    - Change in % college-educated > county (percentage points)
    - Change in % non-Hispanic white > county (percentage points)
    - Change in median household income > county (absolute value)
2. Change in median gross rent > change county median gross rent (absolute value)

The third ("Risk Factors") and fourth ("Predicted Value") spreadsheets are used to predict areas that are at risk of gentrifying. Only tracts that are eligible (determined from the two previous spreadsheets) are included in the calculations. The current spreadsheets use 2000 data as the starting point and the 2009-2013 ACS as the endpoint. Once the necessary data becomes available from SCAG, the values can be replaced with new baseline and projected data. The following variables are to be inputted into the "Risk Factors" spreadsheet:

- ***Median Household Income*** *(2013)*
- ***% non-Hispanic black*** *(2013)*
- ***% Hispanic or Latino*** *(2013)*
- ***% Asian*** *(2013)*
- ***% Renters*** *(2013)*
- ***Employment Density*** *(2013)*
- ***Downtown TOD*** *(Dummy variable)*
- ***Pre-2000 TODs*** *(Dummy Variable)*
- ***Post-2000 TODs Including any Future Transit Stations*** *(Dummy Variable)*

- ***Change in Median Gross Rent*** *(to be projected based on SCAG's predicted changes in land prices)*
- ***Change in Household Density*** *(to be projected based on SCAG's allocation of new housing units and households)*

Projected data are needed to calculate the change in gross rent and household density. Once all data are inputted, the last spreadsheet, "predicted value," calculates and categorizes eligible tracts into one of the three categories: (1) high predicted odds [predicted>.666]; (2) moderate predicted odds; and low predicted odds [predicted<.333].

### *Concluding Remarks*

Given the current state of SCAG's regional models (still in development), future work will be needed to develop, test, and refine an off-model predictive module that identifies neighborhoods at risk of gentrification and displacement in the near future. It is important to incorporate insights and understandings based on empirical evidence. This includes explicitly modeling the dynamics as they relate to economic class, tenure status, and race and ethnicity, both for recent developments and future projections. SCAG can benefit by seeking outside advice from those with expertise on these topics.

## Specifications of the Off-Model Tool for the Bay Area

The Bay Area Off-Model tool uses the variables that we found to be significant in predicting gentrification and displacement in the Bay Area. Instead of using the coefficients from the regressions of Section 2E, however, we construct risk indices similar to the gentrification index used in that section. Again, we focus on variables that the regional model (UrbanSim) can predict, and give an example of calculating risk for present-day (2013) data, although we believe such data can easily be replaced with future projections from the models. We develop two different models, one to assess gentrification and the second to assess displacement, specifically, the loss of low-income households. We separate the two, as our ongoing research has shown that low-income households can be displaced from many different types of neighborhoods, not just poor, gentrifying ones.

### *Gentrification and Displacement Risk*

Recall from Section 2E, the gentrification index was assessed using the following index, which was used in models to determine what kinds of neighborhood characteristics predicted gentrification.

1. Tracts with at least 500 people in year 1 and less than 25% of their population in college (college towns)
2. Vulnerable in year 1 (at least 3 out of 4 of the following indicators):
    - % low-income households > regional median
    - % college-educated < regional median
    - % renters > regional median
    - % nonwhite > regional median
3. Demographic change between years 1 and 2:
    - Growth in % college-educated > region
    - Growth in median household income > region
4. Investment between years 1 and 2:
    - % market-rate units built between year 1 and 2 > regional median

- Growth in either:
  - Single-family sales price per square foot> regional median
  - Multi-family sales price per square foot > regional median
  - Home value > regional median (where sales data is unavailable)

Using the results from the logit models in Section 2, we then assessed future risk of gentrification by first determining if a tract was eligible (criteria 1 and 2 above), and then assess risk based on the presence of the following risk factors:

1. Within a half-mile of a rail transit station
2. % of units in buildings built pre-1950 > regional median
3. Employment density (# jobs/square mile) > regional median

Eligible tracts that had only 1 out of the 3 risk factors above were given a risk level of low. Tracts with a composite score of 2 were assigned a risk level of moderate, and tracts with all 4 risk factors were assigned a high level of risk.

We then applied the same method to data from 2000 and the previous decade to compare predicted risk values to the actual gentrification index for the period of 2000-2013. These are summarized in Table 3C.2.

**Table 3C.2: Actual versus Predicted Gentrification in Bay Area Tracts**

| | Predicted | | | |
|---|---|---|---|---|
| **Actual, 2000-13** | Low | Moderate | High | Total |
| No | 109 | 353 | 50 | 512 |
| Yes | 12 | 57 | 16 | 85 |
| | 121 | 419 | 66 | 597 |

Thus, for the gentrification model, the Bay Area tool predicts moderate or high risk of gentrification for 73 of the 85 tracts that actually gentrified (86%). However, it also predicts a moderate or high risk for 383 of 512 tracts (75%) that did not actually gentrify.

A similar procedure was used to assess displacement risk, except most tracts were deemed eligible to experience displacement if they were home to more than 100 low-income households, had over 500 people living in them and less than 25% of the population in college. Based on the results from section 2E, we added prewar neighborhoods, TODs outside of the three largest cities and percentage of low-income households living in naturally occurring affordable units as risk factors for displacement. Tracts with a composite score of 2 or 3, were assigned a risk level of high, and tracts with a score of 1 were considered moderate.

As shown in Table 3C.3, the displacement prediction tool predicts moderate or high risk of displacement for 470 of the 537 tracts that experienced a loss of low-income households (88%).

**Table 3C.3: Actual versus Predicted Loss of Low-income Households in Bay Area Tracts**

| | Predicted | | | |
|---|---|---|---|---|
| **Actual, 2000-13** | Low | Moderate | High | Total |
| No | 240 | 472 | 297 | 1009 |
| Yes | 67 | 259 | 211 | 537 |
| | 307 | 731 | 508 | 1546 |

# Chapter 3 Conclusions

In this chapter, we explain our findings that the integrated transportation land use and transportation models used by the state's MPOs have varying ability to address displacement. Researchers successfully adapted UrbanSim to address how race, income, household size, rent, and rent burden shape household location decisions and thus displacement. These modifications will ultimately be integrated into MTC's Sustainable Communities Strategy. However, PECAS, the model used by SCAG, could not be adapted to analyze displacement.

We also present several different approaches to an off-model displacement assessment methodology, designed for use by practitioners. All of the models are able to predict gentrification with results ranging from 50% to 86% accuracy.

# Chapter 4: The Effects on Auto Use of Household Displacement from Rail Station Areas

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## Acronyms Used in This Chapter

- ACE (Altamont Corridor Express)
- ACS (American Community Survey)
- BART (Bay Area Rapid Transit)
- CHTS (California Household Travel Survey)
- CNT (Center for Neighborhood Technology)
- GHG (Greenhouse Gases)
- GPS (Geographic Positioning System)
- NHTS (National Household Travel Survey (NHTS)
- OLS (Ordinary Least Square)
- ORNL (Oak Ridge National Laboratory)
- TOD (Transit-Oriented Development)
- TSDC (Transportation Security Data Center)
- VMT (Vehicle-Miles Traveled)
- VTA (Santa Clara Valley Regional Transportation Authority)

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This chapter addresses the question of whether gentrification and displacement affect regional auto use, and greenhouse gas emissions. We use travel survey data for metropolitan areas within California, focusing on the 9-county Bay Area region[1] and the 5-county Los Angeles region[2], to analyze whether low-income households reduce their auto use more than high-income households when locating near transit, as measured by their vehicle miles traveled (VMT). We find that low-income households both near and farther away from rail stations have lower VMT than high-income households, but that higher income households either reduce their driving more in response to being near rail, or that there is no difference in VMT impacts across income categories. When gentrification is accompanied by densification, these results imply it will reduce regional VMT on net. However, when displacement is significant enough and population density declines, regional VMT is expected to increase.

# Chapter 4 Introduction

Transit-oriented development (TOD) policies are intended to reduce auto use by increasing dense, mixed-use development near high-frequency transit stations. But there is a growing concern that TOD policies or new transit investments may cause gentrification and displacement. In addition to disrupting the lives of displaced households, gentrification and displacement might also increase driving and associated problems such as greenhouse gas (GHG) emissions.

Depending on the neighborhood context and the details of implementation, TOD policies could certainly result in rent hikes and increases in home sales prices. This could cause poorer, transit-using households to seek lower-cost housing elsewhere while being replaced by wealthier households more likely to own cars and to drive. Under these circumstances, auto use in the rail station area would surely go up. But if such a displacement scenario were to occur, would regional auto use increase? And do actual patterns of population change in gentrifying neighborhoods near rail stations suggest that gentrification contributes to regional increases in auto use?

Previous research on this topic has neglected to explicitly take a regional perspective. It has focused instead on the fact that household VMT is likely to increase in station areas when gentrification occurs, without attempting to estimate travel patterns of displaced households, or what travel patterns would have been if planners and policy makers succeeded in forestalling gentrification.
In this study we analyzed how household auto use, as measured by VMT, is correlated with access to rail stations, household income, and the interaction of income and rail access, and we explicitly accounted for spatial population shifts using a simple method described below. We used multiple data sources and carried out a variety of regression models. We used data from the California subsample of the confidential version of the National Household Travel Survey of 2009, and from the California Household Travel Survey of 2010-12, merging these household-level travel data with spatial information on the location of rail stations across the state. We then used regression analysis to estimate how rail access reduces VMT differentially according to different levels of income when controlling for variations in household size and other factors. Finally, we used these estimates to simulate hypothetical displacement of poorer by richer households, as well as to model the VMT impacts of observed population changes in a set of four census tracts located near rail stations in

[1] We define the 9-county Bay Area region as Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties

[2] We define the 5-county Los Angeles region as Los Angeles, Orange, Riverside, San Bernadino, and Ventura counties.

California that experienced gentrification between 1990 and 2013, as defined elsewhere in this report.

Our estimates are based on calculating differences in VMT between households of different income levels located near and far from rail. Similar to all previous analysis on this topic, we relied on cross-sectional data. Longitudinal surveys, following the same households over time and repeatedly collecting data on VMT and spatial characteristics, as respondents move into or out of rail station areas, are unavailable and would require significant new resources for survey data collection. Without longitudinal data we must make reasonable assumptions in our scenarios, such as assuming that the average displaced low-income household moves to an average location in the region outside a rail station area.

We found little evidence that gentrification and displacement in rail station areas would cause auto use to increase, across multiple data sources and model specifications. This is for two reasons. First, rail access is associated with either a greater VMT difference for high-income than for low-income households, or no difference in VMT comparing high- and low-income households, in uncontrolled and controlled results. An average high-income household living within a rail station area has much lower VMT than an average high-income household living outside a rail station area. The difference in VMT for low-income households is substantially smaller when comparing those living within and outside rail station areas. This fact is largely robust to controlling for other factors including household size. However, we also find that in some controlled models, moderate-income households have a smaller VMT reduction associated with rail than do either low-income or high-income households. This latter finding, though not consistent across data sources, does complicate matters because it implies that the specific pattern of household turnover could influence whether gentrification increases auto use regionally, decreases it, or has no effect.

Second, in most census tracts located near rail stations that experienced gentrification (as defined elsewhere in this report), there was either no loss of low-income households or there was an increase in higher-income households exceeding that loss, so that the total number of households in most gentrifying station-area census tracts has increased. In fact, in many gentrifying tracts over the study period there was a quite significant increase in population density. Under our assumptions, this feature of gentrification means that more households were able to live near rail rather than far away, with concomitant VMT reduction benefits. Based on our analysis, the most plausible scenario in which gentrification and displacement in any particular neighborhood would cause VMT increases regionally would be one in which displaced low-income households were replaced by a smaller number of moderate- or higher-income households. A relatively small number of census tracts appears to fit this criterion. For example, based on our analysis of the census tract data described elsewhere in this report, between the years 2000 and 2013 there were 87 newly gentrifying tracts in the Bay Area. Of the 87, just two tracts had both a reduction in the number of low-income households and a net decline in the number of households as a whole.

Thus, in our simulated gentrification scenarios (described below), regional VMT declines or is not statistically significantly affected, except in a stylized scenario in which 1,000 low-income households are replaced by 500 high-income households; in this case, one estimate method suggests an increase in regional VMT. One can easily imagine additional but less common scenarios for which our analysis implies increases in regional VMT – mainly neighborhoods where gentrification is accompanied by significant displacement of poor households without a simultaneous increase in local population density.

Our results vary depending on the region and the data used, but they generally imply the following:

- If higher-income households (making more than $100,000 per year) displace moderate-income households (with income in the range of $25,000 to $75,000) on a one-to-one basis, regional VMT will decrease.

- Regional VMT will likely increase if gentrification results in a reduction of the population living near rail and if those rail station areas have good transit service, high density, and other well-known features of supportive TOD.

- Regional VMT may increase (the results are not consistent) if lower-income households are displaced by households of moderate income, and if population density remains the same or falls.

## Study Motivation

How would regional auto use and GHG emissions be affected if transit investments or TOD programs displaced core transit users with higher-income, car-owning residents? Regional reductions in auto use that are assumed to be achieved through the pursuit of smart growth, transit-focused development, and similar urban planning strategies are called into question if such displacement occurs. Urban planners would benefit from a better understanding of how transit investments, and policies to intensify development near rail, may affect the net auto use of households in a region if they also induce spatial population shifts.

Gentrification can cause substantial disruption and harm to lower-income households. It also has the potential to provide benefits to low-income households who are able to remain in gentrifying areas. This study does not address those issues. Rather, we explore whether, if gentrification or displacement does occur, this would result in a global (regional) increase in auto use, as measured by VMT.

If a TOD strategy leads to the displacement of lower-income households near transit stops, replacing those households with those of higher income, the effects on VMT are theoretically uncertain. They partly depend on the nature of residential choice by different household types, which in turn is likely to be influenced heavily by the particular policies adopted to encourage TOD, and they partly depend on whether and how housing supply is constrained, including by policies influencing housing production or renovation elsewhere in the region, as well as physical and environmental conditions affecting the cost of housing production (Chatman 2014, Cao and Chatman 2016). Households seeking new housing are strongly influenced by its spatial distribution and price.

On the one hand, there is reason to believe that displacement caused by TOD would increase auto use. Lower-income households are more likely than higher-income households to take advantage of transit services, and using transit services may decrease auto use. Under such assumptions, regional travel modeling for the San Francisco Bay Area resulted in projections of more net auto use when income increased near transit stops (Kanner and Niemeyer 2012). But the opposite is also possible: the auto use of lower-income households may not be highly dependent on proximity to rail or bus service. Public transit is by no means the only alternative to driving alone. There are alternative modes like walking and bicycling. Since more than three-quarters of auto mileage in U.S. urban areas is for non-work purposes, much daily travel can be thought of as discretionary. Lower-income

households are more likely than those of higher income to travel less, to rely on alternative modes more, and to own and use autos less, regardless of where they live (Chatman 2009). But whether people of different income groups respond differently to transit accessibility and the built environment is a question that has rarely been studied in the literature.

## Literature Review

If TOD leads to the displacement of low-income households, we may expect a change in travel behavior of households living near rail stations. The mobility of richer households is far more likely to depend on automobiles than that of poorer households. Minorities and low-income households also account for a large share of the nation's transit riders (Pucher and Renee 2003). Therefore, if TOD programs caused gentrification, transit ridership might be expected to fall due to the displacement of low-income households, and in turn, auto use might be expected to increase.

Previous research has argued that the travel patterns of households living in TODs are primarily affected by two factors: accessibility and income (Danyluk and Ley 2007, Lund et al. 2004). It has also been argued that increased transit accessibility (such as a new rail line) might not increase transit ridership very much if it is associated with an influx of high-income households into the newly transit-served area accompanied by a loss of lower-income households who were frequent transit users (Lund et al. 2004, Dominic 2012, Pollack et al. 2010). One Canadian study showed that although households living in gentrified districts often cycled to work, they used public transportation less and automobile commuting more than those in non-gentrified districts (Danyluk and Ley 2007). A study of 42 neighborhoods and 12 metropolitan areas in the U.S. in which one or more transit lines were developed between 1990 and 2000 showed that transit development was associated with increased rent burden and an influx of automobile-owning households (Pollack et al. 2010).

However, such studies have failed to consider regional VMT. Almost by definition, gentrifying rail station areas experience an increase of high-income households who are more likely to drive cars and use transit less. From a regional perspective, the outcome of such an influx, whether accompanied by displacement or not, is unclear. Understanding the regional VMT impact of gentrification and displacement requires explicitly accounting for any change in auto use by higher-income households moving into the station area, along with any change in auto use by displaced, lower-income households.

Understanding the regional VMT impact of displacement ideally also relies on a better understanding of travel behavior before and after a move for households of these types. Previous evidence on this question has not shown that transit mode choice increased significantly among TOD residents compared to their travel patterns in their previous neighborhoods. Respondents to one California survey reported small increases in transit trips that were not large enough to be statistically significant (Lund et al. 2004. Those who had changed both work location and residential location indicated a variety of mode changes; 11.5% switched from automobile to rail transit, but an almost equal number switched from transit to automobile. The researchers concluded that the pattern of mode change that occurs when a resident move to a TOD is complex, because TODs provide good accessibility of all kinds, not just rail transit. Another study found that the VMT produced by more affluent, newly moved-in households (defined as income 25% above regional median, and living in their current home for less than 10 years) decreased over time, and residents who had been in their current location for less than a year had the highest auto VMT

(Kushto and Shofer). This suggests that recent movers may be less indicative of equilibrium VMT patterns.

One fundamental question, implicit in understanding the net VMT and GHG effects of any displacement coincident with transit investments or development near transit, is how households of different income levels respond to transit availability or the built environment. The combined effect of built environment and income has rarely been studied. One study of residential location choice and activities found no significant difference in the effect of transit access on activity participation among those of differing income (Pinjari et al. 2009). A recent report by the Center for Neighborhood Technology (CNT) investigated whether transit and employment density had different effects on households of different income levels, using different methods and measures than those used here, and similarly found no statistically significant differences in transit responsiveness among low- and high-income households (Newmark and Haas 2015)[3]. The same report argued that large GHG reductions can be achieved by preserving low-income housing in TOD areas because low-income households emit less VMT when living in TOD areas than high-income households do. But by focusing only on households living in TODs, this conclusion neglects to consider the impacts of TOD on auto use regionally.

# Data and Methodology

We focused on household travel in the major California metropolitan areas—the San Francisco Bay Area, the Los Angeles region, Sacramento, and San Diego—and also estimated separate models for the Bay Area and the Los Angeles region. We relied on two sources of confidential, spatially precise microdata. The first was the National Household Travel Survey (NHTS) of 2009, with 16,575 households residing in California metropolitan areas. The second was the California Household Travel Survey (CHTS) of 2010-2012, with 25,246 metro area households.[4] The NHTS 2009 confidential data were obtained with approvals from the NHTS committee of the U.S. Federal Highway Administration. We accessed the CHTS data through a remote system maintained by the Transportation Secure Data Center (TSDC), with approval from the National Renewable Energy Laboratory.[5]

Our dependent variable in the analysis was average daily VMT. Due to differences in surveying methods between the two datasets, we used a different calculation to arrive at this figure for the CHTS and the NHTS. The CHTS dataset contains detailed travel behavior information using two data collection methods: self-reported trips and GPS tracking. For trip reports, respondents reported the locations they visited over a 24-hour period using an online travel diary, and the travel distance for

[3] The CNT report used data from the California Household Travel Survey and calculated average VMT estimates for five different income groups of households throughout California living within a quarter-mile of TOD areas (including rail, ferry and high-frequency buses), within a half-mile of these areas, and households beyond these thresholds (non-TOD households). The built environment factors used were whether the household was in a major metropolitan region, small city, or rural setting; residential and job density; and commute distance. Demographic control variables included the number of adult students, workers, preschoolers, school children, adults, and seniors, as well as whether any member of the household had a disability, and whether the travel diary day was a Saturday, Sunday, or holiday.

[4] We used NHTS 2001 as well but do not share the results in this paper since the sample size was too small.

[5] The application and approval process for access to confidential CHTS data took several weeks. Additionally, since confidential data cannot be moved or copied from TSDC's servers, we connected remotely in order to access and work with the data on their servers. In doing so we were limited to the software programs available to TSDC, which were QGIS and R statistical package.

each trip was calculated by the system as the shortest network distance between origin and destination for each trip. Since trips are represented at the person-level in the CHTS, we calculated a corrected estimate of VMT for each trip taken by the household by dividing the trip distance in miles by the number of occupants in the vehicle (including both household and non-household members). We then summed the VMT per trip over all trips taken on the travel day for each unique household.

The NHTS dataset includes an odometer reading for each household vehicle, as reported by survey respondents. For the 2009 version of the NHTS, only one odometer reading was collected. Annual mileage per household vehicle was estimated from the total odometer reading, as follows. Using the NHTS 2001 data, which showed a negative correlation between vehicle age and the annual odometer VMT calculation, the Oak Ridge National Laboratory (ORNL) developed regression models for three vehicle types (new vehicles, used vehicles, and used/new status unknown) to estimate the most recent year's VMT based on total VMT and vehicle age (ORNL 2001). We summed this estimate for all household vehicles, and then divided by 365 to get the average daily VMT per household.

The VMT calculation for each dataset has its advantages and drawbacks. Odometer estimates represent aggregated VMT for an entire year, which is less sensitive to noise from atypical travel behavior on the survey day. But odometer estimates neglect any auto trips taken without using household vehicles, such as borrowed vehicles or rental cars. The relatively accurate trip distance calculations in the CHTS dataset include all trips, such as auto trips taken without a household-owned vehicle. But for most respondents these distances are calculated under assumptions about least-path, rather than being directly measured. And the fact that they are measured only for a survey day means there will be much more statistical noise in the CHTS estimate.

The spatial specificity of the two datasets also varied somewhat. The confidential version of the NHTS provides the location of the census block group, allowing us to join the household spatial data, represented here at the block group centroid, to accurate spatial data on rail station locations that we created from a variety of sources (mainly from previous research projects of the first author). The confidential CHTS data included the latitude and longitude of each household, allowing us to calculate a more precise rail proximity measure than for the NHTS data. The CHTS dataset also provides information on each household's most recent move, and the zip code and city of the previous address, if the move was within five years of the survey date. As described below, we investigated these data but did not find statistically significant results due to small sample sizes of households living near rail.

Transit accessibility is represented in this study as being located within a half-mile of a rail station, which is highly predictive of rail ridership (Guerra et al. 2012). Transit access of all kinds, including bus service, tends to be highest near rail stations. Rail-station areas are also where most TOD programs are focused. In California, TOD is defined as being within a half-mile of transit stations with transit services having a headway of not more than 15 minutes (SB 375 2008). The rail stations included are those from the San Diego Trolley, North County Transit District, Metrolink (Orange County), LA Metro, Caltrain, Santa Clara Valley Transportation Authority (VTA), Altamont Corridor Express (ACE) Train, Bay Area Rapid Transit (BART), San Francisco Muni, and Sacramento light rail. This yields a total of 765 rail stations. Of the 16,575 households in the metropolitan areas in the California NHTS 2009 data, 847 are within a half-mile of a rail station. Of the 25,246 metropolitan households in the CHTS data, 2,263 households are within a half-mile of a rail station.
For each dataset, we estimated a Tobit model of average daily household VMT as a function of rail station access, income, the interaction between rail proximity and income, and control variables.

The Tobit model is a more appropriate model than ordinary least squares (OLS) because it accounts for the fact that, in the case of the CHTS, a substantial fraction of respondent households did not drive on the survey day (either because they did not have access to a vehicle, or for some other reason), or, in the case of the NHTS, did not own household vehicles and therefore did not report a yearly odometer reading. The Tobit model allows for the auto ownership effect of transit access to be incorporated into the model, providing an appropriate functional form for the left-truncated distribution of the dependent variable. (We also estimated OLS models and did not find large differences such as changes in sign.) We considered other functional forms including count models (Poisson, negative binomial) and zero-inflated count models, but the Tobit is more appropriate for a continuously distributed variable like VMT. The use of sample selection models is another option that we did not test, and in future research plan to do so. However, we strongly suspect that the results will be consistent with the Tobit model results.

# Results

## Descriptive analysis

Table 4.1 shows summaries of average daily household VMT by income categories and rail access using the NHTS and CHTS data. Figures 4.1 and 4.2 show a graphical representation of the data. In order to ensure comparability between the two datasets, which have somewhat different income category reporting, we used four categories of income for the descriptive analysis: less than $50,000 per year, between $50,000 and $75,000, between $75,000 and $100,000, and over $100,000 per year per household. Household income of $100,000 is not considered particularly high-income in most parts of metropolitan areas in California, but this is the highest income category in the NHTS data.

In both datasets, households of different income categories living near a rail station have lower VMT than those living farther away (although in the NHTS dataset, there is no statistically significant difference for the $50,000 to $75,000 range of household income). In the NHTS data, the percent and absolute VMT difference is higher for the $75,000-$100,000 and $100,000+ income groups than the less-than-$50,000 group. In the CHTS data, although the VMT difference is higher in percentage for the lowest-income group, the absolute value of the VMT difference is higher for households with income exceeding $75,000, while the middle-income groups have smaller differences in VMT.

We conducted the same descriptive analysis for the entire state of California, for the San Francisco Bay Area only, and for the Los Angeles region only (see appendix S, Tables S.1 to S.3 and Figures S.1 to S.6). The statewide California descriptive statistics are similar to those for metropolitan areas within California. Comparing average VMT by income category within the Bay Area and Los Angeles region reduces the sample size considerably, which in the NHTS data results in low sample sizes (less than 100 respondents) for households in middle-income categories living near station areas, and reduces statistical reliability (see Appendix, upper half of Tables S2 and S3).

**Table 4.1: Average Daily Household VMT by Income Category and Rail Access, metropolitan areas only, NHTS 2009, and CHTS 2010-2012**

| National Household Travel Survey (NHTS) 2009 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | In rail station area | | Outside rail station area | | VMT difference | | t-test |
| Income categories | VMT | N | VMT | N | Percent difference | Absolute difference | |
| <$50k | 31.08 | 444 | 37.84 | 6,220 | 17.86% | 6.76 | 2.8 |
| $50k-$75k | 49.03 | 140 | 55.87 | 2,571 | 12.24% | 6.84 | 2.02 |
| $75k - $100k | 49.69 | 104 | 71.24 | 2,207 | 30.25% | 21.55 | 5.44 |
| >$100k | 60.86 | 159 | 79.86 | 4,730 | 23.79% | 19 | 5.79 |
| Total | 41.86 | 847 | 57.89 | 15,728 | 27.69% | 16.03 | 9.71 |
| California Household Travel Survey (CHTS), 2010-2012 | | | | | | | |
| | Near Rail | | Away Rail | | VMT difference | | t-test |
| Income categories | VMT | N | VMT | N | % of VMT difference | Absolute VMT difference | |
| <$50k | 16.81 | 846 | 26.67 | 6,855 | 36.97% | 9.86 | 7.55 |
| $50k-$75k | 28.09 | 386 | 39.02 | 3,923 | 28.01% | 10.93 | 3.48 |
| $75k - $100k | 29.77 | 323 | 45.93 | 3,661 | 35.18% | 16.16 | 5.53 |
| >$100k | 35.17 | 708 | 55.64 | 8,544 | 36.79% | 20.47 | 11.34 |
| Total | 25.61 | 2,263 | 43.65 | 22,983 | 41.33% | 18.04 | 15.85 |

[1] *This difference is not statistically significant*

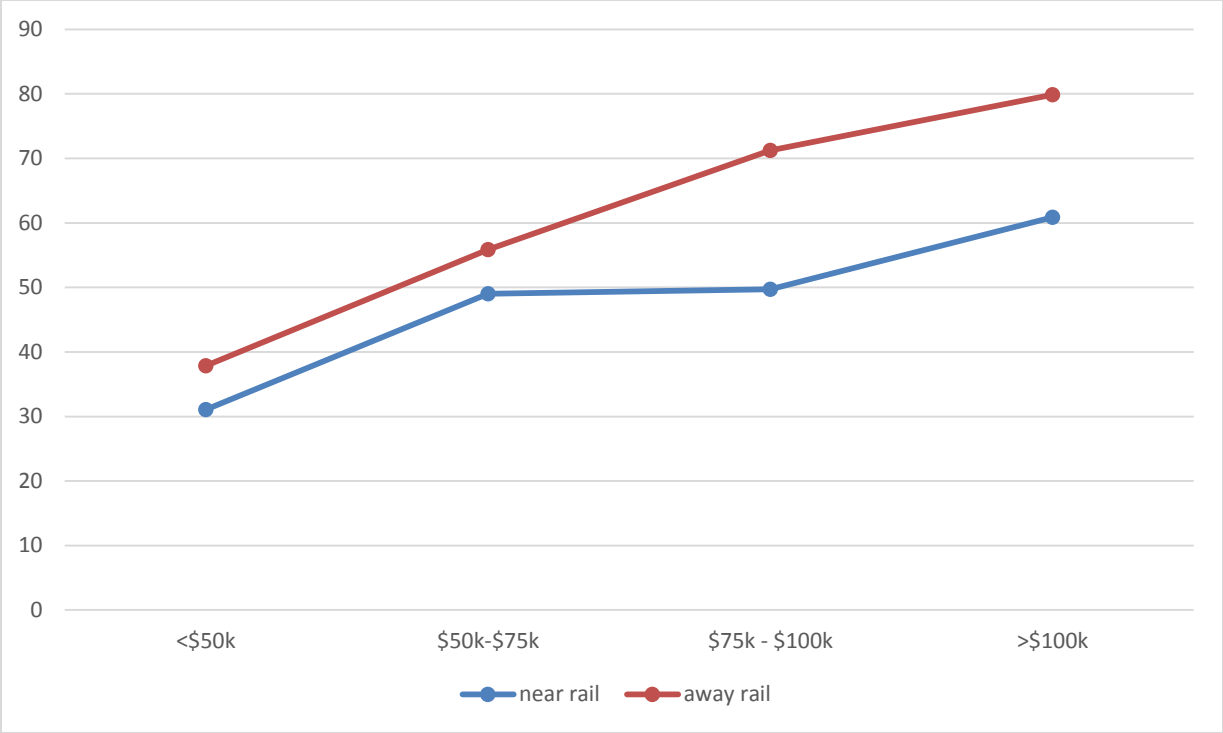



**Figure 4.1: Average daily household VMT by income category and rail access, NHTS data, all California metro areas**

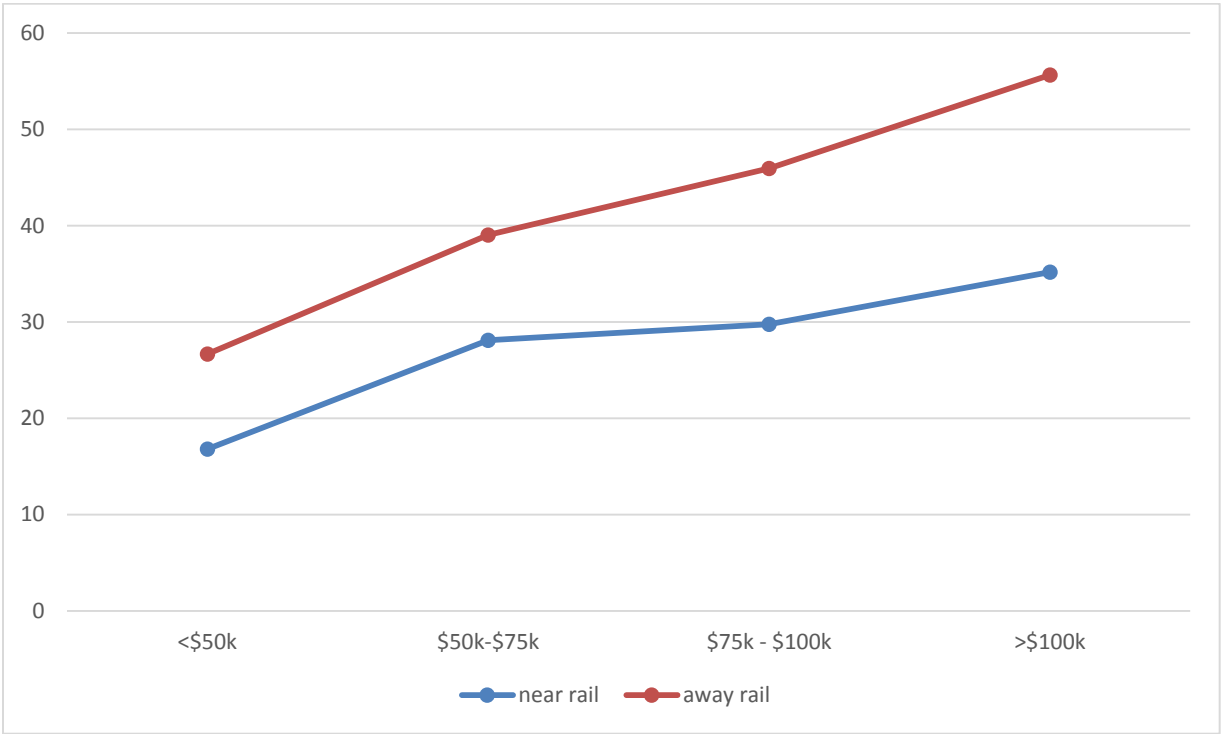



**Figure 4.2: Average daily household VMT by income and rail access, CHTS data, all California metro areas**

In the NHTS data for the San Francisco Bay Area, the decrease in VMT is larger for each successively higher income category, while in the CHTS data the VMT difference is smallest for the $50,000 to $75,000 income range (and not highly statistically significant), somewhat larger for households with less than $50,000 in income, and largest for the $75,000 to $100,000 and "$100,000 or more" income ranges. In NHTS data for the Los Angeles region, partly due to small sample sizes of households living near rail stations in the Los Angeles region sample, we found no statistically significant differences in VMT by rail access (see Appendix S; Table S.3). In the CHTS data for Los Angeles, we found that only among the lowest-income households was there a VMT difference associated with rail access. Differences in the other income categories were large but not statistically significant due to the small number of households in the sample who live near rail stations.

Thus in both the CHTS and the NHTS data, uncontrolled descriptive differences tend to suggest that displacement might not increase auto use, but might instead have no effect on regional VMT, or even decrease it. The statistically significant evidence suggests the absolute difference in VMT associated with rail access is either larger for higher-income households or there is no difference by income.
We also looked at data about recent movers in the CHTS, although unfortunately the number of respondents is small. Data about households moving near to and away from TOD areas would be a better way than cross-sectional data to determine how rail access influences VMT in a gentrification and displacement scenario, because moving households are likely different from those that stay in place, particularly if travel habits from the previous location influence their travel in their subsequent neighborhood. In the CHTS dataset, the respondent's previous zip code or city is provided when the respondent moved within five years of the survey date. We used data for the entire state of California (not just metro areas), which has 8,426 households that moved recently. Then we excluded households that only reported a city and no zip code, leaving 6,922 households. Of these, 5,878 households had moved within California and were retained for this analysis. We determined the transit accessibility of the respondent's previous address by checking whether the respondent's previous zip code had at least one rail station. We subdivided the movers into three income categories: $0 to $49,999, $50,000 to $99,999, and $100,000 or more, and then we categorized these recent movers into one of four mover profiles, based on whether the household moved as follows:

- From a zip code with no rail access to an address within a half-mile of a rail station ("away to near");
- From a zip code with no rail access to an address farther than a half-mile from a rail station ("away to away"),
- From a zip code with a rail station to an address within a half-mile of a rail station ("near to near"); or
- From a zip code with a rail station to an address farther than a half-mile from a rail station ("near to away").

Within each mover profile, higher-income respondents had higher VMT, as expected. Unlike the cross-sectional descriptive analysis just described, the difference in VMT associated with rail access was smaller for high-income than for low-income respondents among those who had moved into or out of zip codes with rail stations. But most differences were not statistically significant, since as few as 18 respondents are found in the subgroups (see Appendix, Table S.4). Thus while the mover data might appear to suggest that low-income households increase their VMT when moving out of a station area to a degree exceeding the reduction in VMT by high-income households moving into a station area, this pattern is not statistically reliable. Without a larger set of longitudinal data, we can only work in controlled analysis with the relatively robust set of cross-sectional data available to us,

which is the analysis we turn to next.

## Controlled analysis

While the cross-sectional data show that VMT differences associated with rail access in the major metropolitan areas in California tend to be larger for higher-income households, factors other than rail access may play a role. Household size, age, sex, race/ethnicity, and other observed factors also influence auto use, and those factors may be correlated with both rail access and income. For example, higher-income households who live near rail may also have smaller household sizes and may be less likely to have children in the household than lower-income households living near rail. Larger households with children tend to travel more.

Regression analysis that includes control variables is therefore helpful in establishing whether the differences we observe in VMT levels near and far from rail access are actually attributable to rail access. We conducted regression analyses controlling for household size, whether the household has one adult, whether the household has children, and if the home is rented. We also controlled for census tract population density and employment density. These variables have been found to be highly significant determinants for VMT in previous studies (e.g., Chatman 2003). We also carried out models with additional control variables (including the number of drivers, as well as an endogenous variable, the number of household vehicles); results were consistent with the more parsimonious models presented here, which are also more statistically reliable given small sample sizes in certain income categories near rail. We were not able to include additional variables such as parking availability or workplace characteristics in this analysis. Parking availability is likely quite important but not available in the NHTS or CHTS data. Workplace characteristics were not available in the data that we had confidential access to even though they exist in the confidential data held by data steward agencies that may be made available under confidentiality agreements to us or other researchers in the future.

A relatively large percentage of respondents did not report household income (7.1% in the NHTS and 8.6% in the CHTS). We tested three different approaches to address this problem: we excluded households that did not report their income; we included them in the analysis by adding a dummy missing income variable; and we estimated their income using an imputation technique applied with non-missing data on demographics, using the multiple imputation routine in R. The estimation results for the three different outputs were very similar, so we only present models using imputed income.

Table 4.2 shows a first set of estimation results for all California metropolitan areas, as well as the San Francisco Bay Area only, and the Los Angeles region only, using both NHTS and CHTS data. This set of models uses household income represented with two variables: as a continuous (numeric) variable, and as the square of that variable. Representing income as a continuous variable using NHTS or CHTS data requires re-coding categories of income as the midpoint value for the category (e.g., the "$0 to $10,000" income category is recoded as "5" to represent $5,000). For the top-coded income category we arbitrarily assigned a value of $110,000 for the NHTS "$100,000 or more" category, and a value of $250,000 for the CHTS "$200,000 or more" category, consistent with other studies. As noted previously, the other independent variables include rail proximity (a dummy variable representing whether there is a rail station within a half-mile of the residence), and the interactions between rail proximity and income. These interactions between rail proximity and income are of most interest because they help answer whether households in different income categories are more or less likely to reduce their driving in response to living near a rail station.

Significant coefficients on these variables imply that people of different income levels are more or less responsive to rail access in terms of their auto use, and therefore, that displacement would influence regional VMT in some way.

**Table 4.2: Household daily VMT regressed on rail proximity, numeric income, income squared, interaction of income and rail proximity, and demographic controls**

| | Metropolitan areas | | SF Bay Area | | LA Region | |
|---|---|---|---|---|---|---|
| Household VMT per day | NHTS (1) | CHTS (2) | NHTS (3) | CHTS (4) | NHTS (5) | CHTS (6) |
| (Constant) | -2.16 | -7.90** | -5.36 | -3.03 | -4.11 | -12.55** |
| Near rail | -11.89** | -7.91** | -5.14 | -15.43** | -25.28** | -4.66 |
| Income (1000s) | 0.69** | 0.47** | 0.66** | 0.38** | 0.76** | 0.53** |
| Income (1000s) + near rail | 0.38* | 0.03 | -0.03 | 0.09 | 0.86* | 0.08 |
| Income$^2$ (100 millions) | -0.23** | -0.12** | -0.26** | -0.10** | -0.25** | -0.15** |
| Income$^2$ (100 millions) + near rail | -0.34** | -0.03 | -0.02 | -0.05 | -0.70* | -0.03 |
| Census tract housing. density (1000 /sq mi) | -1.00** | -0.35 | -1.20** | -0.43 | -0.97** | 0.51 |
| Census tract pop. density (1000 /sq mi) | -0.22** | -0.68** | -0.04 | -0.72** | -0.27* | -0.93** |
| Household size | 12.62** | 9.23** | 13.39** | 9.91** | 12.49** | 9.79** |
| One-adult household | -10.63** | -9.03** | -9.25** | -10.01** | -9.93** | -6.89** |
| Household with children | 4.13** | -1.76 | 7.62** | -1.69 | 4.11** | -3.20* |
| Rental house | -9.13** | -5.48** | -9.37** | -6.06** | -9.14** | -5.05** |
| | | | | | | |
| N | 16,575 | 25,246 | 3,986 | 9,251 | 6,616 | 12,869 |
| Log (scale) | 3.8 | 4.16 | 3.76 | 4.12 | 3.86 | 4.18 |
| Log-likelihood | -8,835 | -11800 | -19,670 | -39160 | -32,940 | -55120 |

*Note: ***: 99% significant; **: 95% significant; *:90% significant*

The first relevant finding from the models shown in Table 4.2 is that rail proximity is not always associated with a reduction in daily VMT controlling for other factors. In the metropolitan area models (columns 1-2), the rail proximity indicators are statistically significant; being near a rail station is associated with 11.89 fewer VMT per day in the model using NHTS data, and 7.91 fewer VMT in the model using CHTS data. But there is inconsistency in the models restricted to respondent households living in the San Francisco Bay Area and Los Angeles region (Table 4.2, columns 3 to 6). Rail proximity is not significantly associated with VMT in the Bay Area-specific model when using NHTS data, but it is significant and large when using CHTS data, implying a reduction of 15.43 miles per day (Table 4.2, columns 3-4). Apparently this is not merely a function of the different dataset characteristics, because the finding reverses between data sources for household respondents in the Los Angeles region. Rail proximity is significant and large when using NHTS data (rail access is associated with a reduction of 25 VMT per day), but the relationship is statistically insignificant with CHTS data (Table 4.2, columns 5-6). Note that we control for both population and housing density in these models, and our other published research has argued that rail access by itself may be less important than such factors as those, which may be correlated with rail access (Chatman 2013). Thus this finding is not new or particularly surprising, but its inconsistency is somewhat remarkable.

Both numeric income and income squared are statistically significant in the expected direction in all models. That is, across income categories, while there is increasing VMT with income, the effect decreases at higher levels of income. But the focus of this analysis is on the interaction of rail access and income, which provides evidence to help answer the question of whether higher-income households are different from lower-income households in how they reduce their vehicle use when near a rail station. The models show significant relationships only with the NHTS data, and when looking at all metropolitan areas and at Los Angeles (Table 4.2, columns 1 and 5), but not in the San Francisco Bay Area. In other words, four of the six models (Table 4.2, columns 2-4 and 6) imply that rail access has the same effect on VMT regardless of income level, and therefore that a one-to-one displacement of poorer by richer households has no effect on regional VMT.

In the other two models (Table 4.2, columns 1 and 5), the results imply that higher-income households and lower-income households decrease their VMT in response to rail access more than middle-income households do. For all metropolitan areas, there is a positive statistically significant coefficient on the interaction of rail access and income of 0.38, and a negative coefficient on the interaction of rail access and income squared of -0.34. For Los Angeles, the coefficients are 0.86 and -0.7. These coefficients are somewhat difficult to interpret in numerical form so we have graphed them (Figure 4.3, below). Within rail proximity areas in both regions, higher income is associated with higher VMT, but the incremental effect of income decreases when income is higher. Controlling for other factors, in Los Angeles specifically and in the major metro areas in the state, the VMT reduction associated with rail access in the NHTS data declines steadily in the income range from $0 to $60,000 and increases again at higher levels of income until becoming largest at levels of household income exceeding $100,000 per year (Figure 4.3, below). In other words, in the models using NHTS data, the highest-income households have the largest VMT reduction associated with rail access; households with incomes less than $25,000 are not far behind; and households in the $50,000 to $75,000 range have the smallest VMT reduction (in fact, the NHTS model for Los Angeles implies that rail access leads to a small VMT increase for the middle range of income; however, as noted previously, the number of middle-income households living near rail in the Los Angeles subsample of the NHTS data is quite small so the results are somewhat suspect). It is important to reiterate here that the preponderance of evidence, from the larger and more recent CHTS dataset, implies there is no difference by household income in how much VMT declines in response to rail access. In fact, in two of the models, there is no evidence that rail is associated with VMT levels at all.

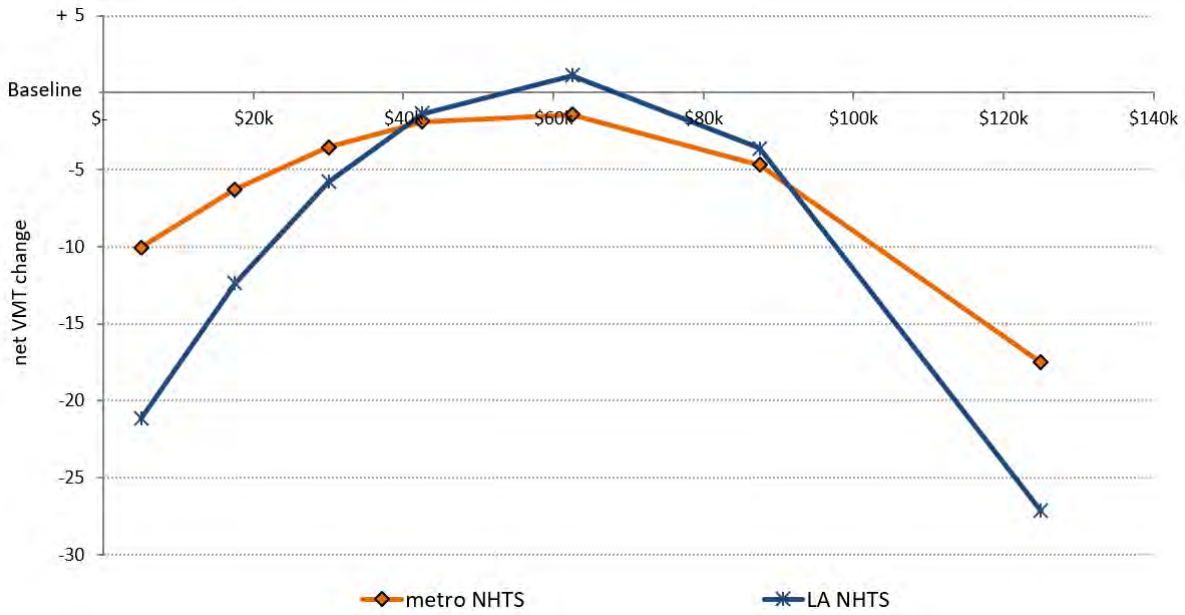



**Figure 4.3: Net Effect of Household Income on Household Daily VMT (NHTS, Based on Models in Table 4.2)**

A more flexible and potentially more accurate way to represent how VMT is affected by household income and rail access is to specify the income variables and their interactions with rail access as threshold variables for successively higher levels of income (Table 4.3, below), along with a linear coefficient for the effect of income represented numerically (with category midpoints). Using income thresholds is complicated by the relatively small sample sizes for income categories, particularly in the NHTS data as we elaborate upon below, but it is nevertheless instructive to compare this way of representing income effects, and we therefore do so.

In these models, each income threshold is represented by a dummy variable. For instance, the variable "Income > $10,000" equals 1 if household income is above $10,000, and zero otherwise. The remaining variables are specified the same way, so that the coefficient on each threshold variable measures the marginal difference in VMT associated with that additional household income increment. We removed those variables representing the interaction of rail proximity and income categories when they were not statistically significant, which accounts for the blanks in Table 4.3. Calculating the net effects for each income category requires summing the coefficient for "near rail," the product of the midpoint of the income category and the coefficient for "Income (1000s) + near rail," and, where present, the coefficient for the "Income > + [income threshold] + rail" variable. Since interpretation of Table 3 results is therefore complex, we also represent the results graphically (Figure 4, below). The figure uses dashed lines to represent NHTS model results (reflecting their lower sample size and therefore lower reliability), and uses solid lines to represent CHTS model results.

These models again find some evidence that rail proximity has different effects for households with different income levels, but again, not in the San Francisco Bay Area. In NHTS data for the major metros, the regression model finds a monotonic increase in VMT associated with rail access as household income increases (a reduction of 0.38 VMT per $1,000 in income), but with positive VMT increments associated with exceeding $10,000 in income and exceeding $35,000 in income (Table 3, column 1; Figure 4.4, dashed orange line). In this model, households with income between $35,000 and $50,000 increase their VMT when near a rail station. But with the CHTS data, though the shape

of the function is similar, there are no positive VMT effects of rail access. The CHTS model results imply that the reduction of rail access on VMT increases modestly with household income though there is a narrowing of the VMT reduction when income exceeds $25,000 (Table 3, column 2; Figure 4, solid orange line).

The San Francisco models with NHTS and CHTS data are completely consistent with the models shown in Table 4.2 in that there is no statistical significance of income interactions with rail (Table 4.3, columns 3 and 4; not represented in Figure 4.4). Thus we find no evidence in controlled models that the VMT impacts of TOD have different effects depending on household income in the San Francisco Bay Area.

Finally, we turn to the models for Los Angeles, where results vary based on the data being used. We begin with the model that uses NHTS data (Table 4.3, column 5; Figure 4.4, dashed blue line). At the lowest level of income, rail access is associated with a reduction of 19.77 VMT (see coefficient on "near rail"), but each additional $1,000 in income beyond that increases VMT by 0.42 miles (see coefficient on "Income (1000s) + near rail") until, when income exceeds $75,000, there is a reduction of an additional 19.67 VMT associated with rail access (see coefficient on "Income>$75,000 + near rail"). The additive effects of these coefficients means that between about $45,000 and about $70,000 in income, this model predicts an increase in VMT associated with rail access, and that the income category having with the biggest VMT reduction due to rail access is households earning between about $70,000 and $80,000. However, as noted previously, we view the NHTS results with some skepticism due to the very small number of households living near rail in each of the income categories, particularly since above $50,000 in income there are a total of only 51 such households.

The model using CHTS data for the Los Angeles region had reasonable numbers of households in the different income categories, with 276 households living near rail with household income exceeding $50,000 per year. This model shows no independent significance of rail access on VMT (the "Near rail" coefficient is small and statistically insignificant) and no significant continuous relationship between income and rail access (the coefficient on "Income (1000s) + near rail" is also small and statistically insignificant). But one variable, the interaction between having income exceeding $75,000 and living near rail, is large and statistically significant, implying that, controlling for other factors, households earning more than $75,000 per year, and living near rail, have fewer VMT per day than households in the same income category who live far from rail (Table 4.3, column 6; Figure 4.4, solid blue line).

Across the metro California and Los Angeles region models, the VMT reduction associated with rail access is greater for high-income households than for moderate-income households; moderate-income households have a smaller VMT reduction than the lowest-income households; and high-income households tend to have the same VMT reduction associated with rail access as the lowest income category for the CHTS data, while for the NHTS, which has lower reliability due to sample size issues, high-income households have a smaller VMT reduction associated with rail than lower-income households.

**Table 4.3: Household daily VMT regressed on rail proximity, numeric income, income thresholds, interaction of numeric income and income thresholds with rail proximity; and demographic controls (NHTS and CHTS data)**

| | Metropolitan areas | | SF Bay Area | | LA Region | |
|---|---|---|---|---|---|---|
| | **NHTS** | **CHTS** | **NHTS** | **CHTS** | **NHTS** | **CHTS** |
| (Constant) | -1.62 | -14.61** | -5.63 | -7.45 | -1.12 | -19.33** |
| Near Rail | -13.54** | -9.40** | -4.67 | -9.79** | -19.77** | -4.47 |
| Income (1000s) | 0.41** | 0.07** | 0.25 | 0.05** | 0.55** | 0.04* |
| Income (1000s) + near rail | -0.38** | -0.07** | -0.06 | -0.03 | 0.42** | 0.14 |
| Income > $10,000 | 2.95 | 9.41** | 7.64 | 0.58 | -0.86 | 13.15** |
| Income > $25,000 | 7.04** | 7.75** | 4.51 | 11.79** | 4.79 | 7.17** |
| Income > $35,000 | -3.11* | 7.65** | -0.41 | 10.25** | -4.34 | 7.12** |
| Income > $50,000 | -0.29 | 5.33** | 1.17 | 0.88 | -0.08 | 7.52** |
| Income > $75,000 | 0.99 | 2.38 | 6.35 | 2.94 | -2.12 | 2.69 |
| Income > $100,000 | -4.43** | 3.08* | -5.98 | 2.91 | -7.64** | 5.62** |
| income>10,000 + near rail | 16.71** | | | | | |
| income>25,000 + near rail | | 8.22* | | | | |
| income>35,000 + near rail | 16.65** | | | | | |
| income>50,000 + near rail | | | | | | |
| income>75,000 + near rail | | | | | -36.10** | -19.67** |
| income>100,000 + near rail | 13.75* | | | | | |
| Census tract housing. density (1000 /sq mi) | -1.00** | 9.20** | -1.18** | -0.45 | -0.99** | 0.35 |
| Census tract pop. density (1000 /sq mi) | -0.22** | -9.16** | -0.05 | -0.70** | -0.26** | -0.88** |
| Household size | 12.59** | -1.44 | 13.44** | 9.93** | 12.45** | 9.76** |
| One-adult household | -10.81** | -4.78** | -9.38** | -9.95** | -9.97** | -7.09** |
| Household with children | 4.20** | -0.45 | 7.95** | -1.42 | 4.11** | -2.82 |
| Rental house | -9.14** | -0.63** | -9.53** | -5.58** | -9.19** | -4.56** |
| | | | | | | |
| N | 16,575 | 25,246 | 3,986 | 9,251 | 6,616 | 12,869 |
| Log(scale) | 3.8 | 4.16 | 3.76 | 4.12 | 3.86 | 4.18 |
| Loglikelihood | -88350 | -118600 | -19640 | -43330 | -32920 | -60540 |

*Note: ***: 99% significant; **: 95% significant; *:90% significant*

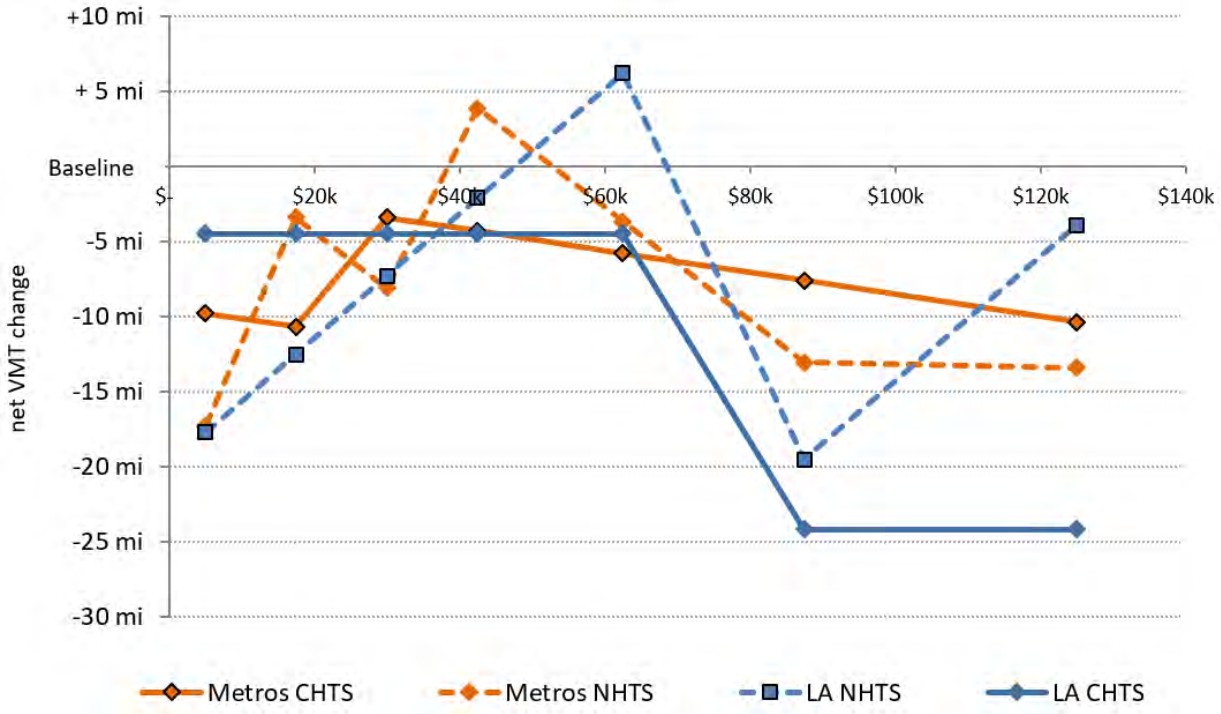



**Figure 4.4. Net effect of rail proximity on household daily VMT, by income category – threshold models**

***Hypothetical gentrification and displacement illustrations***

What seems likely to happen to regional VMT when a neighborhood gentrifies, given these findings? We begin our discussion of hypothetical gentrification and displacement scenarios with two simple illustrations and end with data on population change by income for four actual census tracts near rail stations in California that experienced an increase in the share of higher-income households.

For the sake of our first simple illustration, let us assume that there is an influx of 1,000 high-income households with an income level exceeding $100,000, who previously lived away from rail. Let us assume that they displace the same number of low-income households, with an income level below $50,000, from TODs to somewhere away from rail. What is the net impact on VMT of the richer households moving near rail, and the poorer households moving farther away? We used two different methods for the two data sets, thus calculating four results:

1. **Compare the near-station and outside-station average VMT figures from Table 4.1 for the lowest- and highest-income household categories.** This method does not control for other features of households that vary between households living inside and outside station areas. This uncontrolled method is arguably appropriate if self-selection is at work and if households require both motive and opportunity to reduce VMT, so that their self-selection, including their different demographic characteristics, is part of what enables a reduction in auto use (Chatman 2014).

2. **Use the Tobit estimation results shown in Table 4.2 (using the model for metropolitan areas) to predict net VMT change controlling for other factors.** We set the average income for low-income households at $25,000 (the midpoint of the lowest income group), and for high-

income households at $125,000. Note that the control variables do not need to be fixed at any particular value because the Tobit model is linear in parameters. In other words, there is no need to assume anything about household size or other characteristics of movers, given the model form.

With these assumptions and methods, we estimate the impact of displacement on regional VMT to range between zero effect (using a Tobit model on the CHTS data) and a reduction of 22% (using a Tobit model on the NHTS data) (see Appendix S, Table S.5). These results illustrate that a displacement of this type (of an equal number of higher income households moving in, and poorer households moving out) would not result in an increase in VMT regionally if the model results are generalizable.

However, note that a different kind of displacement in which a smaller number of high-income households displaced a larger number of low-income households, could in fact increase VMT on net simply by decreasing the total number of households with access to rail. This could happen if higher-income households took more space in new developments that consolidated or replaced denser housing near a rail station. Thus in a second stylized scenario, we assume that 1,000 low-income households are displaced by 500 high-income households (Appendix S, Table S.6). In this case the net regional VMT impact estimate ranges from a reduction of 7% to an increase of 23%. Clearly, the actual pattern of displacement will play a potentially large role in whether gentrification leads to a decrease or increase in regional VMT. In the next section we consider four additional scenarios of neighborhood change using census data to illustrate this point more explicitly.

***Gentrification/displacement scenarios based on census data***

We applied the same method to four census tracts near rail stations, three in the Bay Area and one in Los Angeles. Instead of using the continuous income models shown in Table 4.2, we used the threshold income models shown in Table 4.3, because these models had greater statistical significance for Los Angeles and because we wanted to apply region-specific estimates to carry out the scenarios. We identified the four census tracts using an online tool created as part of this research project (and described elsewhere in this report) which enabled us to find examples of census tracts with rail stations that experienced increases in the share of higher-income households between 1990 and 2013.

For the purpose of this next set of estimates we used numeric income midpoint values to generate average VMT. “Low-income households” are defined as those earning below 80% of the county median household income, according to 1990 Decennial census data and the 2009-2013 American Community Survey (ACS) (see Appendix S, Table S.7). We defined the income of this group of people as the midpoint between $0 and the dollar amount representing 80% of median household income (this midpoint was about $20,000 in both metro areas). We defined higher-income (or “non-low-income”) households as having income equal to 50% above the 2013 county median adjusted to 2010 dollars (which was about $80,000 in both metro areas). For the San Francisco Bay Area estimates, however, the household income assumption is irrelevant because in the Bay Area models we did not find any evidence of any difference in the VMT impact of rail access according to household income. But for Los Angeles the assumptions matter, since as we showed above, the VMT impacts of changes in population in the Los Angeles model results are partly dependent on the particular income levels of the population shifted in and out of rail station areas.

For our scenario analysis, we made the simplifying assumption that the added households in a tract moved from a location far from rail to a location close to rail, and that any reduction in the number

of households in the tract moved to a location far from rail. In other words, changes in the number of households by income category are considered moves into or out of a rail-proximate area, rather than as changes in income among resident households. We estimated regional changes in VMT between 1990 and 2013 assuming that 1990 travel patterns are consistent with findings from the contemporary CHTS and NHTS data. Because in actual fact vehicle use was substantially lower in 1990, our estimates could arguably be better understood as likely region-wide VMT impacts that would be caused by rapid gentrification in such a census tract in the region between, for example, 2008 and 2013.

Our first example is the census tract adjacent to the Hollywood/Western metro station, census tract 1905.10, in Los Angeles County (Table 4.4, part 1). The share of low-income households in the tract decreased between 1990 and 2013, from 78% to 69%, with an absolute reduction of 48 low-income households and an increase of 172 higher-income households. This neighborhood is a mixed-use area and had median household income below the county average in 2013, but a greater share of non-Hispanic whites and fewer households with children compared to county-wide shares. Table 5 shows the rough estimated change in aggregate VMT between 1990 and 2013 using the assumptions described above, and this change ranges from a VMT decrease of between 16% and 33%.

Our second example is census tract 5019 in San Jose, which has experienced increased densification around a transit station, for both low-income and higher-income households. San Jose has experienced an all-time high for housing costs while wages for low-income workers remain stagnant. New residents are more likely to be single or not have children, be highly educated, and earn higher salaries, but the tract has not experienced displacement, which is sometimes attributed to San Jose's anti-displacement policies and rent-stabilized units. From 1990 to 2013, this gentrifying tract gained 411 low-income households and 931 higher-income households. The VMT scenario estimates range from a reduction of 30%to a reduction of 36%, with one estimated reduction of 16.3% being statistically insignificant.

Our third example is a census tract (5003), also located in San Jose, which lost 190 low-income households and gained 447 higher-income households. Table 4.4 suggests that regional VMT would decrease about 19% to 25% overall after such displacement (with one estimated decrease of 10.32% being statistically insignificant). An increase in VMT due to lower-income households moving away from the rail station is more than made up for the decreases in VMT by higher-income households moving near rail. Note that in the case of San Jose specifically, given the low level of rail service available here, it is possible that VMT may not be much affected by rail access. But our sample sizes with these data do not allow us to estimate VMT impacts below the metropolitan area level.

Our final example is census tract 20,1 located in San Francisco's Mission District, a neighborhood that is often used as the face of gentrification. Despite the decreasing share of low-income groups between 1990 and 2013, over that period of time the tract gained low-income households, as well as higher-income households. Like the densification story of our second example (tract 5019), this example results in an estimated decrease in regional VMT ranging from 31% to 41% , with one reduction of 15.4% being statistically insignificant.

**Table 4.4: Example scenarios showing estimated change in VMT in selected gentrifying census tracts**

| **Census Tract 1905.10, Los Angeles County, California** | | | | |
|---|---|---|---|---|
| Change in Low-Income Households Near Transit (1990-2013) | | | -48 | |
| Change in Non-Low-Income Households Near Transit (1990-2013) | | | 172 | |
| | Uncontrolled Analysis | | Tobit Models[1] | |
| Aggregate VMT | NHTS | CHTS | NHTS | CHTS |
| 1990 | 14,136.80 | 8,824.36 | 12,097.56 | 6,454.07 |
| 2013 | 10,470.08 | 7,366.20 | 8,652.68 | 4,262.90 |
| % VMT changes | -25.94% | -16.52% | -28.48% | -33.95% |
| **Census Tract 5019, Santa Clara County, California** | | | | |
| Change in Low-Income Households Near Transit (1990-2013) | | | 411 | |
| Change in Non-Low-Income Households Near Transit (1990-2013) | | | 931 | |
| | Uncontrolled Analysis | | Tobit Models | |
| Aggregate VMT | NHTS | CHTS | NHTS | CHTS |
| 1990 | 81,712.99 | 62,762.21 | 82,369.33 | 47,167.75 |
| 2013 | 56,446.20 | 39,652.18 | 68,927.32 | 29,958.65 |
| % VMT changes | -30.92% | -36.82% | -16.32% | -36.48% |
| **Census Tract 5003, Santa Clara County, California** | | | | |
| Change in Low-Income Households Near Transit (1990-2013) | | | -190 | |
| Change in Non-Low-Income Households Near Transit (1990-2013) | | | 447 | |
| | Uncontrolled Analysis | | Tobit Models | |
| Aggregate VMT | NHTS | CHTS | NHTS | CHTS |
| 1990 | 36,816.18 | 28,064.98 | 37,974.69 | 20,438.55 |
| 2013 | 29,088.84 | 20,788.29 | 34,054.04 | 16,378.64 |
| % VMT changes | -20.99% | -25.93% | -10.32% | -19.86% |
| **Census Tract 201, San Francisco County, California** | | | | |
| Change in Low-Income Households Near Transit (1990-2013) | | | 600 | |
| Change in Non-Low-Income Households Near Transit (1990-2013) | | | 440 | |
| | Uncontrolled Analysis | | Tobit Models | |
| Aggregate VMT | NHTS | CHTS | NHTS | CHTS |
| 1990 | 52,799.60 | 40,483.60 | 54,341.95 | 29,769.24 |
| 2013 | 36,244.80 | 25,560.80 | 45,980.12 | 17,599.44 |
| % VMT changes | -31.35% | -36.86% | -15.39% | -40.88% |

*[1] VMT estimates come from income category regression coefficients by the household income values and rail proximity, holding other independent variables at mean values (see article text). Note that the difference in values drives the net effect of each scenario. Since the regression models are linear in parameters, this difference does not depend on values of the other independent variables in the model.*

These stylized displacement scenarios certainly fail to account for more complex real-world phenomena. For example, perhaps displaced households drive more after they move, at least for a while, in order to maintain social ties and participate in activities in their previous neighborhoods. And the dynamics of displacement go beyond income and include other factors that we cannot easily control for here. But we know of no strong reason to know whether such phenomena lead to either underestimation or overestimation of likely VMT impacts of gentrification and displacement. The direction of error is uncertain.

# Chapter 4 Discussion and Conclusions

The central question of this chapter was to determine whether the presence of rail reduced VMT more or less for lower-income households than for higher-income households, and to provide an informed discussion of how neighborhood gentrification and displacement might therefore influence regional VMT. The limited amount of previous research on this question had not found much evidence that households of different income levels were more or less responsive to transit access. Such evidence would provide a new reason to fear gentrification and displacement, because it would imply that the intended environmental benefits of TOD programs are precarious. But our results suggest this fear is largely unwarranted, though further research would be helpful.

We used two different data sources and looked at pooled data for the major metropolitan areas in California as well as looking at the 9-county San Francisco Bay Area and the 5-county Los Angeles metropolitan area separately. Almost all results suggest that rail access affects VMT about the same regardless of income, if it affects VMT at all. In about half of the models, using mainly the less-reliable of the two datasets, we find a differential effect of rail access by income. Regardless of dataset or region, the results suggest that one-to-one displacement of middle-income households (between $25,000 and $75,000 in income) by high-income households (those earning more than $100,000) will either reduce VMT or have no significant effect on VMT. We also found some evidence that very-low-income households (below $25,000 in income) reduce their VMT in response to rail access more than middle-income households do, but this evidence is from the NHTS dataset which has small numbers of middle-income households living near rail. Finally, it is important to note that some of our model results implied that rail access has no independent impact on VMT, and therefore that gentrification and displacement near rail stations will have no impact on GHG reduction.

We note that concerns about TOD-caused gentrification may be over a much more spatially-specific and policy-specific phenomenon than simply rail proximity, our focus here. But the policy landscape in California and elsewhere does privilege proximity to rail or other high-quality transit, making these results clearly policy-relevant. Any more-narrowly tailored research question is also of smaller potential magnitude and importance than the question we have focused on here, and more difficult to empirically investigate because of sample size problems with existing data.

The second focus of the paper was to construct plausible scenarios of VMT changes associated with neighborhood change and displacement in specific rail-proximate census tracts between 1990 and 2013. In all of these scenarios, we found reductions in regional VMT, for two reasons. First, as already noted, most of the data analysis suggests that higher-income households reduce their VMT more in response to rail proximity than do lower-income households. Second, census tracts near rail stations that underwent gentrification in California between 1990 and 2013 also typically increased in population. Any increase in the number of households having proximity to rail will tend to reduce regional VMT, in cases where rail access is substantial enough to reduce household reliance on auto use, or in TOD areas that have low parking levels, high density, and other characteristics that support good transit access. Thus, we do not find evidence that most kinds of gentrification and displacement around rail stations would increase VMT regionally, even if it does increase local VMT generation within rail station areas.

As noted, the analysis also provides some evidence that some kinds of neighborhood change could cause regional VMT to increase. For example, in Los Angeles, a pattern of one-to-one displacement of low-income households (those making less than $25,000 per year) by moderate-income

households (those making between $25,000 and $75,000 per year) could increase VMT. These statistical results, found in NHTS data only, are our most questionable due to a small sample size for moderate-income households living near rail stations. But the result is intuitively reasonable due to the built form and land use policies in the Los Angeles region. In particular, there has until recently been very little relaxation of parking standards in Los Angeles for either new development or redevelopment near rail stations, suggesting that proximity to rail may have little effect on auto use among households who can afford to own autos.

In some cases, anti-displacement policies may have helped rail station areas (particularly, areas with high transit accessibility and high driving costs) to retain lower-income households, or to densify rather than displacing households, without dampening housing production there. Our analysis suggests that such policies would have clear regional VMT benefits. However, given the likely household income profile in California urban areas, our analysis also suggests that a policy that reduced market-rate housing development in locations that encourage lower auto use, even if the policy reduced displacement and preserved affordable housing, would likely result in a net regional increase in VMT compared to a policy that increased the production of (dense) housing near transit.

Finally, the regional VMT impacts of population changes near rail stations critically depend on whether rail-proximate neighborhoods have low parking, high density, and other built environment factors that we were not able to control for in these data (Chatman 2013). Regardless of household income level, rail access is likely not the most critical factor in determining how much households reduce their auto use when they move into and out of rail station areas.

Future refinements to this analysis, which were not possible for us to complete given the scope and timeline of the larger research project for the California Air Resources Board, could include several tasks. First, it would be helpful to investigate a larger number of neighborhood-change scenarios to give a more context-specific sense of the conditions under which gentrification is likely to lead to regional increases in VMT, and even to estimate in what share of tracts statewide these results would predict VMT increases to occur. Second, our models allowed for an interaction of income and rail proximity but did not similarly investigate other interactions. Specifically, we did not investigate whether the effect of rail access varies according to household size, whether rail access effects are influenced by neighborhood population and employment density levels, or whether effects vary by rail service type. (We expect that some of these analyses would yield statistically insignificant results due to small subsample size.) Third, the use of “sample selection” models in addition to the Tobit and OLS estimates we carried out would provide an additional technical robustness check on the validity of these results. However, we expect such models to yield very similar results.

# Chapter 5: Anti-Displacement Policy Analysis

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## Acronyms Used in This Chapter

- ABAG (Association of Bay Area Governments)
- ACE (Altamont Commuter Express)
- ACS (American Community Survey, U.S. Census)
- ACTC (Alameda County Transportation Commission)
- AMI (Area Median Income)
- CASP (Cornfield Arroyo Seco Specific Plan)
- CBA (Community Benefit Agreement)
- CBO (Community-Based Organization)
- CCDC (Chinatown Community Development Corporation)
- CHPC (California Housing Partnership Corporation)
- CMA (Community Management Association)
- CPIO (Community Plan Implementation Overlay)
- EIR (Environmental Impact Review)
- HCD (California Department of Housing and Community Development)
- HUD (U.S. Department of Housing and Urban Development)
- LAANE (Los Angeles Alliance for a New Economy)
- MTC (Metropolitan Transportation Commission)
- OBAG (One Bay Area Grant)
- PDA (Priority Development Area)
- RHNA (Regional Housing Needs Assessment)
- SCS (Sustainable Communities Strategies)
- SDC (System Development Charges)
- SEACA (Southeast Asian Community Association)
- SNAP (Station Neighborhood Area Plan)
- SRO (Single-Room Occupancy)
- Thai CDC (Thai Community Development Corporation)
- TIF (Tax Increment Financing)
- TLC (Transit for Livable Cities)
- UNIDAD (United Neighbors in Defense Against Displacement)

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Many different anti-displacement and affordable housing policies exist at the city, regional, and state level. This chapter first summarizes the policies and programs available to combat displacement and then assesses which Bay Area and Los Angeles cities offer them. It then examines the potential of regional planning, specifically, station area planning and incentive programs related to the Sustainable Communities Strategies, to mitigate displacement. The chapter concludes that although some mechanisms exist to mitigate displacement, little is known about their effectiveness and in any case, implementation is weak.

# Chapter 5 Introduction and Methodology

Many different policies and programs can mitigate the displacement impacts of transit investment-induced gentrification. The following presents a discussion of different housing affordability and anti-displacement policies, as well as an inventory of the policies that exist in the 89 jurisdictions of Los Angeles County and the 109 jurisdictions of the 9 county Bay Area. The purpose of the inventory is to highlight and better understand the policies that can promote affordability or mitigate displacement of vulnerable populations in gentrifying neighborhoods. Where possible, we highlight policies that have been effective specifically in transit neighborhoods. We describe the most common housing affordability and anti-displacement policies and analyze, as well as compare, the policies of both regions.

In what follows, we first offer an overview of the multitude of anti-displacement policies encountered in cities across the country and a review of the literature on anti-displacement policies, as a way of introducing the policies and discussing how other scholars and practitioners write about them. Next, we provide an overview of anti-displacement policies in two metropolitan regions: the San Francisco Bay Area and Los Angeles. Given the potential for displacement around fixed-rail transit stations, we next include a section on anti-displacement policies specific to transit-oriented development (TOD), before turning our attention to specific policies that, while benefitting transit regions, are not explicitly targeted towards them.

We discuss four specific policies: inclusionary zoning and condominium conversion ordinances, because of their prevalence in Los Angeles and the Bay Area; rent control, because of its importance in the anti-displacement discourse, effectiveness, but lack of prevalence and state-imposed limitations; and mobile-home rent control ordinances, because of their prevalence in the Los Angeles region.

To understand how such strategies work at a finer grain, we provide six case studies of specific neighborhoods that, in most cases, have experienced gentrification pressures but less gentrification than expected (as determined by our analysis in Chapter 2)—three in each region. In the Bay Area, we discuss neighborhoods in Chinatown in San Francisco, East Palo Alto, and San Jose. In Los Angeles, we discuss Chinatown, Hollywood/Western, and 103rd St./Watts Towers. Our conclusions appear in the last section.

In terms of methods, this report relied on literature review and secondary data analysis, as well as primary data from surveys and stakeholder interviews. We reviewed both academic and practitioner literature on anti-displacement strategies. For secondary data, we used Decennial Census and American Community Survey (ACS) data from the U.S. Census as well as various other datasets. A survey on the effectiveness of anti-displacement strategies was sent to staff at all of the planning departments in the Bay Area as well as housing-related community-based organizations

(CBOs); we refer to responses from this survey as "stakeholder" comments. Finally, we conducted interviews with many stakeholders, including community advocates, staff of community organizations, and individuals involved with local, regional, and state policy.

# Anti-Displacement and Housing Affordability Policies: Literature Review

The emphasis of this literature review is on residential anti-displacement and housing affordability policies.[1] While the existing literature does not provide a systematic assessment of the effectiveness of anti-displacement policies, the metrics, conditions needed for success, and methods of evaluation used in the various studies are useful to our analysis.

## Research Methodologies

In general, the literature on anti-displacement policies can be classified into three categories of research methodologies: 1) policy toolkits; 2) case studies; and 3) analysis and evaluation of a specific policy.

The policy toolkit is a particularly popular format among practitioners, in which authors outline an array of policies that cities could implement, describing how they work and giving brief examples of their implementation in various neighborhoods or cities. (Allbee et al. with ChangeLabSolutions 2015; Great Communities Collaborative 2007; Policy Link 2008a). These inventories group certain policies together, often distinguishing between policies that preserve existing affordable housing (subsidized or market-rate affordable) and those that produce new affordable housing. Discussion around the different strategies considers how they are financed, what challenges they face, and where they are most appropriately applied.

A second category of research presents detailed case studies of cities or geographic contexts from which lessons can be drawn. Some focus on just one study area, providing a comprehensive list of anti-displacement policies that have been implemented there or highlighting one of its programs that was particularly successful. Another variation of the case study compares and contrasts policies in two or more places. Comparative studies may assess the performance of similar policies in two cities and pinpoint unique factors that affected their respective success rates. Other studies consider multiple neighborhoods experiencing gentrification pressures and draw conclusions about policy implementation more generally.

Finally, a third category of studies focuses on a specific policy. These studies tend to focus on places where the policy was implemented, and seek to provide a critical analysis of the effectiveness of the policy. This category is most useful in outlining the strengths and weaknesses of policies or sets of policies used in tandem.

[1] This literature review is focused on residential displacement; a separate suite of policies is available to address commercial displacement. While a wealth of studies have focused on residential gentrification and displacement, very few scholars have examined commercial gentrification. As a result, the literature on policies addressing commercial gentrification and displacement is largely nonexistent.

## Gaps in the Literature

Gaps in the literature include the relative absence of discussion of unsuccessful policies (negative case studies) or examples of policy limitations or misapplications. This is probably due to the fact that most of the anti-displacement literature is action-oriented, and often written by policy centers to help policy makers with future implementation. Therefore, studies are often written prospectively—they diagnose an ongoing problem and propose solutions moving forward (for example, Pollack et al. 2010), as opposed to retrospectively, giving a critical analysis of a problem, the solutions put forward, and their effectiveness at addressing the problem.

## Approaches to Evaluation

A number of quantitative metrics, or indicators, emerge from the literature that can be used to evaluate the effectiveness of certain policies. We discuss three here.

A common measure is the number of housing units preserved or developed, and is most useful for evaluating preservation and production strategies. Studies that present the numbers of units preserved or created as a proportion of the larger housing stock show the relative contribution of a specific policy given the scope of the problem. However, authors frequently present such data.

A second metric is the level of affordability of housing units. Different anti-displacement policies are targeted toward or end up benefitting households at different income levels; therefore, this metric estimates the number proportions or residents of different income levels benefitting from a specific policy. This is most useful for evaluating production strategies.

Other studies focus on qualitative approaches. Authors use qualitative sources, such as government records, focus groups, and interviews, to identify contributors and barriers to success and to detail recommendations for a particular study area. This is a good approach for improving a policy that has already been implemented, or has widespread support.

Lastly, several studies take a historical approach, tracing the impact of a certain set of policies, usually in a specific place (Calavita et al. 1997; Furman Center for Real Estate and Urban Policy 2006).These studies provide greater insight into the potential trajectory of certain policies over an extended period of time, distinguishing between short-term and long-term solutions.

## Discussion of Policies in the Literature

Anti-displacement policies found in the literature can be grouped roughly into four categories: those that produce new affordable housing, those that preserve existing affordable housing, those that protect tenants, and those that build the assets of low-income residents (Table 5.1).

**Table 5.1: Affordable Housing and Anti-Displacement Strategies**

| **Affordable Housing Production Strategies** |
|---|
| *Fiscal Strategies* |
| Affordable housing impact fees |
| Jobs-housing balance or commercial impact fees |
| Community benefits agreements |
| Housing production trust funds |
| *Taxing Powers* |
| Tax exemptions for non-profit affordable housing |
| Levying parcel taxes, tax-increment financing districts |
| Bonds |
| *Land Use Controls* |
| Expedited permitting processes for affordable housing |
| Reduced parking requirements for affordable housing |
| Inclusionary housing/zoning |
| Density bonus in exchange for building affordable units |
| Accessory dwelling units |
| *Assets and Investments* |
| Public land dedicated to affordable housing |
| Land banking |
| **Preservation Strategies** |
| Rent stabilization/control |
| Condominium conversion ordinances |
| No-net-loss, one-for-one replacement strategies |
| Single-room occupancy hotels rent and conversion controls |
| Mobile home rent controls |
| **Tenant protections and support** |
| Rental assistance |
| Tenant counseling |
| Proactive code enforcement |
| Just-Cause eviction policy |
| Tenant right to purchase laws |
| **Asset Building and Local Economic Development** |
| Minimum wage |
| Wage theft protections |
| Local or first source hiring ordinances |
| Individual development accounts |
| Homeowner assistance programs |
| Housing rehabilitation funds |

### *Affordable Housing Production Strategies*

Restricting the production of affordable housing are several factors. High land costs, exacerbated by competition among developers (market-rate and affordable), further drive up production costs. Infill development, while incentivized through state programs, is more expensive, and can be difficult in terms of navigating regulations. Further, according to a non-profit developer, staffing is "inelastic:" it's hard to compete with market-rate developers with more money.

Cities have a number of tools at their disposal to influence the quantity of affordable housing in their neighborhoods, including fiscal strategies to generate resources for development, land use

policies to incentivize or prioritize certain types of developments, and public investments that can be tied to affordability requirements.

Fiscal Strategies

Numerous jurisdictions have used development fees and transaction fees to generate funds from the private housing market as a means to creating affordable housing. Examples of these include affordable housing impact fees, jobs-housing balance or commercial impact fees, community benefits agreements, and housing trust funds.

One Oakland expert sees impact fees as a policy that is "starting to catch on" given legal limitations on inclusionary zoning; impact fees provide an alternative way to generate affordable housing at a cost to market-rate developers. While less common, commercial impact fees are also emerging. One development fee program that has enjoyed notable success is Boston's commercial linkage fee program (Kim 2011). This program raises about $5-$7 million a year for housing, funding the creation or preservation of more than 8,500 units of affordable housing in projects throughout Boston from 1983 to 2011 (Kim 2011). The strength of the program is attributed in part to its "breadth of coverage." Tied to all private commercial development, "everything from university projects to hospital expansions trigger the linkage ordinance," so the City of Boston has a steady revenue stream each year (Kim 2011 p. 42).

When impact fees are in place, jurisdictions can further facilitate production by granting developers an exemption from affordable housing projects. For example, the City of Portland requires that developers pay system development charges (SDCs) to help offset a project's impact on the city's parks and recreation facilities, storm water and sanitary sewer systems, water systems, and street infrastructure (Kim 2011). They offer exemptions to SDCs for affordable housing projects, and the cost savings can add up to hundreds of thousands of dollars. As of 2011, the exemption had "reduced development costs for more than 2,225 units of affordable housing" (Kim 2011 p.27).

Another key tool for affordable housing production are housing trust funds. These funds are created by local or state governments as a pool of fees and taxes derived from real estate development (or other sources) that can be drawn upon to provide gap financing for the preservation or new construction of affordable housing (Calavita and Grimes 1992). One of their useful features is that, once established with their criteria for distributing monies, new sources of revenue into the fund can be approved—and the resulting funds distributed—without a whole new advocacy push around what to spend the funds on.

The importance of a housing trust fund was underscored by an expert interviewed, who believes that, in terms of revenue-generating policies (like commercial impact fees), "it's very rare that any of those fees or policies by themselves can really stimulate production. What you need is a trust fund that has multiple sources that feed into it."

Taxing Powers

A city's taxing powers can also be used to create an affordable housing fund or incentivize development, such as providing property tax exemptions for non-profit owners of affordable housing, levying a parcel tax or floating bonds to generate funding for affordable housing, or

creating tax increment financing (TIF) districts[2] to generate revitalization funds by borrowing against future improvements in land value.

One study looks at New York City's "Ten Year Plan" launched in 1985, which called for the building and rehabilitation of 100,000 units of affordable housing by non-profit and private developers, funded through bonds, the city's capital budget, and other state and federal sources (Furman Center for Real Estate and Urban Policy 2006). It was largely successful: by 2003, the city "had created over 34,000 affordable units through new construction, had restored nearly 49,000 affordable units through the gut rehabilitation of formerly vacant buildings, and had provided renovation subsidies to another 125,000 units of distressed and occupied buildings" (Furman Center for Real Estate and Urban Policy 2006 p.6). The authors find several factors to have enabled the plan's success: "the income mix of households; the focus on preservation and neighborhood revitalization; the cooperation with local institutions; and the overall level of public commitment" (Furman Center for Real Estate and Urban Policy 2006 p.8).

The City of Portland has also made significant gains by implementing TIF districts, which allocate 30% of funds to the city's designated urban renewal areas for the development and rehabilitation of affordable housing (ChangeLabSolutions et al. 2015, Kim 2011). The TIF funds have income guidelines that prioritize the city's most economically vulnerable populations. In the 2012-2013 fiscal year alone, the Portland Housing Bureau was able to use $28 million of TIF funds in order to create or preserve 959 units throughout the city (ChangeLabSolutions et al. 2015).

Land Use Controls

Cities' land use control and zoning powers are often used to incentivize the production of affordable housing by reducing costs through expediting permitting processes, reducing parking ratios, and easing other requirements that increase development costs. Land use controls can also be used to create inclusionary housing requirements on market-rate developers, requiring that a certain fraction of the units they develop be affordable.

Our literature search using the key words "anti-displacement strategies" and other related terms turned up multiple studies on inclusionary housing—far more than for any other policy (Schuetz et al. with Furman Center for Real Estate and Urban Policy 2007; Hickey 2014; Non-Profit Housing Association of Northern California 2007; Hickey et al. 2014).This could indicate the effectiveness or ubiquity of inclusionary housing in light of the lack of other financing mechanisms for the production of affordable housing. However, it more likely indicates how intricately the policy is tied to anti-displacement work; municipalities tend to implement inclusionary housing in a real estate market experiencing significant growth and development, where households are at risk for displacement.

The Furman Center for Real Estate and Urban Policy (2007) has looked at inclusionary zoning policies across the United States and found that specific factors can predict the adoption of inclusionary zoning policies: "larger, more highly educated jurisdictions and those surrounded by neighbors with inclusionary zoning are more likely to adopt such policies." They find that the policies that produce the most units are those that have been in place the longest (Furman Center

[2] While the elimination of redevelopment agencies has made this strategy impossible to utilize in California, a recent law signed by Governor Brown enables localities to establish "community revitalization investment authorities" (Young 2015). These will allow tax increment financing districts, albeit in a more limited capacity than were allowed under the former redevelopment agencies.

for Real Estate and Urban Policy 2007, p.4). In some California cities, state legislation is the primary motivation for the adoption of inclusionary housing policies. For example, a survey by Calavita and Grimes (1998) found that eight jurisdictions in San Diego County implemented inclusionary housing programs to avoid actual or perceived threats of litigation due to noncompliance with the state's Housing Element Law.

Advocates of inclusionary housing often cite California as a success story because so many cities have adopted ordinances, but the data shows that the number of below-market units actually built resulting from the policy is modest in comparison to regional housing needs (Powell and Stringham 2006). For example, Powell and Stringham point out that the Association of Bay Area Governments estimated the need for 133,195 affordable units in the San Francisco Bay Area during the 2001-2006 period, but in the 30-plus years of inclusionary zoning leading up to 2006, the policy had resulted in the production of only 6,836 affordable units. Thus, much of the literature asserts that inclusionary housing should continue to be part of an overall affordable housing strategy but not necessarily the core of it (Calavita et al. 1997, Powell and Stringham 2006).

As opposed to requiring affordable units (either directly or through in-lieu fees), some cities choose to incentivize them through density bonuses. California's Density Bonus Law requires that municipalities allow developers to build at higher density in exchange for affordable units (APA 2006). Density bonuses act as a cost off-set and can increase the number of inclusionary units in new developments, specifically in cities where there is significant market interest in developing taller buildings (ChangeLabSolutions et al. 2015). For example, New York City rezoned a number of locations to allow for higher density and provided a strong density bonus for developers that agreed to meet specified affordability targets. The program generated about 2,700 permanently affordable rental units between 2005 and 2013 (ChangeLabSolutions et al. 2015).

However, without the proper market, incentives alone may not be enough to produce affordable units (Schwartz et al. 2012). For example, the City of Cambridge, Massachusetts, had a voluntary inclusionary zoning program that offered density bonuses, and over the course of a decade, the program failed to produce a single unit. In 1998, the program was made mandatory, and as a result, it produced 385 affordable rental and for-sale homes by 2010 (Schwartz et al. 2012).

For built-out areas that may lack sufficient developable land for new units, jurisdictions may consider allowing homeowners to create accessory dwelling units on their property, as enabled by the state Second Unit Law (AB 1866). Chapple et al. (2012) discuss how the creation of secondary units (known as "in-law" or "granny" units) helps increase the stock of very-low- and low-income housing units without dramatic increases in parking demand and with no government investment required. This in turn, "could help to free up such scarce (and dwindling) monies for the subsidization of the lowest-income affordable developments" (p. 12). Through a qualitative review of planning and zoning restrictions, they found that the regulatory environment, with its onerous parking requirements, is the most significant barrier to secondary unit development.

Assets and Investments

Finally, cities can use their assets and investments to generate new affordable housing. Affordable housing advocates are beginning to push jurisdictions to dedicate land they own for affordable housing (Hickey and Sturtevant 2015a; Lane and Seifel 2015). Cities can also invest in land that they later open up for affordable housing development, a process known as land banking. In addition to owning a lot of land, cities continually invest in infrastructure and operate other programs that can be leveraged to create affordable housing.

For example, Hickey and Sturtevant (2015b) discuss policies to use public lands for the development of affordable housing in the Washington, D.C., region. They find that the "strongest" policies have much community engagement and are conscious of the limits of the policy, namely that other subsidies will be necessary for affordable housing to be built beyond just providing the land. They offer recommendations of how to maximize policies' effectiveness, admonishing policymakers to understand the "relationship between land values and the affordability gap" so that they are aware exactly what kind of difference the land donation would make for developers of affordable housing (Hickey and Sturtevant 2015b, p.1).

In another study prepared for HUD, Sage Computing (2009) discusses the successful use of land banks to simultaneously revitalize abandoned properties and provide affordable housing. The study describes the work of the Fulton County/City of Atlanta Land Banking Authority, which prioritizes the transfer of land for affordable housing development, enabling community development corporations and other affordable housing developers to acquire tax-delinquent properties with insurable title at below-market prices for affordable development. The authority facilitates the transfer of 50-100 properties per year, and as of 2009, affordable housing groups had identified over 140 parcels to bank for future development. The land bank is also part of the Atlanta TOD Collaborative, a 13-member partnership of local non-profits, developers, banks and government agencies aimed at promoting equitable TOD in the Atlanta region ("Atlanta TOD Collaborative," n.d.). The group was established in 2011 to leverage their joint resources to create affordable homes for low-income residents near transit, and it has conducted strategic planning, market, and feasibility studies since then to guide their future development efforts ("Atlanta TOD Collaborative," n.d.).

One expert interviewed saw a connection between community land trusts and the "tiny home" movement: holding land in a community trust and allowing the construction of cottages on that land could provide an "eco village" of affordable homes.

Recognizing that the boom period will likely be followed by a downturn, several stakeholders have said that cities should be ready to strike quickly when that downturn comes, buying up land for later development, or getting anti-displacement policies in place when the political temperature isn't so high.

### *Preservation Strategies*

In many built-out neighborhoods experiencing gentrification pressures, there may be little room for new developments. Therefore, strategies for preserving both deed-restricted affordable units and naturally occurring affordable rental units are needed to counteract displacement forces in these communities. Rent stabilization is perhaps the most well-known strategy used to control the price of non-subsidized rental units, often tying it to inflation rates. Other strategies used in high-demand markets are controls for condominium conversions, adopting no-net-loss or one-for-one replacement policies to ensure that the quantity of affordable units are maintained, and laws that aim to preserve single-room occupancy hotels and mobile homes.

Of the policies discussed in this report, rent control has yielded the most literature with critical analysis. Writing primarily from an economics framework, numerous scholars have undertaken analyses of rent control, generally concluding that it reduces the quality and quantity of rental housing (Keating et al. 1998). They argue that when landlords cannot earn a competitive return on

rents, they under-maintain their units and look for more profitable uses, exacerbating the rental housing shortage (Keating et al. 1998). The less rental housing and the greater the rent gap between regulated and unregulated units, the less mobility renters have (Freeman and Braconi 2004; Munch and Svarer 2002; Keating et al. 1998; Gyourko and Linneman 1989).

However, other scholars point out that the benefits of rent control may outweigh the cost of market distortions in the context of gentrification and displacement. Freeman and Braconi (2004) posit that the limited mobility caused by rent control may be a logical trade-off in gentrifying areas because it allows vulnerable residents to stay in their neighborhoods by moderating their rent burdens. For example, rents for unregulated units in gentrifying neighborhoods of New York between 1996 and 1999 increased by an average of 43.2%, while rents for regulated units increased by only 11.4% (Freeman and Braconi 2004). Ellen and O'Flaherty (2013) also suggest that rent control can contribute to population stability and security of tenure in the face of displacement pressures. For example, 35.2% of renting households in New York stayed in the same unit from 1990 to 2000, while nationally, 13.6% stayed in the same unit (Ellen and O'Flaherty 2013). Minton (1996) prospectively evaluates the potential of targeted rent control to limit displacement in soon-to-gentrify neighborhoods, finding that rent control, in the short run, would have winners and losers: helping low-income renters to afford to stay in their neighborhood while distorting the housing market, which in turn creates an incentive for landlords to use unsavory methods to remove tenants and win a higher return. He also considers the long-term effects, which range from halting gentrification entirely to full gentrification, when the policy fails to preserve a low-income community in a neighborhood.

Barton's (1998) historical account of strong rent control in Berkeley concludes that its undoing was less economic than political. The policy was established at a time of rapid rent increases in the Bay Area, and while Berkeley also suffered a decline in low-rent units, its decline was half the rate of the Bay Area as a whole and half the rate of Alameda County (Barton 1998). The initial strong policy successfully increased community stability and tenure for low-income households. However, Barton also takes note of its limitations: 70% of the lowest-income residents still shouldered rent burdens greater than 30% of their income, insufficient staff hindered efficient implementation, and controls were gradually loosened over time because of strong landlord resistance at the local and state levels.

The effectiveness of rent control laws depends significantly on the specifics of the policy and the market. For example, ordinances that include vacancy decontrol provisions "reduce the number of affordable units over time" because each time a tenant moves out, the rent can increase to the market rate (Levy et al. 2006, p.17).

In California, due to the Costa-Hawkins act, passed in 1995, all rent control ordinances must allow for vacancy decontrol. This gives landlords an "incentive to push out tenants, which can lead to unjust, or no-fault evictions" (Great Communities Collaborative 2007, p.4). The law also makes it impossible for jurisdictions to pass rent controls on any units built after 1995, on single-family homes, and on condominium units (Portman and Brown 2013).

### *Tenant Protections and Support*

Another important tool to stabilize gentrifying communities is sufficient protections for tenants and homeowners to be able to stay in their homes. These can run the gamut from providing rental assistance and tenant counseling to proactive code enforcement and requiring landlords to have a "just cause" when trying to evict tenants.

The Harrison Institute for Public Law (2006) studied Washington, D.C.'s tenant purchase law, coming out generally in support of the policy: it has "been the catalyst for preserving thousands of affordable homes in Washington, D.C., often in neighborhoods that have been undergoing gentrification", "has preserved hundreds of units" of low-rent housing, and has allowed "low-income residents to purchase homes" (p. 2). The authors also offer a detailed critique of the law's shortcomings and a set of recommendations. Through qualitative research, they identify "areas of concern", including poor data management, lack of resident familiarity with the policy, the availability of technical assistance, and availability of funding.

Winstead (2006) discusses barriers to the tenant protection movement in Richmond, CA. He concludes that the lack of hard evidence of a tightening in the rental market and the difficulty of obtaining evidence of unjust evictions pose the greatest obstacles. Because of the evidence gaps, there is no public sense of "crisis" around rental housing in Richmond, which makes it difficult to garner political support for greater tenant protections. Winstead argues that advocates should focus on the implementation of a well-written just-cause ordinance that would include record-keeping provisions to make further action to protect tenants much easier. He also notes that a tenant protection campaign in Richmond centered on just cause would receive less opposition from landlords and property owners than one pushing for rent control (Winstead 2006). In general, experts argue that without a just-cause evictions policy in place, other preservation strategies will not work, because landlords can remove tenants very easily. It is very difficult to win against landlords in places without these policies, because any challenge to the landlord could result in eviction—forced or through raised rent—and it is hard to prove retaliation.

### *Asset Building and Local Economic Development*

In addition to working on maintaining a sufficient affordable housing stock, jurisdictions can also support their residents by increasing their capacity to obtain housing. A diverse array of asset building and local economic and workforce development programs have been implemented around the country. These include the ever-growing movement to increase the minimum wage, implementing strong wage theft protections, and local or first-source hire ordinances that require a certain percentage of workers to be from the local disadvantaged community (PolicyLink 2015). Other asset-building strategies such as individual development accounts, homeowner assistance programs, and housing rehabilitation funds, among many others, are necessary elements to a comprehensive community stabilization strategy.

Minimum wage as an asset-building strategy has many ends: improving personal well-being, enhancing economic security, increasing civic behavior, and more (Page-Adams and Sherraden 1997). As such, the literature on minimum wage and similar strategies is not explicitly focused on addressing displacement, but scholars writing inventories of anti-displacement policies frequently include minimum wage in their lists because it may allow residents to build sufficient assets to be able to stay in an ascending neighborhood. However, minimum-wage policies have also received scrutiny. For example, there are many studies that evaluate the effects of minimum-wage laws on

levels of employment (Doucouliagos and Stanley 2009), and others on the number of hours worked (Couch and Wittenburg 2001).

Lester's (2009) study challenges this criticism, finding that a living-wage law is unlikely to harm a city's economic development prospects and is the only tool that individual jurisdictions can effectively use to address rising income inequality. He finds that living-wage laws not only provide direct wage increases for workers, but they may also help raise wage standards across the sector due to competition among firms for workers. In San Francisco, living-wage advocates explicitly linked wages and with ongoing debates around land use and displacement. Pitching their argument in terms of the high cost of living in the city contributed to their success in passing legislation(Lester 2009).

Whatever the efficacy of income- and wealth-building strategies, stakeholders interviewed emphasized that they must be linked to anti-displacement policies that target housing costs in order to address the affordability crisis effectively.

## General Conditions for Implementation and Effectiveness in TOD Neighborhoods

The conditions for policy effectiveness and implementation are an important component of policy analysis that several authors have undertaken. Levy (2006) discussed tactical barriers to policy implementation, such as the requirement that they be enacted by legislation, market considerations, like the importance of a strong housing market for certain policies, and barriers to effectiveness once implemented, like what level of affordability a policy creates. She provides a good precedent for analysis, as she first outlines the policy, describes "anticipated outcomes," "implementation challenges," and also includes "timing considerations" that focus on which policies are best suited to which market conditions and which gentrification phases.

In interviews, stakeholders pointed out that the context of the city matters tremendously in terms of which policies work best. For example, a production strategy in San Francisco with little available land for development will look different from one in San Jose that has more land available for development; renter protection policies are only useful in places with many renters; the effectiveness of a density bonus will depend on the density limits currently in place, as well as market demand in the locality. One stakeholder put it this way:

> I think the more you try to drill down the more context-specific it gets. So in general terms rent control and tenant protection and condo controls, all those things make sense. But, well, what's the right condo policy to have? Or how exactly should you write your rent control ordinance? What Richmond just adopted is very different from what Oakland has, for example.

Most of the literature reviewed does not include a discussion of political barriers or a policy's likelihood of being implemented based on how liberal or conservative a city and its elected officials are. Ellen and O'Flaherty (2013) examined whether New York's progressive housing policies may be due to the city's more liberal electorate, but rejected that hypothesis on the basis that other similarly liberal cities are lacking similar policies. Levy (2006) also considered the political barriers to implementing various strategies, but more generally and less along a "liberal-conservative" spectrum.

Others, like Marcuse (2004), considered political forces broadly, discussing ideological barriers to reforming housing policy, such as a "tendency to focus on the market and ignore non-market participants' concerns" (p. 3). Goetz (1994) finds that non-traditional economic development policies and progressive housing policies (defined as those that are not directly in line with business interests) are more widespread than previously believed, and are in place not only in strong market cities, but often "in an environment of uneven development. Cities that are characterized by the existence of both wealth and poverty are engaging in progressive policy" (Goetz 1994, p. 103). Political culture and community mobilization are also "positively associated with alternative development policy" (Goetz 1994, p. 100). These variables, plus a good bond rating, are correlated with progressive housing policies as well (Goetz 1994).

At the same time, an ideology that favors real estate interests may obstruct anti-displacement policies in many cities: as one stakeholder argued in an interview, "…people think that people should be able to make as much money as they want." Besides this pervasive ideology, stakeholders described the "real money" of developers as an obstacle to winning more anti-displacement protections. Given the often-changing cast of elected officials, politicians are less likely to remember to enforce an old agreement than they are to focus on the next big campaign issue ("political memories are short"); slowing development is viewed unfavorably to say the least; and many of these policies invoke the specter of anti-capitalist intentions, which inflame the opposition.

Incentives (like density bonuses) are easier than requirements (like inclusionary zoning) to get through the political process. While some stakeholders believe that housing preservation policies (like rent control) are easier to pass because they require minimal public outlay of funds, others think it is easier to come out in favor of housing production strategies, since doing so does not challenge property rights and is not seen as anti-development like preservation strategies sometimes are.

Stakeholders agreed that some of the barriers to local anti-displacement policy implementation can only be resolved with a state-level legislative fix. Examples include the Ellis Act, vacancy decontrol, and inclusionary housing, the latter two of which we discuss in more detail later in this chapter.

Behind the policies and strategies listed above often lie an informed and organized resident base and a robust community engaged decision-making process. For example, Howell highlights the importance of a strong, engaged non-governmental sector in a case study of neighborhood change in the Washington, D.C. neighborhood of Columbia Heights (2013). Her results indicate that planners "seemingly nailed the punch list for redevelopment"—including ensuring that new housing included low-income units, helping tenants purchase their homes, preserving existing affordable housing, and more—all of which worked to some extent (Howell 2013, p. 11–12). However, even with the city's many interventions, displacement has still occurred and "low income residents' sense of community, political power, and access to amenities changed significantly" (Howell 2013, p. 11–12). Findings indicated that it was "the work of tenant organizers, affordable housing developers, policy advocates" and the like that have "driven the effort to preserve neighborhoods" (Howell 2013, p. 16). Another case study of Vancouver goes over several neighborhoods that should have experienced gentrification but did not because strong community resistance held off the market and "[denied] the opportunity for gentrification to occur on these development sites" (Ley and Dobson 2008, p.2484).

Anti-displacement efforts in the context of transit neighborhoods have a particular set of challenges. Although some housing production policies target the areas around transit stations, for instance by requiring inclusionary housing or purchasing land, it is rare to find targeted

preservation policies. One challenge specific to TOD is the way in which transit agencies interpret the Federal Transit Administration's requirement that federal fund be used for the "highest and best transit use"(PolicyLink 2008). The common approach is to pursue development that generates the most revenue. However, advocates can make the case that low-income residents use transit more than high-income residents, so location affordable housing near transit can increase ridership, another element of the "highest and best" use (PolicyLink 2008). Also important is community engagement during all phases of the TOD planning process and the introduction of anti-displacement efforts early on before land prices around transit rise (Ibid.). Community development corporations can proactively lead TOD partnerships and develop projects of their own. For example, in Chicago, the community development organization Bethel New Life launched a series of development projects around the Lake Pulaski transit stop in partnership with the Chicago Transit authority, producing 50 homes for low- and moderate-income residents and planning for 66 more in the future (PolicyLink 2008). Community benefit agreements can also be used to achieve anti-displacement and affordable housing protection around TOD projects (Ibid.). For instance, the Ballpark Community Benefits Agreement (CBA) in San Diego includes a provision that requires and funds studies of how the development will impact land prices and low-income residents (Ibid.).

# Statewide Affordability and Anti-Displacement Policies

Before discussing local policies, we provide an overview of the relevant statewide affordability and anti-displacement policies. The primary role the state plays in anti-displacement policy is in funding affordable housing and providing the policy backdrop against which local governments are able to act.

## State Affordable Housing Funding

On the production side, the significant expense of building or rehabilitating a single unit of affordable housing means that it is very difficult to fund projects solely from local dollars. Instead, developers rely on state and federal low-income housing tax credits, which are both administered by the state. Wegmann estimates that "63% of the average affordable rental housing project" in an array of projects in the Bay Area he analyzed "is financed by state and federal sources, with the remainder coming from local, rent-supported, and philanthropic financing" (see Table 5.2; Wegmann 2012, p.8).

California has a variety of programs that fund affordable housing, including the Multifamily Housing Program (through the state's Housing and Community Development department), the new Affordable Housing and Sustainable Communities funding (through the Strategic Growth Council), the Affordable Housing Program (through the Federal Home Loan Bank) and several other programs. In addition, it administers the federal Low-Income Housing Tax Credit Program—usually the largest source of funds in a project—through the Tax Credit Allocation Committee. Localities administer HUD programs, like Community Development Block Grants and HOME funds. A detailed discussion of these programs is beyond the scope of this chapter.

**Table 5.2: Federal and State Funding Available for Affordable Rental Housing Development in the Bay Area**

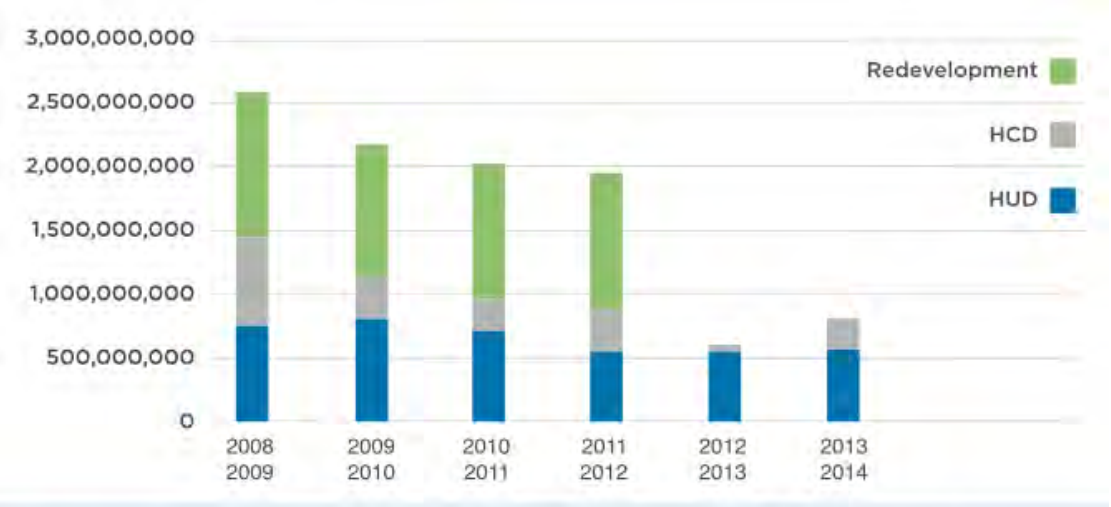
| | **2010 Estimated 9-county Bay Area share (mm)** |
|---|---|
| **Federal - off balance sheet** | |
| 4% Low Income Housing Tax Credits (includes CA state tax credits) | $163 |
| 9% Low Income Housing Tax Credits (includes CA state tax credits) | $176 |
| Federal Home Loan Bank Affordable Housing Program (AHP) | $14 |
| | |
| **Federal – appropriations** | |
| Project-based Housing Choice Vouchers (HCV) | $114 |
| HUD Section 202 capital expansion | $19 |
| HUD Section 811 (Capital Advance and PRAC) | $6 |
| CDBG | $37 |
| HOME | $64 |
| | |
| **State** | |
| Multifamily Housing Program (MHP) from Prop 1C | $15 |
| Infill/Infrastructure program from Prop 1C | $55 |
| MHSA | $9 |
| CALReUSE | $1 |
| **Total** | **$673** |

*Source: (Wegmann 2012)*

The competitive 9% tax credit program (see Table 5.2 above) receives requests double the amount of funding available (Schwartz 2015). This means that, even if local governments dramatically increased their funding of affordable housing, more projects would not get built, since they rely so much on the tax credit funds.

The state's investment in affordable housing has been decreasing steadily in recent years, even as the state faces a shortage of 1.5 million homes affordable to very- and extremely-low-income households (California Housing Partnership Corporation 2015).

As Figure 5.1 shows, the most dramatic change was the elimination of state funding for redevelopment agencies. These agencies managed redevelopment areas in which they were able to retain new property taxes generated as an area was revitalized, and use these funds to support affordable housing and other investments (Taggart 2012). The agencies were eliminated in 2012 after a legislative act and court decision. Almost every stakeholder we have spoken with has cited the loss of redevelopment as a major barrier to local cities' funding affordable housing: of a sample of 27 projects in the Bay Area, "about 26% of the [non-state and federal] funds contributed...originated from redevelopment" (Wegmann 2012).




| FUNDING SOURCE | FY 2008-2009 | FY 2013-2014 | % CHANGE |
|---|---|---|---|
| Redevelopment | $1,142,555,324 | $0 | -100% |
| HCD | $680,429,821 | $245,937,092 | -64% |
| HUD | $778,782,375 | $561,051,019 | -28% |
| Total | $2,601,767,520 | $806,988,111 | -69% |

*Source: CHPC analysis of 2000-2010 annual HCD Redevelopment Housing Activities Reports 2010-2011, 2011-2012 are estimated 2002-2014 annual HCD Financial Assistance Programs Reports; and 2001-2015 annual HUD CPD Appropriations Budget data.*

**Figure 5.1: State and Federal Investment in Affordable Housing (from the California Housing Partnership Corporation (CHPC))**

*Source:(CHPC 2015)*

One example of the interplay between state and local governments in financing affordable housing is with the way tax credits are allocated. According to a long-time employee of state housing agencies, the City of Los Angeles is considered its own region and receives its own allocation of tax credits (interview with authors). This was motivated by the city's construction of new transit stops, and its interest in targeting its affordable housing dollars towards those areas. The city and state tax credit agency worked together to create the new region (with "Balance of Los Angeles County" a region for the rest of the county besides the city). This arrangement allows the city to effectively control which projects its tax credit funds will flow to (through its control of the flow of predevelopment financing, which is essential for developers to have in order to be able to apply for tax credits). The decision was and is controversial, but could be effective as another tool to address transit-related displacement. Making decisions about the location of such developments and how those projects are integrated within the community is typically considered an appropriate role for localities.

The chief challenge at the state level, according to several experts, is the opposition of the incumbent governor, Jerry Brown, who has taken several steps in recent years to dismantle affordable housing programs, like the redevelopment agencies and an inclusionary zoning "fix" bill.

Ideas for state-level policy changes are numerous and beyond the scope of this project to detail. However, the CHPC suggests the following (2015, p.8):

- Create an "ongoing, predictable revenue source for the state housing trust fund with a $75 document recording fee on real-estate transactions (excluding commercial and residential home sales)."
- Expand the state's Low Income Housing Tax Credit by $300 million per year and make it easier to use.
- Invest in the existing Multifamily Housing Program from the general fund.

These policies would not specifically target transit-oriented development areas, but they would help affordable housing developers who are attempting to develop affordable housing near transit; development in these areas is encouraged by other state affordable housing programs, like tax credits and the new Affordable Housing and Sustainable Communities program. Therefore, expanding these complementary programs indirectly helps produce affordable housing near transit.

## State Laws That Enable or Limit Localities' Anti-Displacement Policies

In terms of encouraging anti-displacement planning, the state requires that all local governments compose Housing Elements that include plans to address affordable housing needs. They must also report on prior progress towards reaching goals.

One aspect of these plans must be how the locality plans to preserve housing that is at-risk of conversion from affordable to market-rate—a major concern for the state (California Department of Housing and Community Development 2014).

On the other hand, several other aspects of state law limit localities' ability to mitigate displacement. The Costa-Hawkins bill, passed in 1995, limits the scope of local governments' rent control and inclusionary zoning policies; the effects of this bill on local anti-displacement policies are discussed more below (Great Communities Collaborative 2007).

Other barriers at the state level include changing voter thresholds for communities that want to raise their own funds. Currently, housing bonds must clear 67% of the vote. Since this is challenging for many cities, experts suggest reducing the threshold to 55%, the level required for school facility bond measures. However, this change has not yet succeeded at winning approval of the legislature (interview with authors).

To address the loss of subsidized housing to the market, the tax credit state agency is currently considering including a right of first refusal for the state in their regulatory agreements with owners of tax credit-funded projects. This would allow the state to have the first right to buy the property (at set prices, like the remaining debt on the project plus taxes owed) if ever the partnership that owns it wants to sell. That right would be assignable, allowing the state to allow a non-profit developer, for example, to step in and buy it to keep it affordable. According to a long-time state housing agency employee, this would allow the state to purchase the property at a reasonable price and then preserve the affordability of the housing in the future (interview with authors).

The federal Department of Housing and Urban Development (HUD) recently released a new rule on affirmatively furthering fair housing, which the state of California and local jurisdictions will have to comply with as they distribute affordable housing financing (Fluit 2015). Cities will have to submit detailed reports on their plans to, and progress in, addressing segregation and access to

high-quality affordable housing for low-income households (Semuels 2015). This has several implications for anti-displacement work. It could force localities to focus more on ensuring low-income households can stay in, or move to, moderate- and high-income areas. In terms of transit areas, if an affordable developer is proposing a new development before the area has gentrified, the new rules could make it more difficult for the city to grant that funding, since those funds would be going to build housing in a low-opportunity area. However, cities may be able to show how they expect the area to gentrify in coming years, and invest proactively to retain low-income households in the midst of that change. In sum, this rule change will probably encourage agencies that distribute HUD funds to focus their efforts in places that are experiencing displacement, either already high-income or gentrifying.

## Housing Affordability and Anti-Displacement Policies in the Bay Area and in Los Angeles County

To construct an inventory of anti-displacement policies in the Bay Area and Los Angeles, we first reviewed anti-displacement toolkits and policy documents to generate a comprehensive list of strategies, considered by advocates, researchers, and policy makers as efforts to mitigate displacement (see Appendix T for sources). From an initial list of about 50 policies, we applied the following criteria to select policies to inventory:

1. Policies that are applied uniformly to the jurisdiction as a whole (i.e., not only restricted to specific neighborhoods).
2. Policies that have been implemented in at least two jurisdictions, but not all.[3]
3. Policies that have "teeth" and are being implemented.

A list of 14 anti-displacement policies was generated (Table 5.3)[4]. Researchers then analyzed municipal codes and housing elements for each of the jurisdictions in the Bay Area and Los Angeles County, which was complemented in the Bay Area with data from a survey of housing policies completed by the Association of Bay Area Governments (ABAG) (2015). Note that policies specific to transit-oriented development areas are discussed in a later section; these policies are citywide.

[3] Policies that are required by all jurisdictions, such as the Density Bonus or Secondary Units, were not included because we wanted to focus on policies that went over and above the state law.

[4] Neither the UC Berkeley nor ABAG inventories included Affordable Housing Trust Funds; an alternative data source was found to inventory these policies in the Bay Area and Los Angeles (*Center for Community Change 2015; Center for Community Change 2013).*

**Table 5.3: Anti-Displacement Policies in the Bay Area and Los Angeles County**

| | Policy | Number of Bay Area Cities/ Counties with Policy | Percent of Bay Area Cities/ Counties (Total = 109) | Number of Los Angeles Cities/ Counties with Policy | Percent of LA Cities/ Counties (Total=89) |
|---|---|---|---|---|---|
| *Preservation Strategies* | Just-Cause Eviction Ordinance | 7 | 6% | 5 | 6% |
| | Rent Stabilization or Rent Control | 9 | 8% | 4 | 4% |
| | Rent Review/Mediation Boards | 14 | 13% | 2 | 2% |
| | Preservation of Mobile Homes (Rent Stabilization Ordinance) | 34 | 31% | 16 | 18% |
| | SRO Preservation Ordinance | 28 | 26% | 4 | 4% |
| | Condominium Conversion regulations | 73 | 67% | 24 | 27% |
| | Foreclosure Assistance | 45 | 41% | 1 | 1% |
| *Affordable Housing Production Strategies* | Housing Development Impact Fee (or Jobs-Housing Linkage Fee) | 24 | 22% | 3 | 3% |
| | Commercial Linkage Fee/Program | 27 | 25% | 3 | 3% |
| | Affordable Housing Trust Fund | 15 | 14% | 8 | 9% |
| | Inclusionary Zoning/Housing | 78 | 72% | 16 | 18% |
| | Local Density Bonus Ordinance (above state requirements) | 19 | 17% | 7 | 8% |
| | Community Land Trusts | 26 | 24% | 1 | 1% |
| *Asset-Building and Local Economic Development Strategies* | First Source Hiring Ordinances | 17 | 16% | 1 | 1% |

*Source: UC Berkeley and UCLA Internal Analysis; Association of Bay Area Governments 2015; Center for Community Change 2015; Center for Community Change 2013*

## Bay Area

Anti-displacement policies are found in roughly equal measure across the nine counties, with the exception of Solano and Sonoma Counties. Inclusionary zoning and regulation of condominium conversions are the most prevalent policies in the Bay Area. Most of these policies were adopted in the early 2000s, with some adopted in the 1980s and 1990s. On the other hand, rent control can be found in only nine jurisdictions in the Bay Area, which were all adopted in the early 1980s.[5]

One indicator of the extent of anti-displacement policies is the number of policies per city (Table 5.4). Alameda rises to the top as the county with the most policies per city, at six, after San Francisco (where the sole City of San Francisco has implemented 12 of the 14 policies). Besides San Francisco, the cities with the most policies in place are Berkeley and East Palo Alto (11 policies each), Oakland (10), Cupertino, Hayward, and Petaluma (nine each), and Alameda and San Jose (eight each).

[5] The city of Richmond passed a rent control ordinance in August 2015 (Ioffee 2015).

**Table 5.4: Anti-Displacement Policies/Programs by County**

| County | # Cities in County | # Policies - Total | Average # Policies per city (Total Policies/ # Cities) |
|---|---|---|---|
| San Francisco | 1 | 12 | 12 |
| Alameda | 15 | 87 | 6 |
| Sonoma | 10 | 48 | 5 |
| Santa Clara | 16 | 74 | 5 |
| Napa | 6 | 24 | 4 |
| Contra Costa | 20 | 62 | 3 |
| San Mateo | 21 | 63 | 3 |
| Marin | 12 | 33 | 3 |
| Solano | 8 | 15 | 2 |

*Source: UC Berkeley internal analysis. Note that policies in unincorporated parts of each county are also included in these figures.*

Geographically, the cities with the most anti-displacement strategies cluster together: San Francisco, Berkeley, Oakland, Alameda, Hayward, and San Leandro, with two exceptions: Petaluma (7 policies) and East Palo Alto (12 policies) (Figure 5.2).

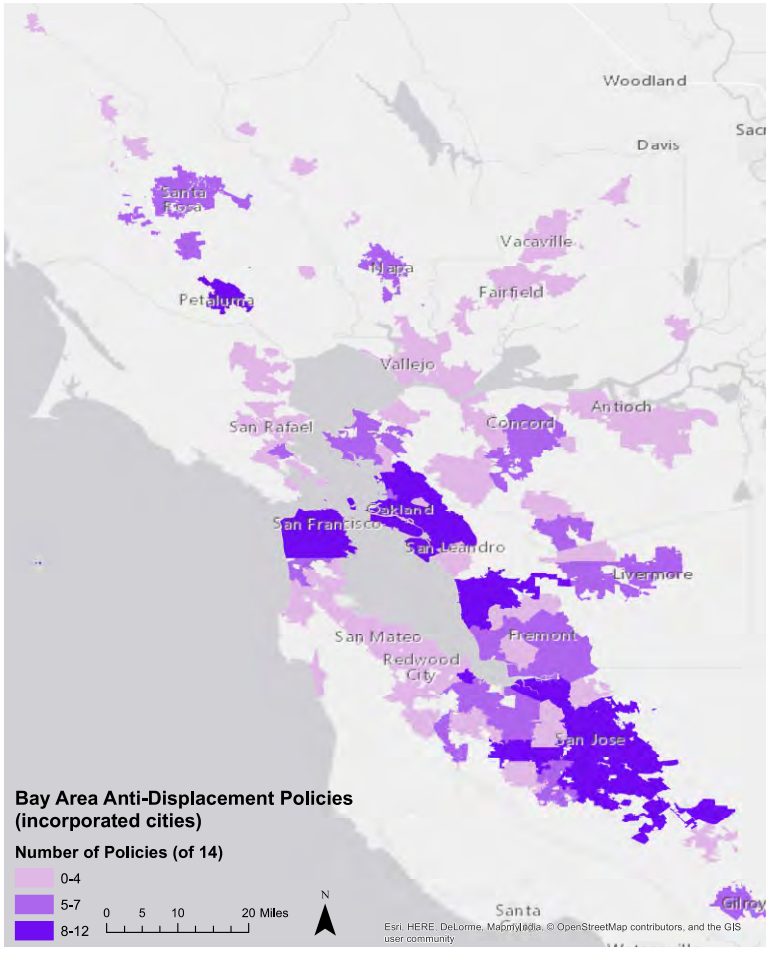



**Figure 5.2: Number of Anti-Displacement Policies by City**

*Source: UC Berkeley Internal Analysis; Association of Bay Area Governments 2015; Center for Community Change 2015; Center for Community Change 2013*

Nearly all these cities have BART stations. In terms of specific policies, most do not display a geographic pattern, with a few exceptions. There is a concentration of the following two policies in the South Bay: Community Land Trusts and Affordable Housing Impact Fees (or jobs-housing fees). Few peninsula cities have mobile home rent control policies in place, despite a need for them there, according to stakeholders.

### *Past and Future Affordable Housing Production*

Using housing production figures that cities must report as part of their Regional Housing Needs Allocation (RHNA) requirements, it is possible to see how different cities perform based on whether they have each of the production policies considered here[6]. In terms of the production of very low-income (30-50% area median income (AMI)) housing, we found that, of Bay Area cities, those with each of the production strategies produce more total units (on average, and per capita) than those without each strategy (except for community land trusts) (Table 5.5). This could mean that cities that build more are then more likely to adopt production strategies, or that the causation is the reverse: cities with the strategies produce more affordable housing because the policies are working.

**Table 5.5: Annual Average Housing Unit Construction per 10,000 People, Bay Area Cities, by Affordable Housing Production Strategy**
**(Average of Constructed Units 2007-2013 / Population in 2010 * 10,000)**

| | | Housing Development Impact Fee (or Jobs-Housing Linkage Fee) | Commercial Linkage Fee/ Program | Affordable Housing Trust Fund | Inclusionary Zoning/ Housing | Local Density Bonus Ordinance (above state reqs) | Community Land Trusts |
|---|---|---|---|---|---|---|---|
| Very Low Income | Without Policy | 9.78 | 9.17 | 11.50 | 10.19 | 10.61 | 11.97 |
| | With Policy | **19.17** | **19.90** | **15.21** | **12.42** | **18.80** | 11.39 |
| Low Income | Without Policy | 9.02 | 8.49 | 8.30 | 7.51 | 8.38 | 8.56 |
| | With Policy | 5.43 | 7.48 | 7.64 | **8.51** | 7.42 | 7.29 |
| Moderate Income | Without Policy | 10.33 | 9.40 | 9.69 | 3.98 | 9.32 | 10.26 |
| | With Policy | 7.99 | **11.10** | **11.16** | **11.95** | **12.66** | 8.48 |
| Above Moderate Income | Without Policy | 54.80 | 47.04 | 61.17 | 27.98 | 55.52 | 56.00 |
| | With Policy | **91.84** | **111.00** | **80.29** | **75.60** | **105.01** | **83.77** |

*Numbers in bold are where cities with the policy have, on average, higher production. Source: Internal policy inventory, combined with Regional Housing Needs Assessment progress from Bay Area Legal Aid, EBHO, and NPH.*

[6] The Regional Housing Needs Allocation is a "state-mandated process to identify the total number of housing units (by affordability level) that each jurisdiction must accommodate in its Housing Element"(Association of Bay Area Governments 2015). The state tells the Bay Area regional planning agencies how many units of housing at each income level they need to produce in an eight-year period. These agencies then distribute those units among the various jurisdictions, who are in turn required to modify their Housing Elements to be in compliance with these allocations.

Interestingly, the same pattern does not apply to low-income (50-80% AMI) housing; except for inclusionary zoning, cities without the policy produce more low-income housing than cities with the policy.

Finally, it appears that moderate (80-120% AMI) and above-moderate income production is dramatically higher in places with each policy than in places without them. One hypothesis for this finding is that cities that have the hottest real estate markets, where developing market-rate homes affordable to low-income people is difficult, are also the cities most likely to implement production policies. Further research is needed to investigate this, and also to examine to what extent the adopted policies are also being implemented.

A projection of affordable housing supply and demand found large gaps between housing needed and likely to be supplied by current programs (Wegmann 2012). About 70% of the demand will not be met by the projected supply—a striking conclusion.

Table 5.6 summarizes the analysis, and provides insight into the relative housing production potential of the suite of financing programs and inclusionary zoning: 27% of the projected units would be built through affordable housing finance, while 11% would be constructed through inclusionary zoning. The number of units represented by these figures would probably be lower now, with decreases in affordable housing funding and the legal conscription of inclusionary zoning (discussed below). However, even so, this analysis provides evidence that inclusionary zoning, in general, is likely to produce fewer units than affordable housing finance.

**Table 5.6: Projected housing demand, supply, and shortfall for the nine-county Bay Area region**

| | **Very Low Income** | **Low Income** | **Moderate** |
|---|---|---|---|
| *affordability metric* | *dwelling units* | *dwelling units* | *dwelling units* |
| Increase in region-wide housing demand, 2010-2040 | 231,142 | 164,216 | 115,286 |
| *Demand absorbed by:* | | | |
| Affordable rental housing production, 2010-2040 | (23,359) | (16,829) | |
| Inclusionary Zoning housing production, 2010-2040 | (4,620) | (7,712) | (3,366) |
| Habitat for Humanity housing production, 2010-2040 | (1,799) | (1,799) | |
| Foreclosed inventory, 2010-2020 | (9,707) | (24,938) | (23,345) |
| Increase in tenant-based Housing Choice Vouchers, 2010-2040 | (30,458) | (1,078) | |
| **Housing demand not met by supply** | **161,200 dwelling units** | **111,859 dwelling units** | **88,576 dwelling units** |
| *As % of total* | 70% | 68% | 77% |

*Source: Wegmann 2012. Wegmann's report includes detailed methodology for arriving at each of these figures.*

## Los Angeles County

As observed in Table 5.3, few jurisdictions have anti-displacement policies and strategies in Los Angeles County, and the vast majority of the 14 policies have only been adopted by a handful of cities. The most prevalent policies in Los Angeles County are condo conversion ordinances (27% of

cities have adopted them), mobile home preservation ordinances (18%), and inclusionary zoning ordinances (18%).[7] Condo conversion ordinances first appeared in the Los Angeles region in the late 1970s and early 1980s (the City of Los Angeles adopted such an ordinance in 1980), and continued to be adopted throughout the 2000s, with the most recent adoption in 2014 by La Canada Flintridge. Eleven out of the 24 jurisdictions that have condominium conversion ordinances adopted them after 2000.

Sixteen out of the 89 Los Angeles County municipalities (18%) have a mobile home preservation ordinance, but only four municipalities (4%) have a rent control ordinance and only two municipalities (2%) have rent mediation boards. The four cities that have rent control ordinances are Los Angeles, Beverly Hills, Santa Monica (adopting its ordinance in the mid-1970s), and West Hollywood (adopting its ordinance in the mid-1980s). Cities with a rent mediation ordinance are Gardena and Culver City (both adopting their ordinances in 1987).

Table 5.7 shows which cities have the highest number of anti-displacement policies (three or more). The cities with the highest proportion of anti-displacement policies are: Los Angeles that has adopted nine out of the 14 policies (64%), Santa Monica and West Hollywood (50%), as well as Calabasas and Pasadena that have adopted six out of 14 policies (43%). See Appendix U for a list of the policies adopted by each of Los Angeles County's 89 municipalities.

**Table 5.7: LA County Cities that have instigated 3 or more Anti-Displacement and Housing Affordability Policies**

| City | # Total Policies | % of Policies Adopted |
|---|---|---|
| Los Angeles City | 9 | 64% |
| Santa Monica | 7 | 50% |
| West Hollywood | 7 | 50% |
| Calabasas | 6 | 43% |
| Pasadena | 6 | 43% |
| Beverly Hills | 5 | 36% |
| Glendale | 5 | 36% |
| Huntington Beach | 4 | 29% |
| La Verne | 4 | 29% |
| Long Beach | 4 | 29% |
| Malibu | 4 | 29% |
| Agoura Hills | 3 | 21% |
| Claremont | 3 | 21% |
| Hermosa Beach | 3 | 21% |
| Los Angeles County | 3 | 21% |
| Rancho Palos Verdes | 3 | 21% |

*Source: UCLA Internal Analysis*

## Comparison between Bay Area and Los Angeles

In comparison with the Bay Area, fewer Los Angeles cities have anti-displacement or affordable housing policies (Figure 5.3). The policy differences between the two regions can be explained by several other differences between these regions: the two regions are politically different, and

[7] 16 Cities (18%) have Inclusionary Zoning and/or In-Lieu Fees. However, La Verne only has Inclusionary Zoning in its Old Town Community Plan, while Malibu only has In-Lieu Fees (Ordinance 375), but not Inclusionary Zoning.

progressive policies are more easily adopted in the Bay Area, due in part to pressures from affordable housing advocates in the Bay Area. Also, geography matters: the supply of land is more limited in the Bay Area; therefore, the development of housing is more constricted and the magnitude of the affordable housing problem is greater compared to Los Angeles (interview with authors).

Another reason cited is that, although Los Angeles is extremely expensive, San Francisco has been the "ground zero" for affordability issues (with rents only rivaled by those in Manhattan). However, given lower incomes in Los Angeles, it is actually relatively less affordable than the Bay Area at this time. Therefore, it is not a simple issue of greater need in the Bay Area. An expert in the Bay Area explained the discrepancy thus:

> "…I think the existence of so much progressive housing and urban policy here is the legacy of volunteers…it was San Francisco and Berkeley that had really strong tenant movements in the 60s and early 70s…I think cities tend to look at their neighbors and see what their adopting and when you get to some sort of critical mass, you know half the city is in the county, half these policies. Now you're not sticking your neck out, you're just doing what everyone else does."

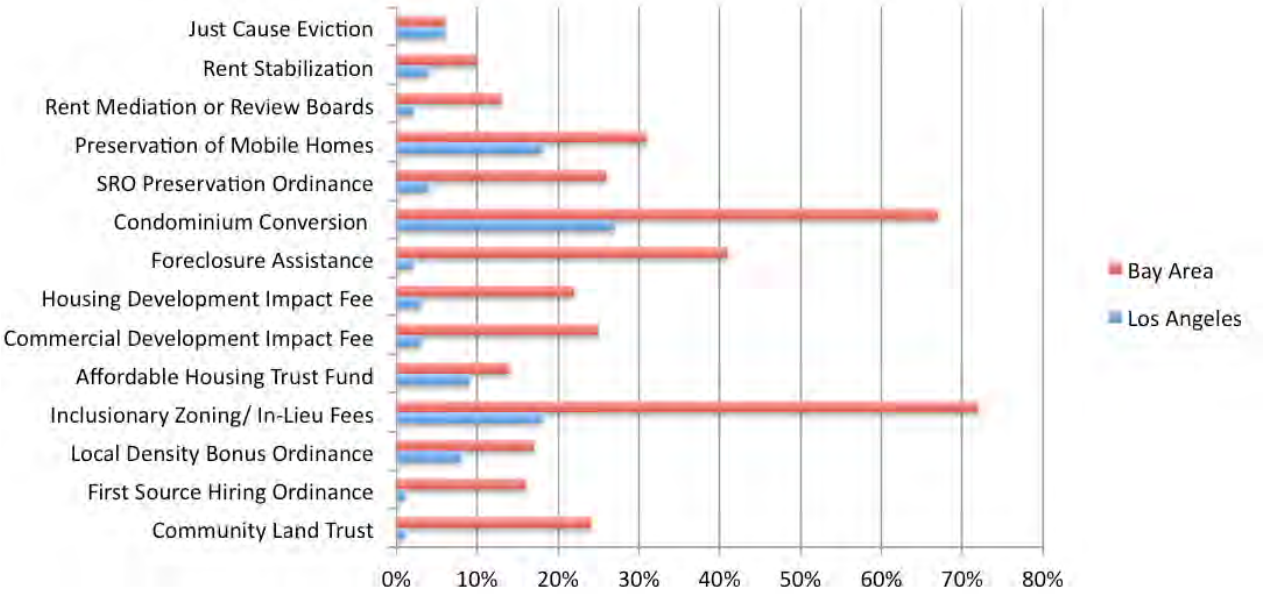



**Figure 5.3: Comparison of the Proportion of Bay Area and Los Angeles Cities with Anti-Displacement Policies**

*Source: UC Berkeley and UCLA Internal Analysis; Association of Bay Area Governments 2015; Center for Community Change 2015; Center for Community Change 2013*

# Addressing Displacement in Transit-Oriented Development

Transit oriented development is defined as "a planning and design trend that seeks to create compact, mixed-use, pedestrian-oriented communities located around new or existing public transit stations" (PolicyLink 2008, p.1). A CHPC working paper clearly explains why there should be a focus on affordability near TODs (CHPC 2013).

1. Low-income people own fewer cars and use transit more.

a. People with lower incomes are more likely to be transit riders, with households that earn less than $20,000 per year using transit more than four times as much as higher-income groups.
b. Nationally, 48.5% of transit riders do not own a car, compared to the national average of only 6.1% of all American households that are carless, and low-income households are far less likely to own a car.

2. Proximity to transit is linked to increasing property values and rents, typically 10-20% above similar rental buildings that are further from transit.
3. New transit stations tend to attract new residents with higher incomes and higher car ownership.
4. Evaluations of smart growth plans that emphasize TOD and other infill development have found reduced affordability and loss of lower income households in TOD areas.

A common idea is to impose targeted policies in areas around transit stations. One expert is skeptical of this approach, however, unless the funds going to transit investments have anti-displacement provisions:

> "Of course, then the question is what's the radius that you want to define…I mean everybody let's say oh within a mile or within a half-mile [of] the transit, and really the effects of our transit—it's not a circle. It's kind of…a snake that swallowed a rope with [a] big bulge and you go out along all the arterials that eat into the station. But however it gets defined, that could be one of the problems. Frankly, I think all of the money that's tied into investments in transportation and close to transit stations needs to have strings attached to it that call for both some kind of anti-displacement policy (however those are defined) as well as some requirement for affordable housing (interview with authors)."

## Planning for Transit Oriented Development in the Bay Area

The San Francisco Bay Area has a long history of developing policies to incentivize smart growth and TODs, some of which have explicitly addressed affordable housing and displacement. In this section we review some of these policies and how affordable housing and displacement risk have been incorporated into planning and project review, both at the local and regional level.

### *Background on Regional Smart Growth Planning in the Bay Area*

Beginning in 1997, the Metropolitan Transportation Commission started the Transit for Livable Communities (TLC) program. TLC provided planning and capital grants for local transportation projects in downtowns, corridors, transit areas, and other activity centers, when they planned for higher-density housing and mixed-use development around transit. Since its inception, TLC has awarded over $250 million in funds to better link land use and transportation decisions made by the region's cities and transit operators (CTOD, CD+A, and Nelson Nygaard 2014).

In the early 2000s, ABAG, the Metropolitan Transportation Commission (MTC) and other regional agencies began to work together to formulate a regional Smart Growth strategy and developed the FOCUS program that promotes linkages between land use and transportation by encouraging development in key locations (CTOD, CD+A, and Nelson Nygaard 2014). In 2007, the regional agencies asked cities to select areas that they wished to prioritize for infrastructure grant funding, such as a downtown or a corridor, to promote infill development as part of the FOCUS program, which were called Priority Development Areas (PDAs). The criteria for identifying PDAs were that they be located in existing communities, where housing growth was expected, and near transit.

These areas, where cities had largely already planned future growth, then became eligible for planning grants, capital improvements, technical assistance, and other resources to support local governments and encourage TOD.

In 2008 California passed SB 375, directing regions to coordinate land use and transportation planning through the development of sustainable communities strategies (SCS) as part of its periodic Regional Transportation Plan. The SCS must also be consistent with state-mandated plans for ensuring that localities provide adequate housing for all income levels under the RHNA process. Grant funding and litigation provide the primary "carrots" and "sticks" for implementing these state goals.

When the Bay Area's regional agencies set out to develop their SCS, known as Plan Bay Area and adopted in 2013, they used the pre-established PDAs as the guiding geography. Seventy-eight percent of future growth was directed towards PDAs. Although the implementation of the plan involves allocating transportation funding to projects consistent with the plan, they are largely coordinated through the county-level congestion management agencies that produce county transportation plans every two years and distribute funds to local jurisdictions (ABAG and MTC 2013).

***Station Area Plans***

Through MTC's Station Area Planning program (which later became the Priority Development Area Planning), over 50 projects have been funded that include station area planning, funding for Environment Impact Reviews (EIRs) of plans, and in certain circumstances gap financing.

MTC began a station area planning program in 2005 in conjunction with the passage of the TOD policy that would apply to nine transit expansion projects covered under the Regional Transit Expansion Program, also known as Resolution 3434 of 2001 (MTC 2005). The TOD policy required that these plans include a minimum number of housing developments within a half-mile of the station along the corridors to ensure future growth in transit ridership, to make the investments cost-effective and to ease the Bay Area's chronic housing shortage, among other goals. These housing thresholds were determined through a study of existing and potential levels of development in the corridors (CTOD, CD+A, and Nelson Nygaard 2014). If the corridors did not meet the thresholds (out of the nine, five projects did not meet them), they were required to conduct station area plans. Below-market-rate[8] units were rewarded by receiving 50% bonus points toward the threshold minima. To be counted toward the threshold, planned land uses had to be adopted through general plans accompanied by the appropriate implementation processes, such as zoning codes.

In an evaluation of the TOD policy, consultants found through a stakeholder survey that despite the bonus points allocated to affordable housing "survey respondents did not feel that the Policy was effective in encouraging the inclusion of affordable housing opportunities within station areas. Most jurisdictions relied on their citywide affordable housing policies rather than making a specific effort to provide affordable housing within the station area plans" (CTOD, CD+A, and Nelson Nygaard 2014). In fact, the consultant team found that "Some jurisdictions feel that their citywide inclusionary ordinances are already near the tipping point of making housing development infeasible and imposing higher requirements for affordable housing in station areas would make transit-oriented housing infeasible. The City of San Jose actually exempted downtown areas from its

[8] Defined in the policy as affordable to 60% AMI for rentals and 100% AMI for owner-occupied units.

citywide inclusionary housing ordinance, which had the effect of stimulating market-rate housing production around transit stations" (p.19).

In 2008, the station area planning program was expanded to allow areas participating in the FOCUS program to compete for funding. The FOCUS program was established by MTC and ABAG in 2007 to promote land use and transportation linkages by encouraging development in PDAs, which were defined by local jurisdictions as areas near transit that provided opportunities for future growth. At the same time MTC commissioned a Station Area Planning Manual from Reconnecting America in 2007 (Reconnecting America 2007). The manual identified different place types (e.g., city center and transit neighborhood) and attached suggested total housing unit targets for the half-mile radius around a station in each type of place, ranging from a low of 1,500 units for transit neighborhoods to 30,000 units for regional centers. According to stakeholders, these targets were very easy to reach as they were written very liberally to encompass a wide range of places. Also within the manual were suggestions for how to create opportunities for "affordable & accessible living" including a) the setting of affordable housing goals, b) consideration of inclusionary requirements, c) providing a range of housing options, and d) minimizing displacement of existing residents by analyzing and adopting policies where "appropriate and feasible" (p. 24). In addition, jurisdictions were encouraged to consider affordable housing financing mechanisms, including the targeting of existing programs to station areas.

The Station Area Planning program was later converted into the Priority Development Area program in 2012. Although MTC staff evaluated applicants based on the housing policies they required, it was not until 2012 that formal guidelines were distributed, which encompassed "Planning Elements" that MTC encouraged grant recipients to include (MTC 2012a). These elements included a section on "Affordable Housing and Anti-Displacement Strategy" (p.7-8), which involved the quantification of the affordable housing needs and identification of an affordable housing goal. In the identification of goals, jurisdictions were encouraged to consider "No net loss of affordability in the plan area", to identify quantitative targets of affordable units, and to demonstrate consistency with RHNA numbers. Among the policies jurisdictions were encouraged to consider were: a) inclusionary housing, b) housing trust fund, c) reduced parking standards, d) rehabilitation programs, e) land trusts, f) foreclosure mitigation. To avoid displacing existing residents, the Plan Elements suggests the engagement of communities likely to be displaced, local economic development, and enhancement of community centers and facilities.

Of the 37 completed plans that were reviewed, 31 (84%) had quantified total housing unit targets, while 16 (43%) had quantitative affordable housing targets, usually in the form of a percentage of the total. In addition 14 (38%) plans mentioned displacement, some of which outlined potential efforts to mitigate it. The vast majority of plans, 31 (84%) included language on reduced or unbundled parking, either as a way to reduce costs, or increase transit ridership or non-motorized transit. In stakeholder interviews, MTC staff noted that although the plan elements were suggested to all grant recipients, they didn't necessarily apply universally as some jurisdictions already covered many affordable housing policies through citywide policies or other plans. In addition, some of the funding went only to EIRs or partial grants for incomplete elements to pre-existing projects, making it difficult to modify plans that were already farther along.

### *Scoring Incentives through One Bay Area Grants*

The One Bay Area Grant (OBAG) was the new funding approach to integrate the region's federal transportation program with SB 375 to encourage land use and housing policies that support the production of housing with supportive transportation investments. In 2012, MTC established

criteria guidelines for how to allocate federal transportation money to the nine-county Congestion Management Associations (CMAs) (MTC 2012b). For FY2015-16, $320 million was allocated to CMAs through the OBAG program, approximately 40% of total federal transportation funds that MTC distributed. With the guiding principle of "using transportation dollars to reward jurisdictions that accept housing allocation through the RHNA process and produce housing as well as promoting investments in PDAs" (MTC 2012d, p.2) the formula used to distribute OBAG funding to the counties takes into consideration the following factors weighted according to the percentages in parentheses: population (50%), past housing production (12.5%), future housing commitments as determined by the ABAG RHNA (12.5%) and added weighting to acknowledge very-low- and low-income housing production (12.5%) and future commitments (12.5%).

Each county CMA is then required to prepare a "PDA Growth and Investment Strategy" that includes selection criteria for OBAG grants. The purpose of the strategy is to ensure that CMAs have a transportation project priority-setting process for OBAG funding that supports and encourages development in the region's PDAs. CMAs in larger counties were directed to spend at least 70% of their OBAG investments in PDAs or on projects connected to PDAs. In addition, jurisdictions were required to have an adopted and certified Housing Element to be eligible for OBAG grants. In developing their local funding guidelines for the competitive grants (accounting for approximately 50-75% of the OBAG grant money, which varied by county), MTC encouraged the CMAs to emphasize housing growth in PDAs, "favorably consider" projects located in Communities of Concern and in PDAs with "affordable housing preservation and creation strategies" (MTC 2012c, p.2). In a footnote, examples of such policies included: inclusionary housing requirements, city-sponsored land-banking for affordable housing production, just-cause eviction policies, policies or investments that preserve existing deed-restricted or "naturally" affordable housing, condo conversion ordinances that support stability and preserve affordable housing, and the like. (MTC 2012c, p.1)

Some CMAs used these suggestions from MTC directly when constructing their evaluation criteria for OBAG grants. For instance the Alameda County Transportation Commission (ACTC)'s first Investment and Growth Strategy of 2013 outlined a two-tier evaluation process. First projects were evaluated based on planning and development readiness, followed by a 100-point OBAG scoring and selection criteria. Projects could potentially receive nine out of 100 points for "Affordable Housing Preservation and Creation Strategies" such as "inclusionary zoning ordinance or in-lieu fee, land banking, housing trust fund, fast-track permitting for affordable housing, reduced deferred or waived fees for affordable housing, condo conversion ordinance regulating the conversion of apartments to condos, SRO conversion ordinance, demolition of residential structures ordinance, rent control, just cause eviction ordinance, or others" (ACTC 2013, pp. 3-13). In contrast the CMA of San Mateo awarded up to two out of 103 possible points for projects located in or near an "affordable housing PDA" (C/CAG 2014, p.46). Santa Clara County's Santa Clara Valley Transportation Authority (VTA), on the other hand did not award any points for affordable housing (VTA 2014).

In a recent analysis of the first round of OBAG funding by the Great Communities Collaborative (Montojo 2015), researchers found that 61% of cities were allocated less funding than what was determined by their MTC formula share. Furthermore, Montojo found that on average, 51% of projects funded with OBAG grants were within a quarter-mile of affordable housing and only 21% were within a half-mile of both transit and affordable housing. According to the Great Communities Collaborative inventory of funding allocation and the number of anti-displacement policies we inventoried in each jurisdiction, the relationship appears weak at best. The jurisdiction with the highest number of anti-displacement policies (San Francisco) also received the largest amount of

OBAG grants. However, looking at the grant funding on a per-capita basis, there appears to be no correlation between the number of policies and funding received (Figure 5.4).

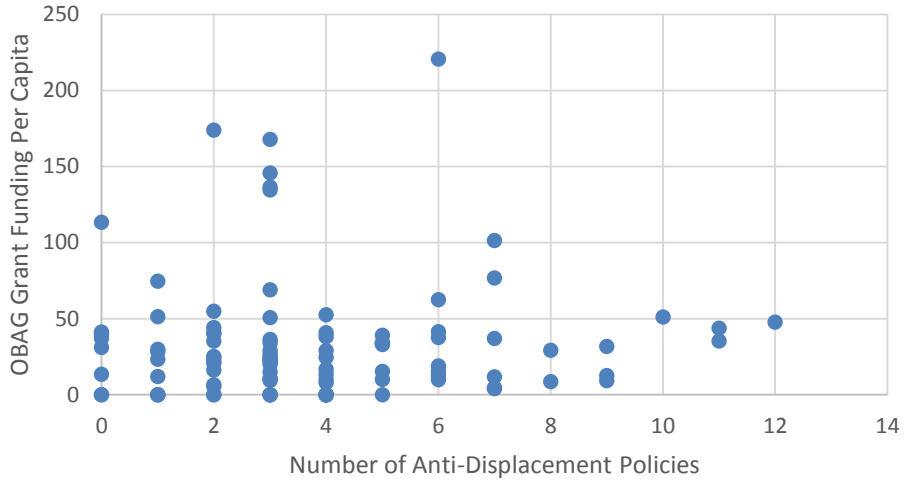



**Figure 5.4: Per-Capita Opportunity Bay Area Grant Funding By Number of Anti-Displacement Policies, Bay Area Cities**
*Source: UC Berkeley Internal Analysis*

## Los Angeles Station Neighborhood Area and Planning Guidelines

The City of Los Angeles has created TODs or Station Neighborhood Area Plans (SNAPs) as a means of guiding development near existing or new transit stations. Various city documents have also incorporated transit sections into planning documents, including community plans and specific plans. The following section outlines how these types of plans address issues of affordability, and whether they mention the topics of gentrification or displacement. The emphasis of this section is not on the types of plans that have been created, rather how these documents propose development near transit and how/if they referred to affordability, displacement, or gentrification.

Before delving into these station area plans, consider a requirement of Los Angeles County Metropolitan Transportation Authority (LA Metro) when it enters into joint development agreements for construction on its land: the fifth listed goal is affordable housing[9]. The guidelines call for "35% of the total housing units in the Metro joint development portfolio [to be] affordable for residents earning 60% or less of the Area Median Income" (LA Metro 2015). One mechanism for achieving this is a policy of land discounting, whereby LA Metro may "discount joint development ground leases" by no more than 30% of fair market value. This is a promising addition (as of July 2015) to the guidelines, and is likely to help address displacement in transit neighborhoods by providing more affordable housing.

The planning documents are official statements of the local planning departments reflecting the government policy regarding the physical development of a community. However, the documents are not legally binding, but are instead a list of recommendations for interpreting those values into

[9] Prior to the 2015, joint development agreements often included affordable housing requirements. The 2015 guidelines, however, institutionalized the 35% affordable housing requirement and also introduced the 30% discount limit on joint development ground leases.

future land use and development policies and decisions. The plans aim to be comprehensive in addressing how physical aspects of the community affect social, economic, and environmental issues. The plans can help shape future neighborhood plans, corridor plans, and other community improvements, but they do not guarantee a specific outcome. As with SNAPs, specific plans usually cover smaller geographical areas than the Community Plan. The goal of Specific Plans is to restrict development through regulatory controls and incentives that promote systematic and incremental neighborhood change to ensure orderly development and appropriate capacity off public facilities.[10] Community Plans provide specific, neighborhood-level strategies necessary to achieve the General Plan objectives.

Table 5.8 lists the existing Los Angeles plans with TOD sections. None of the TOD plans[11] explicitly use the words gentrification or displacement, but there are references to the creation and preservation of affordable housing. The Northeast Los Angeles Community Plan mentions issues of displacement several times. The West Adams, Baldwin Hills, and Leimert Community Plan implies that gentrification is a concern and discusses preventing displacement.

There are 12 future Los Angeles County and City TOD plans. These future plans include five stations along the Crenshaw line, with additional five stations along the Exposition Line. Two future Los Angeles County TOD plans include Willowbrook and East Los Angeles 3rd St. Specific Plan.

[10] A detailed description on community plans and specific plans can be found on the City of Los Angeles Planning website: http://www.lacity.org/311-service-category/policy-planning

[11] The three Los Angeles SNAP plans include 1) Vermont/Western 2) Avenue 57, and 3) Warner Center 2035 Plan. The five plans that include TOD sections include: 1) the Northeast Los Angeles Community Plan, 2) the West Adams, Baldwin Hills, Leimert Community Plan, 3) Cornfield Arroyo Seco Specific Plan, 4) Southeast L.A. Community Plan Implementation Overlay Zone, and 5) the South Community Plan Implementation Overlay Zone. There is also one report that is outlined in this summary that relates to the Vermont/Western Transit Plan—*Surveying East Hollywood: A Profile and Needs Assessment of the Business Community.*

**Table 5.8: Existing Los Angeles Plans with TOD sections**

| Name | Type of Document | Year Adopted | Metro Line | Mention of Displacement or Gentrification | Affordability Policies Mentioned |
|---|---|---|---|---|---|
| Vermont/ Western | SNAP/TOD | 2001 | Hollywood/Western, Vermont/Beverly, Vermont/Santa Monica, Vermont/Sunset (Red Line) | No | Mixed-Use Developments, Community Benefits, Homeownership, Exemptions from Park Fees |
| Avenue 57 | SNAP/TOD | 2002 | Highland Park Station (Gold Line) | No | Homeownership support, Mixed-Use Development |
| Warner Center 2035 | SNAP/TOD | 2013 | Warner Center Station (Orange Line) | No | Mixed-Use Development, Affordable Housing Requirement, Workforce Housing, Living Wage, Local Hiring, Exemptions from Development Fees. |
| Northeast Los Angeles | Community Plan w/ TOD | 1999 | Highland Park Station (Gold Line) | Yes, displacement concerns | Higher density near transit, Mixed-Use Development, Maximize opportunities for affordable housing adjacent to rail stations |
| West Adams, Baldwin Hills, Leimert | Community Plan w/ TOD | 2007 | Exposition (Phase I) and North-South Crenshaw/LAX | Yes, gentrification & displacement | Increase Homeownership, Affordable Housing Options, Accessory Dwelling Units, Infill Development, Parking Reductions, Condo Conversions. |
| Cornfield Arroyo Seco | Specific Plan w/ TOD | 2013 | Chinatown and Lincoln/Cypress Metro (Gold Line) | No | Affordable Housing Density Bonus, Unbundled Parking Exemption |
| Surveying East Hollywood | Report on Vermont/ Western | 2002 | Hollywood/Western, Vermont/Beverly, Vermont/Santa Monica, Vermont/Sunset (Red Line) | Yes, displacement of businesses | Local Job Incentives, Lower Parking Standards, Love/Work Spaces |

*Source: UCLA Internal Analysis*

The Los Angeles SNAP, Specific, and TOD Community plans vary in terms of if and how they mention gentrification and displacement, and how they propose to preserve or develop affordable housing. The older plans such as Vermont/Western or Avenue 57 do not directly speak to issues of displacement, but do refer to the need for housing affordability. The plans focus on maintaining the existing scale of the neighborhoods, as well as the need to promote homeownership. The plan encourages mixed-use and live-work spaces. Planners consider the development of mixed-use housing as an opportunity to provide affordable housing units. The Metro Joint Development Program: Policies and Processes, updated in 2016, states that "Metro will define affordable housing

as housing for residents earning 60% or less than AMI, and will prioritize units with even deeper affordability levels for very-low-income and extremely-low-income residents" (p. 7). There are also exemptions from standard parking requirements. The Vermont/Western Plan also mandates community benefit agreements. Although the Northeast Los Angeles Community Plan refers to displacement concerns, the Avenue 57 SNAP for the area does not speak to this issue directly.

The Warner Center Plan, which was adopted in 2013, speaks to a range of affordability policies such as workforce and affordable housing. Additionally the plan promotes anti-displacement policies such as living wage and local hiring. The Warner Center Plan does not directly refer to displacement or gentrification, but has an extensive list of policies that encourage both affordability and job opportunities for locals.

The West Adams, Baldwin Hills, Leimert Community Plan does refer to gentrification and displacement as a concern and provides numerous proposals to promote affordability. Numerous policies speak to affordable homeownership opportunities, the need to provide more affordable housing options built at the same scale as the neighborhood, the need to promote co-housing, and accessory dwelling units. The plan also promotes middle- and working-class homeownership and suggests that this could be done through condominium conversions.

The newest community plans, Cornfield Arroyo Seco (adopted 2013), the South and Southeast Los Angeles Plans (draft form), as well as the future Expo Line TOD plans, are more complex in their proposals. These plans create specific subareas where tiered zoning is encouraged as a means to promote denser development. The zoning scheme that would allow developers to build larger buildings if preferred uses, such as affordable housing, are included. These plans also have areas where single-family homes are prohibited, since the emphasis is on higher density as a means to provide more affordable housing options. The Expo Plan also incorporates public benefits as a part of development projects.

There is a significant distinction between the earlier and newer TOD plans. For instance, in the Vermont/Western Plan affordability is encouraged, but few incentives or guidelines are provided for developers when compared to the newer TOD plans, where a menu of incentives is provided to encourage different ways of achieving affordable housing.

# Prevalent Policies that Aid in Addressing Transit-related Displacement

We will next consider four policies in depth, three production and one preservation. We focus on inclusionary housing and condominium conversions, because of their prevalence in the Bay Area and Los Angeles County. We then discuss rent control in the Bay Area, because it is a policy frequently discussed in the literature and believed to be effective in addressing displacement, yet few cities in in the Bay Area have implemented it. Finally, we discuss preservation of mobile homes in Los Angeles County since it is one of the more prevalent policies in Los Angeles.

## Inclusionary Housing/Zoning

Many cities use inclusionary housing or inclusionary zoning policies to increase the stock of affordable housing at a minimal cost to the city and concurrent with development. Such policies

include requirements on developers to devote a certain portion of new development to below-market renters or owners or provide an in-lieu fee to develop affordable housing elsewhere. As can be expected, inclusionary zoning works best in robust housing markets (Hickey 2014) and mandatory policies produce more units than programs that are voluntary (those that have guidelines for including below-market rate units in new developments but where development is possible without meeting the requirements) (Hickey et al. 2014).

Inclusionary zoning programs are widespread—over 500 jurisdictions in 27 states and Washington, D.C. have policies in place, though they are particularly concentrated in California and New Jersey (Hickeyet al. 2014). In the Bay Area 78 cities have some type of inclusionary zoning policy in place, but only 16 cities have inclusionary zoning in Los Angeles County. The policies vary considerably, both in their design and implementation and in how much housing they produce (Hickey et al. 2014). Overall, "larger, more highly educated jurisdictions, and those surrounded by more neighbors with inclusionary zoning are more likely to adopt" such policies (Schuetz Meltzer, and Been with Furman Center for Real Estate and Urban Policy 2007).

Inclusionary zoning policies have generated a significant number of units of affordable housing. Nationally, Mallach and Calavita estimate that between 129,000 and 150,000 units have been produced through these programs, mostly in California, Massachusetts, and New Jersey[12] (Mallach and Calavita 2010). In California, between 1999-2007, inclusionary housing programs generated 29,281 affordable units, or 2% of total units authorized for construction[13] (Non-Profit Housing Association of Northern California 2007; California Department of Finance 2015).

A data limitation on inclusionary housing production figures is that units produced via now-shuttered California redevelopment agencies are left out. These redevelopment agencies had requirements that "15% of all production inside a project area has to be affordable, under state law," which meant that "every community [using redevelopment dollars] had to have an inclusionary policy of some kind," according to a policy expert (interview with authors). Therefore, other units developed in a similar manner as inclusionary zoning have been produced in the state and are not captured in these figures.

However, even with these potential data inaccuracies, the policy has only made a small contribution towards addressing the affordable housing shortage. A recent report from the CHPC finds a statewide need for 1.5 million rental homes affordable to extremely-low- and very-low-income households (CHPC 2015). In the Bay Area, just over 17,000 units of affordable housing (for moderate-, low-, and very-low-income households) are needed annually through 2040 (Wegmann 2012). Inclusionary zoning, on its own, is not enough to satisfy so large a demand.

[12] This estimate includes units produced "in whole or part with [in-lieu] fees," paid by developers in place of building the below-market rate units in their developments.

[13] 1,500,213 units of housing were authorized to be constructed in this period.

### *Statewide Characteristics of Inclusionary Housing Policies*

In California, inclusionary zoning has been significantly circumscribed. In 2009, two Court of Appeal decisions, *Building Industry Ass'n of Cent. California v. City of Patterson* ("*Patterson*") and *Palmer/Sixth Street Properties L.P. v. City of Los Angeles* ("*Palmer*") together upended previous understandings about the validity of, and appropriate analysis applied to, inclusionary housing ordinances. *Palmer* found that an existing state law related to rent control precludes jurisdictions from forcing developers to include rent-restricted units in their market-rate, rental developments (Shigley 2009). More specifically, the two cases, taken together, have the following implications for inclusionary ordinances:

1. *Patterson* suggests that inclusionary housing ordinances should be viewed as "exactions" that must be justified by nexus studies.[14]
2. *Palmer* does not allow inclusionary housing ordinances to limit rents unless public assistance is provided (*Palmer* does not affect buildings that receive public funds, nor those that receive some regulatory incentive, such as a density bonus (21 Elements, Strategic Economics, and Vernazza Wolfe Associates, Inc. 2015).

Since these decisions, most California jurisdictions have ceased applying their inclusionary policy to market-rate rental developments to stay clear of legal trouble (Hickey 2013). This is significant because California is home to almost half of the nation's inclusionary policies (Hickey 2013). Others have instead required developers to pay fees in lieu of construction inclusionary units, which the city can then use for funding separate affordable housing. However, such policies require a nexus study to be completed showing that the fee imposed is equal to the contribution the development makes to the affordable housing project; therefore, the potential revenue that can be raised is lower (Jacobus 2015).

The inability to generate inclusionary rental units comes at a time when many California towns and cities are seeing rent levels nearing all-time highs, and fiscally strapped state and local governments have cut or fully spent public funds that subsidize affordable rental housing. The *Palmer* decision has highlighted the importance of finding new ways to address legal impediments to rental inclusionary housing; some of the challenges are outlined in Appendix V.

In 2013, a bill to reverse the *Palmer* decision was passed by the California legislature, but was vetoed by Governor Brown (Daniel 2013). Efforts are ongoing to pass a "*Palmer* fix."

Although the Palmer ruling did not restrict inclusionary zoning policies related to ownership units, a subsequent case in San Jose challenged those laws as well (*California Building Industry Ass'n ("BIA") v. City of San Jose).* In June 2015, the California Supreme Court ruled that inclusionary zoning ordinances for ownership units are allowed under jurisdictions' police powers and, importantly, "affordable housing ordinances are simply price controls on new homes" and therefore require no

[14] Nexus studies must show that the construction of market-rate housing contributes to the need for affordable housing. They usually do so by showing the new market-rate housing will increase household spending in a community, which will create low-wage jobs, whose workers will need a place to live. An alternative nexus theory, more difficult to quantify, is that market-rate projects use up land that would otherwise be available for affordable housing. In a case involving commercial linkage fees, the Ninth Circuit discussed the "indirectness of the connection between the creation of new jobs and the need for low-income housing," but ultimately concluded that the fees bore a "*rational relationship* to a public cost closely associated with" new development. *Commercial Builders of Northern California v City of Sacramento,* 941 F.2d 872, 874-76 (9th Cir. 1991).

nexus studies or proof of "deleterious impact" to be passed, making their implementation much easier (Goldfarb Lipman LLP 2015).

Assessing the effectiveness and importance of inclusionary policies, one expert said: "No one has ever claimed that inclusionary is *the* policy…it's one more tool in the toolbox…maybe between inclusionary and impact fees and this and that, you can cobble together enough" to create some level of affordable housing (interview with authors).

A different expert commented that inclusionary zoning might be so widespread because it is, from a fiscal standpoint, easy to pass: it requires no new tax funding nor allocation of general fund monies (interview with authors).

One of the most significant differences between older and newer programs is in the affordability of units produced (NPH 2007). According to the NPH report, newer programs (post-2000s) produce more rental housing and more housing for lower-income households, when compared with older programs (Figure 5.5).

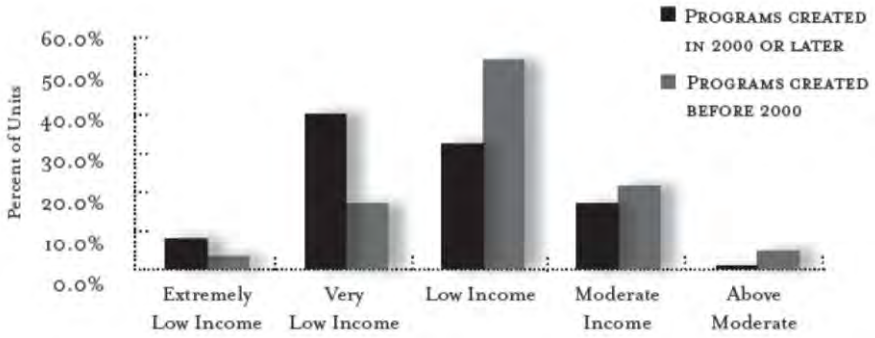



**Figure 5.5: Distribution of Units by Income Level and Age of Inclusionary Program**
*Source: (NPH 2007, 20)*

The report also documented that almost none of the housing goes to extremely-low-income households, a quarter to very-low-income, nearly half to lo- income, and 21% to moderate-income (Figure 5.6) (NPH 2007, 14).

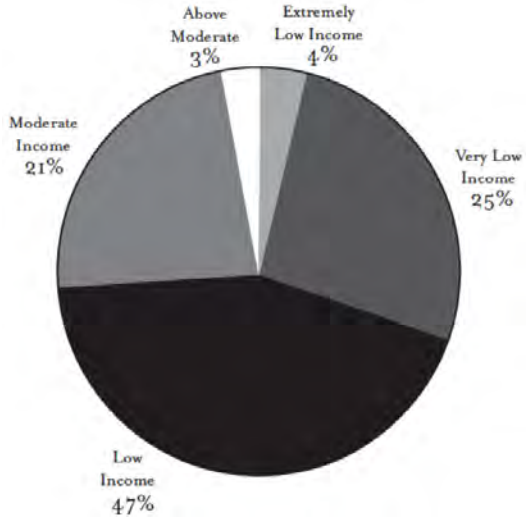



**Figure 5.6: Inclusionary-Development Units by Income Target**
*Source: (NPH 2007, 14).*

Although 81% of programs in California offered payment of fees as an option (CCRH and NPH 2003), there are not many estimates of the total amount of in-lieu fees generated by inclusionary programs. The NPH report (2007) estimates the number of units created as a result of in-lieu fee: "nearly one-quarter of all the reported units (4,798)" (NPH 2007, 17). But the authors also claim that it is very likely the figure is higher. Such counts are inexact because most jurisdictions mingle in-lieu fees with other housing funds and do not track them separately. While most of the cities and counties with inclusionary housing allow in-lieu fees, the NPH study found that a smaller percentage of developers exercised this option.

***Inclusionary Housing in the Bay Area***

In the Bay Area, 72% of cities have inclusionary zoning policies in place (Figure 5.7). One expert thought the policy's prevalence could be related to how easy the policy is to implement: "it doesn't cost them money," like funding affordable housing directly does. He believes that passing inclusionary laws allows cities to say "development is still happening, we're getting housing built, and we're still getting some affordable housing, aren't we great. So I think at some point if enough cities are doing it the rest do it because it just becomes common sense" (interview with authors). On the other hand, the expert also speculated that some communities implement inclusionary housing as a "growth control measure…[such cities] were really interested in getting no more housing at all" as opposed to affordable housing (interview with authors).

Three policies were adopted between 1979 and 1989; 19 in the 1990s; 38 in the 2000s; and 11 between 2010 and 2014. The policies differ in terms of whether they target rental or ownership housing or both, and in regards to the specific proportion of affordable housing they require. Other differences include whether developers are allowed to construct their inclusionary units off-site from their market-rate development, and whether they may pay fees in lieu of providing the housing. There is no geographic pattern to which cities have inclusionary zoning policies.

Notably, Oakland, which has 10 of the 14 policies in place, does not have an inclusionary policy. A longtime advocate in Oakland believed this was because the city council is "just so eager to get development of any [kind]" given an "image problem" and a view that "people don't want to invest in Oakland" and so are wary of placing any limitation on that, even negotiating with a developer to include community benefits or some affordable housing (interview with authors).

Most policies require developers to designate between 10-15% of their units as affordable, with others as high as 20% or as low as 4%. Nearly 70% of policies include an "in-lieu fee" provision that allows developers to pay a fee to the city instead of building the affordable units. Most policies specify a "minimum" number of units that triggers the law, around four-10.

Several cities include different requirements for different income levels. For example, in Richmond, developers must include either 17% of their units affordable to moderate-income households, 15% to low-income, 10% to very-low-income, or 12.5% to a combination of very-low-income and low-income. A plurality of policies explicitly target moderate-, low-, and very-low-income households (nearly 40%), while others focus on only low- and very-low-income households.

A very common feature of the policies is to include a prescribed breakdown of levels of affordability within the required below market-rate (BMR) units: for example, in San Bruno, 15% of units (in projects with 10 units or more) must be BMR; for rental buildings, 40% of those units are for very-low-income households, and the rest for low-income, while in ownership buildings, 40% are

reserved for low-income households and the rest for moderate-income. However, cities vary in terms of the income level qualifying for such affordable housing units—many cities also target moderate-income households, while other cities only focus on low-income households. Stakeholders from several cities in the Bay Area (Sonoma and Concord, for example) suggested changing the policies to shift the focus from moderate-income to lower-income households. Several other stakeholders suggested raising the in-lieu fees, which they said are currently too low. Many respondents also cited the *Palmer* case and the governor's veto of a "*Palmer* fix" as challenges to the implementation of such policies.

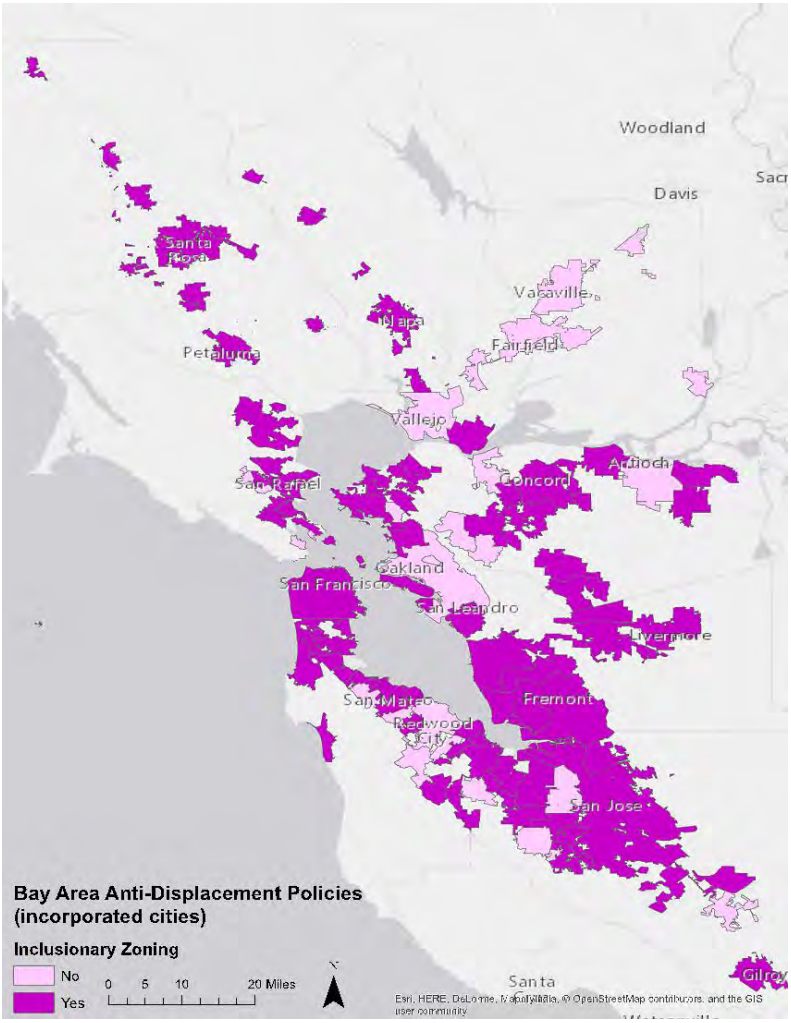



**Figure 5.7: Inclusionary Zoning in Bay Area Cities**
*Source: UC Berkeley Internal Analysis*

The experience of two cities in the Bay Area (Colma and Walnut Creek) shows that inclusionary zoning does not work in cities without significant new housing investment. In these cities, stakeholders report that very few units (less than 10) have been developed as part of the ordinances, which were implemented in 2005 in Colma and 2004 in Walnut Creek.

These are both places that have experienced minimal development of any level: in Colma, which is comprised in large part of cemeteries, only two units of any kind have been built between 2007 and 2013, while in Walnut Creek, the figure is 75. However, in Walnut Creek, 47 of those units have

been for very-low-income households, even though no or very few units of inclusionary zoning have been developed. This indicates that other strategies besides inclusionary zoning are working to provide affordable housing.

Other cities have seen more success: in East Palo Alto, 80 units were developed through the policy between 1994-2013; in Sunnyvale, hundreds of units have been constructed since 1980; and in San Francisco, 1,214 on-site units and 346 off-site units have been constructed between 1992-2013 (San Francisco Mayor's Office of Housing and Community Development 2014). These statistics are the exception to the rule: most cities do not track the numbers of units built through inclusionary ordinances, according to a stakeholder.

### *Inclusionary Housing in Los Angeles*

In Los Angeles County, there are 14 cities with inclusionary housing policies. Three cities adopted inclusionary zoning in the 1980s, five in the 1990s, and six from 2000 to 2010. La Verne has inclusionary zoning in its Old Town Community Plan, while Malibu only has in-lieu fees (Ordinance 375), but not inclusionary zoning. Twelve of the 14 cities with inclusionary housing policies have mandatory inclusionary zoning, while the remaining two, Long Beach and Monrovia, have voluntary programs. Voluntary programs are based on the premise that cost offsets provide sufficient incentive for developers to participate in the arrangement (Mukhija et al. 2010, pp. 233–234). On the other hand, mandatory programs are likely to be based on the premise that revenue-neutral cost offsets are not necessary or that voluntary programs, even if financially neutral, are insufficient to motivate developers (Mukhija et al. 2010, pp. 233–234).

There are three recent papers or reports that provide numbers for how many units of affordable housing were produced through inclusionary zoning policies for some of the 14 Los Angeles cities. Although not all the cities are included and the time frames for when the information was collected varies, they provide a glimpse of how many affordable units have been produced using inclusionary zoning since the late 1990s.

The Non-Profit Housing Association of Northern California (NPH) report discussed above found that a total 659 affordable units were created through inclusionary zoning in the Los Angeles region from 1999 to 2006; however, this only accounts for inventories in six cities (Table 5.9). (NPH 2007, p. 7). Artesia is the only jurisdiction in the Los Angeles region that reported that 10% or more of the total housing in its jurisdiction was for affordable units as a result of local inclusionary housing programs (NPH 2007, 8).

**Table 5.9: Inclusionary Housing Units Produced (1999-2006)**

| City | Affordable Units Completed | Units Created via In-lieu Fees | Total Units Created |
|---|---|---|---|
| Artesia | 25 | Not available | 25 |
| Calabasas | No response | No response | 0 |
| Glendale | No response | No response | 0 |
| Pasadena | 348 | 178 | 526 |
| Rancho Palos Verdes | No response | No response | 0 |
| West Hollywood | 37 | 71 | 108 |
| Total | 410 | 249 | 659 |

*Source: NPH, 2007*

A Lincoln Institute paper that analyzed 20 inclusionary housing programs nationwide included one city in Los Angeles, Santa Monica (Hickey 2014). According to this report, up to 2006 Santa Monica had produced around 1,000 affordable housing units from inclusionary housing, 998 rental and two for-sale units (Hickey 2014, p. 23). These figures do not include affordable units developed by in-lieu fees. A more recent study by Mukhija et al. (2010) provides the numbers of affordable units created through inclusionary zoning for nine of the 14 Los Angeles cities from 1998 to 2005, as seen in Table
5.10.

**Table 5.10: Inclusionary Housing Units Produced (1998-2005)**

| City | Affordable Units Completed | Affordable Units in Development | Units Created via In-lieu Fees | Total Units Created |
|---|---|---|---|---|
| Agoura Hills | 36 | 0 | Not available | 36 |
| Calabasas | 0 | 0 | 0 | 0 |
| Huntington Beach | 428 | 78 | 111 | 617 |
| Long Beach | 0 | 0 | N/A | 0 |
| Monrovia | 0 | 0 | N/A | 0 |
| Pasadena | 346 | 357 | 128 | 831 |
| Rancho Palos Verdes | 0 | 9 | 0 | 9 |
| Santa Monica | 680 | 72 | 534 | 1,286 |
| West Hollywood | 91 | 50 | 224 | 365 |
| Total | 1581 | 566 | 997 | 3143 |

*Source: Mukhija et al. 2010*

Overall, studies have found that many cities do not have complete and accessible data on the number of affordable housing units produced (or the in-lieu fees generated) through inclusionary zoning (Mukhija et al. 2010; NPH 2007).

## Condominium Conversion

The conversion of multifamily rental housing into condominiums is not a new phenomenon. The conversions of condominiums is a well-established trend that typically moves in waves (Chambers 2005; Pitarre 2005). "[Conversions were] popular in the late 1970s, and then [they] stopped completely. A mini wave happened again in the late 1980s, and now we're seeing another wave" (Pitarre 2005 in Chambers 2005, p. 359). Historically, the most dramatic increases in conversions have occurred just before the real estate market peaks (LePage 2004 in Chambers 2005). For example, between 1970 and 1979, there were 366,000 conversions nationwide; 135,000 of those occurred in 1979 alone (Casazza 1982, p. 4).

There are several factors that fuel the condominium conversion trends in California: the lack of affordable homeownership options, an insufficient supply of undeveloped land, and developers' financial motivation (Chambers 2005). Proponents of conversions emphasize that condos open the door to home ownership to people otherwise priced out of the housing market (LePage 2004, p. 29). Condominiums are typically much more affordable than detached, single-family homes. Thus, with affordable housing in California becoming increasingly scarce, "[c]onverted condominiums... are the only way for many residents to buy their first home" (Jones 2005a). The economic advantages of condominium ownership created a growth in both the demand and development of condominiums by the early 1980s (Vandeveer 1980; Judson 1983; Roback 1985).

The second component underlying the California boom of condominium conversions is the absence of available land for development (Hammer 2004). Thus, conversions are undertaken out of lack of alternative options. The last major factor fueling condominium conversions is the incentive for profit (Vandeveer 1980; Hammer 2004; Chambers 2005). The developer of a converted condominium project can realize returns from 15% to 30% in a matter of months (Pitarre 2005). Additionally, developers often save time and costs when they convert existing apartments instead of building new condominiums (Levy et al. 2006).

Together these incentives enable developers to pay substantial premiums for the apartment properties they acquire, often providing a high motivation for apartment building owners to sell their buildings (Gose 2004). Overall, this has resulted in a boom of converting existing apartments into condominiums in the 1980s and again in the early 2000s (Vandeveer 1980; Judson 1983; Roback 1985; Hofmann 2005; Ottens 2013).

While conversions have proven to be economically profitable to some building owners, the increasing frequency rate of conversions has sparked housing availability concerns. In recent years, the increase in conversions has resulted in the decrease of available rental units in many urban areas. For instance, by 1980, in California, the conversion of apartments to condominiums had doubled every year since 1976 (Vandeveer 1980, p. 467). The condominium surge returned in the mid-2000s.

Although no exact figures are available on how many renters are affected, the number of apartments sold to condominium redevelopers nationwide rose nearly tenfold from 7,800 in 2002 to 70,800 in 2004, according to Real Capital Analytics, a Manhattan-based research consulting firm (Jones 2005b). The condominium conversions are occurring most rapidly in Southern California, Northern Virginia, and the Miami and Las Vegas areas (Jones 2005b).

In addition to shrinking the supply of available rental units, condominium conversions also create numerous tenant-related problems (Committee on Government Operations, Commerce, Consumer, and Monetary Affairs Subcommittee, and U.S. Congress 1981). Tenants on fixed income such as the elderly, young families, couples, and individuals without operating capital are unable to purchase units they live in, or in some cases find replacement rental housing. Relocation becomes necessary and substantial moving costs can be incurred.

Condominium conversions are controlled primarily by local government regulations. In California as a whole, landowners must follow the Subdivision Map Act to convert rental property to condominiums, which includes applying for a tract map, attending a public hearing, and securing a public report from the State Department of Real Estate (Portman and Brown 2013). Tenants must be given sufficient notice if they are to be evicted, as well as the right to buy their unit (Portman and Brown 2013). However, even these provisions do not impose substantive restrictions on the ability of developers to convert (Bakker 2005). In addition, there are a number of ambiguities in state law provisions. Therefore, many cities have enacted condominium conversion ordinances that impose restrictions on the ability to convert and also deal with some of the ambiguities contained in the state law provisions. For example, under the California Subdivision Map Act, localities may establish social and economic criteria for regulating conversion in order to “make adequate provision for the housing needs of all economic segments of the community” (Cal. Gov Code § 65580(d)(West Supp. 1982)).

Local condominium conversion policies limit landlords' ability to turn multi-family rental housing into condominiums. These help existing tenants to stay in their housing as well preserving the overall stock of rental housing (Allbee, Johnson, and Lubell with ChangeLabSolutions 2015).

Bakker (2005) lists the most typical provisions found in procedural ordinances (ordinances that do not impose direct limits on conversions), which include a requirement that the initial notice of intention to convert contains a statement of tenant rights, a restriction on increasing rent during pendency of conversion process, and a requirement that the converter enters into extended leases (that will extend beyond the conversion).

Many local ordinances include provisions that require landlords to offer financial assistance to "elderly, disabled, or low-income tenants, and to families with minor children" as well as lifetime leases for elderly tenants (Portman and Brown 2013). Policies may also include specific notification requirements for tenants (such as 90 days or a year), relocation assistance, or offering residents the right to purchase their apartment (Allbee, Johnson, and Lubell with ChangeLabSolutions 2015).

In contrast to procedural ordinances, substantive ordinances typically limit the number of condo units that may be converted each year. The criteria for determining whether conversion is permitted or not is usually based on one or more of the following:

- Prohibiting conversions unless the city or regional vacancy rate is above a certain fixed amount.
- Prohibiting conversions unless the percent of total units rented is equal to or above a certain fixed number following the conversion. For example, the city might set its rental housing ratio at 30%, and conversions would be approved unless the conversion would push the proportion of rental units below 30%.
- Limiting annual conversions to a fixed percentage (such as 5%) of the total rental units in the community, or limiting them to a fixed number of units.

***Condominium Conversion in the Bay Area***

Seventy-three cities in the Bay Area have condominium conversion policies in place (67% of all cities/counties, see Figure 5.8), making this policy one of the most widespread of the 14 we considered. These policies were passed between 1974 and 2013: 11 in the 1970s, 24 in the 1980s (mostly 1980-1983), 12 in the 1990s, and 24 since 2000. Most prohibit conversion unless the vacancy rate in the city is above a certain level, usually around 3-5%. A few prohibit conversion of small buildings (such as fewer than 21 units in Burlingame). Others limit conversions based on the proportion of the housing stock that is rental: in Alameda and Santa Clara, conversion cannot occur if the percentage of units that are rented will drop below 40% due to conversion; in San Anselmo, the figure is 25%; in Mountain View and San Bruno, there is a floor of rental units as opposed to a percentage. Others set an annual limit on the number of units that may convert to condominiums: 200 in San Francisco, 100 in Fremont, 100 in Berkeley, 5% of units in Sausalito, 7% of units in Dublin. In Piedmont, apartments converted to condominiums must be replaced in kind by an equal number of equivalently priced rental units, with rents restricted for 55 years.

One stakeholder in Daly City believes "there is no need for the statute. Condominium conversions are not the trend in the housing market as they once were in the 1980s-1990s." Several other stakeholders around the Bay echoed a similar sentiment: while important at one time, condo conversions simply are not happening anymore. Yet many stakeholders around the Bay view these policies favorably: one in Sonoma noted "it has been effective;" and in South San Francisco, "no condominium conversions have occurred…to that extent, the current policy is very successful at

preventing the loss of rental units." On the other hand, a stakeholder in San Francisco writes, "There are multiple problems with the ordinance. Existing tenants are pressured to accept buy-outs to move…[and it] also does not regulate [tenancy-in-common] conversions which would require state law reform to cover such conversions" (interviews with authors).

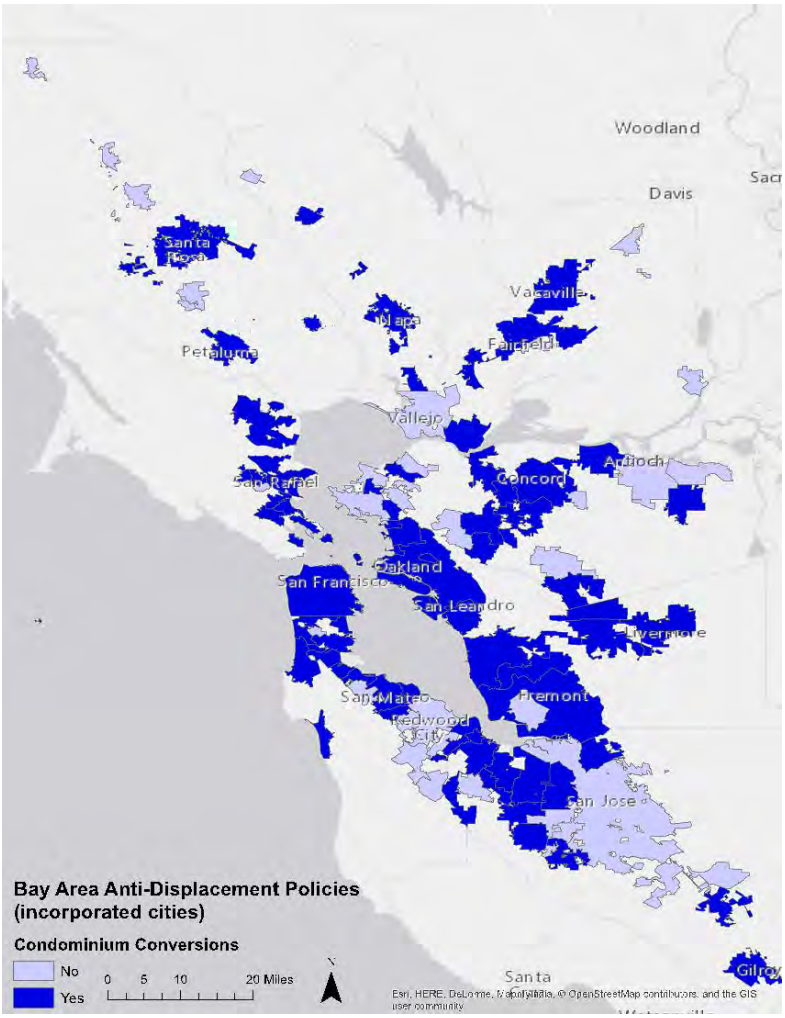



**Figure 5.8: Condominium Conversion Policies in Bay Area Cities**
*Source: UC Berkeley Internal Analysis*

One policy expert described many loopholes in Oakland's condominium conversion policy that make it ineffective. The law's intent is to ensure that any developer who takes rental units off the market must replace each one with rental housing someplace else. Developers can do this by building those units or buying "credits" from another developer for rental housing that another developer owns. However, developers can build a building as a condominium, rent out the units for seven years, and, through a provision in the law, that seven-year period generates conversion rights which can be sold to another developer. At the end of the seven-year period, the original developer can then sell the units, which means "there's no permanent replacement housing." Another loophole in the law, according to the expert, is that two- to four-unit buildings outside a certain zone in the city are exempt from the policy; most of the "close to 1,000" condo conversions in the last 10-15 years were in buildings this size (interview with authors).

One way developers avoid condominium conversion policies statewide is to evict tenants under the Ellis Act (which is by law a statement that they are exiting the rental housing business) and then sell the emptied building as condominiums later on, according to an expert (interview with authors).
These are but a few examples of how condominium conversion laws—and others, too—may seem effective on paper, but play out very differently.

**Condominium Conversion in Los Angeles**

In 2007, the City of Los Angeles issued 208 permits allowing apartment complexes to be converted to condominiums. Before the recession in 2008/2009, it was common for apartments to convert to condos when the market was hot. But when the housing bubble burst, the trend slowed down and declined every year afterwards. The city issued only 38 permits in 2010 (Ottens 2013). However, a 2013 *Los Angeles Times* article stated that, "Apartment building owners in Los Angeles and throughout California are once again converting to condos, but not at the torrid pace of 2007, when condo conversion peaked before the Great Recession" (Ottens 2013).

The Condominium Conversion Ordinance is the most prevalent anti-displacement policy in the Los Angeles region, with 27% of the jurisdictions having implemented it (24 jurisdictions). The majority of the cities in Los Angeles have procedural ordinances. The earliest condominium conversion ordinances date back to the late 1970s (two cities) and early 1980s (five cities). There were five cities that implemented condominium conversion ordinances in the 1990s and 12 from 2000 to the present. One of the cities, Pasadena, has imposed a Condominium Conversion Moratorium, which began in 2007. The use of these ordinances by cities may be reflective of condominium conversion booms from the 1980s and early to mid-2000s.

## Rent Control in the Bay Area

Rent control refers to policies that limit the rent private landlords may charge tenants, either fixing it at a certain dollar amount, allowing it to increase by a specific percentage (often tied to the official rate of inflation) annually, or having the allowable increase set by a board each year. Some policies include restrictions on evictions and specific processes for landlords or tenants to petition for higher or lower increases, respectively.

Nationally, rent control was popular in the late 1960s through the early 1980s (Levy et al. 2006). By the late 1970s, 170 municipalities had put rent control laws in place, "mainly in the Northeast and California where the rent pressures were most severe and tenant organizations were strongest" (Keating and Kahn 2001, p.1). However, in the 1980s, an "emerging conservative onslaught" put tenants "on the defensive" and curtailed additional rent control ordinances, though cities that had passed rent control maintained a strong tenant voice (Keating and Kahn 2001). However, in Massachusetts and California, rent control was eliminated or limited, respectively, statewide; this is consistent with a national trend whereby opponents of rent control turn to the state level if they cannot roll back laws at the local level (Keating and Kahn 2001).

Nine cities in the Bay Area have rent stabilization/control policies in place, summarized in Table 5.11 and displayed in Figure 5.9.

**Table 5.11: Cities in the Bay Area with Rent Stabilization/Control Ordinances**

| City | Year Introduced, Last Modified | Allowable Rent Increases | Type (according to California Tenants' Rights Guide) |
|---|---|---|---|
| Berkeley | 1980, 2005 | 65% of the Consumer Price Index (CPI). Once per year. | Strict |
| Campbell | 1983, 1998 | No binding rule, but allows tenants to contest rent increases and includes dispute mediation. | N/A |
| East Palo Alto | 1983, 2010 | 80% of the CPI but not exceeding 10%. Once a year. | Strict |
| Fremont | 1997, 2001 | No binding rule, but allows tenants to contest rent increases and includes dispute mediation. | N/A |
| Hayward | 1980, 2003 | 5% max annual increase. | Weak |
| Los Gatos | 1980, 2004 | 5% max annual increase or 70% of the increase in the CPI, whichever is greater. Once a year. | Weak |
| Oakland | 1980, 2014 | CPI; more if landlords have "banked" their rent increases. Once a year. | Weak |
| San Francisco | 1970 | 60% of CPI, not exceeding 7%. | Strict |
| San Jose | 1985 | 8% increase; 21% if the last increase was more than 24 months ago. Once a year. | Weak |

*Source: UC Berkeley Internal Analysis; (Portman and Brown 2013).*

All the ordinances were passed between 1980-1985 except San Francisco's, which passed in 1970. Explaining the reason for the surge in rent control policies in the early 1980s, one stakeholder said these policies were in reaction to Prop 13. A policy expert mentioned that many rent control laws include a provision that if the vacancy rate is above a certain level (5 or 6%), the law does not apply, "because if you've got a really soft market it's harder to argue that there's a public purpose" (interviews with authors).

Most policies use the consumer price index, a measure of inflation, as the benchmark for the increase—such as East Palo Alto, where allowable rent increases are 80% of the consumer price index in that year—while others have a set increase of 5% or 8%. All policies allow only one increase per year.

Another way these policies vary is in which units they cover; statewide, no policy covers all rental housing (which is circumscribed under state law). For example, in San Francisco, units built after 1979 are exempt (Portman and Brown 2013). Most of the policies in the Bay Area exempt units built after they were passed.

All the cities listed here, with the exception of Los Gatos and San Jose, also have just-cause-for-evictions laws in place, which prohibit a landlord from evicting a tenant except for specific reasons. Such provisions are essential to make rent control effective because, without them, landlords can avoid rent control limits by evicting tenants for no reason, and then using vacancy decontrol to raise rent on the next tenant.

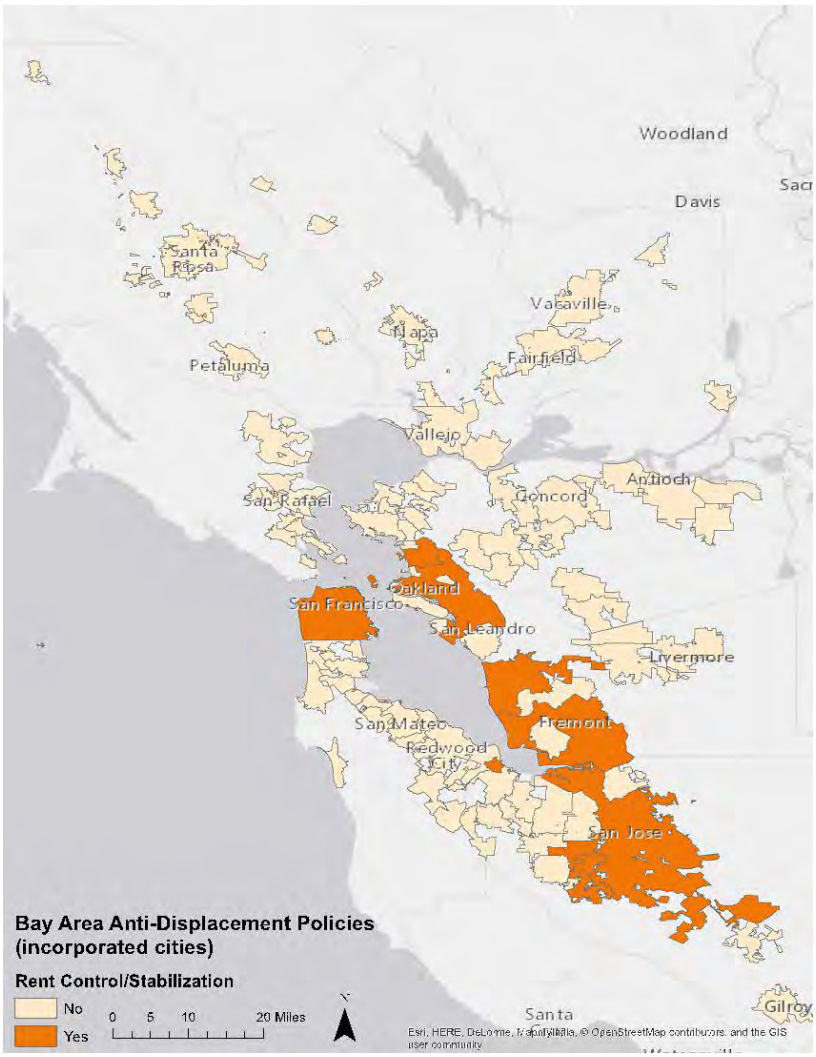



**Figure 5.9: Rent Control Policies in the Bay Area**

*Source: UC Berkeley Internal Analysis*

The California Tenants' Rights guide classifies California cities' rent control policies into groups: "Weak Rent Control" laws allow landlords to raise the rent generously, and even above the fixed amount unless a tenant protests to a rent board. These policies do not require landlords to register their units with the city. "Moderate-to-Strict Rent Control" laws require the landlord to prove they must raise rent beyond the threshold listed in the law, include a just-cause evictions ordinance, and require landlords to register units with the city (Portman and Brown 2013).

One stakeholder from San Jose said, "Rent Control has been implemented in San Jose and is in force for qualifying units. However, because there is high tenant turnover and no eviction protections, it has not been effective in keeping rents down overall." Regarding Oakland's rent control law, a stakeholder there commented that, though "there are weaknesses…at the end of the day, [it] is working." One weakness, cited by a different stakeholder, is that the city lacks a registry of rent-controlled units, making it difficult to track them and ensure compliance (interview with authors).
There have been no new rent control ordinances passed in the Bay Area since 1985. However, San Mateo County recently appointed a commission to study the policy and then promptly scaled back the study to be a request for only "a little" more information (Kinney 2015a; Kinney 2015b). In

Richmond, a just-cause evictions and rent control ordinance passed a first reading in July 2015, only to be voted down at the second reading amidst major pushback, though a revised version was ultimately passed (Swan 2015; Ioffee 2015). These examples show how difficult it is to pass new rent control ordinances. The stakeholder believes the Bay Area may be experiencing another "moment" where such policies may kick in, "because the crisis is so sharp and happened so quickly" (interview with authors).

In terms of directions for improving rent control policies, one expert thinks a key change would be shifting the onus of proving a rent increase is legal from tenants to landlords (where applicable): "If that were the case, you'd have to change the whole administration and in the long run it'd probably increase the registration fee because you'd now be registering units and…there'd be cases all the time. So, it would definitely change it" (interview with authors).

Other key components of a rent control policy, according to the expert, include anti-harassment provisions, disallowing owners from "effectively constructively [evicting] their tenants…And there has to be just-cause, because if you don't have just-cause then, you know, they'll just give people a 30-day notice. And if you have just-cause and no rent control, then they'll just double the person's rent. You know, so the two have to go hand in hand" (interview with authors).

## Mobile Home Rent Control in Los Angeles

Although only a handful of mobile parks are located near transit, mobile home rent control is so widespread in the state that it is worth discussion. Most of the mobile home park construction in California took place in the 1960s and 1970s (Baar 2011). From 1960 to 1975, the number of mobile home park spaces in the state increased from about 150,000 to about 370,000. No mobile home parks have been constructed within the City of Los Angeles since the 1980s (Baar 2011; Zheng et al. 2007). A 1984 study commissioned by the city noted that no land was zoned for mobile home parks and that they were only permitted under special use permits. In Los Angeles County, the supply of mobile home park spaces has declined by about 10% since 1986, from 53,496 to 47,907 (Baar 2011).

The majority of mobile homes in the City of Los Angeles were manufactured before 1980, and only about 20% were manufactured within the last 25 years. By 2011, the City of Los Angeles had 57 mobile home parks with a total of 6,526 mobile home spaces (Baar 2011). In 2011, the average monthly rent of a mobile home park space in the City of Los Angeles was about $615 (Baar 2011, p. i). In addition to space rents, most mobile home tenants reimburse park owners or directly pay for sewer, water, or trash collection expenses.

The rising housing and land prices in Los Angeles and other California jurisdictions impact the land (or pad) rents in many of the state's mobile home parks (Zheng et al. 2007, p. 5). As a consequence, renters in many jurisdictions have launched efforts to have mobile home rent controls enacted into law. From 1983 to 2003 the number of mobile homes in California subject to rent controls increased (Zheng et al. 2007, p. 4). By 2005, over 90 California cities and eight counties had some sort of mobile home rent control (City of Banning 2005). In both the Los Angeles and Bay Area regions, rent control laws are more commonly adopted for mobile home parks than multi-family residential properties.

Mobile home park owners in the City of Los Angeles can increase space rents by only 10% when a mobile home is sold in-place to a new owner. This provision is the same in virtually all mobile home

parks, because mobile homes are sold in-place to incoming tenants, rather than being moved. The 10% ceiling under the mobile home space rent regulation differs from the regulations of apartment rents that permit unlimited rent increases upon a change in tenancy (Baar 2011). In the City of Los Angeles, owners may increase the rent by the consumer price index.

Under California state law, spaces covered by leases of one year or more that meet specified conditions are exempted from local rent regulations (Civil Code Sections 798-799.2.5). However, park owners may not require that current tenants enter into such leases and most local rent ordinances, including the City of Los Angeles ordinance, provide that prospective tenants cannot be required to enter an exempt lease as a condition for approval to move into the park (Baar 2011, 40).

Some have speculated that the implementation of rent controls in California jurisdictions may explain the declining shipments of mobile homes to the state (Hirsch and Rufolo 1999). However, while the decrease in mobile home park construction since the 1980s has been attributed to rent controls, it is important to note that since 1992, state law has exempted newly created mobile home park spaces from local rent regulations (California Civil Code Sec. 798.45 (1992)).

# Case Studies

To better understand how these and other policies have helped avoid displacement in practice, we next consider several case studies of places that were vulnerable to but did not experience the gentrification or displacement we would have expected.

In the Bay Area, we profile neighborhoods in Chinatown (San Francisco), East Palo Alto, and San Jose. These neighborhoods (each occupying one or two census tracts) were chosen from among all the tracts that were low-income places at risk of gentrification or displacement[15] in 1990-2000, but did not experience gentrification[16] between 2000 and 2013, shown in Figure 5.10.

[15] "At risk of gentrification" defined as: Population in 2013 over 500; Percent low income (80% or less than surrounding county's median income) greater than regional median (39%); Signs of vulnerability to gentrification/loss of low-income household (at least 4 out of 7): 1. Has rail station in tract 2. Percent of units in prewar buildings greater than regional median, 3. Loss of market-rate units affordable to low-income households greater than regional median (1990-2000), 4. Employment density greater than regional median (2000), 5. Rent increase greater than regional median (1990-2000), 6. Real estate sales value increase more than regional median (1990-2000), 7. Development of market rate-units greater than regional median (1990-2000).

[16] Gentrification defined as: Growth in percent college-educated greater than region; Growth in median household income greater than region; Percent market-rate units built between 2000-2013 greater than regional median; At least one of the following: Single-family sales price per square foot greater than regional median, Multi-family sales price per square foot greater than regional median, Home values greater than regional median.




**Figure 5.10: Census Tracts at Risk for Gentrification/Displacement in 1990 and 2000, but Did Not Experience Gentrification between 2000 and 2013**

*Source: UC Berkeley Analysis*

In Los Angeles County, there are 80 Metro rail stations. Here, our focus is three Metro station areas: Chinatown, Hollywood/Western, and 103rd St./Watts Towers. Input from our Southern California Advisory Board and diversity of station-area conditions influenced the selection of the three case studies. The neighborhoods are defined as 2010 census tracts completely or partially within a half--mile radius of the transit station. The Chinatown and Hollywood/Western are mixed-use areas that are at risk of gentrification, while 103rd St./Watts Towers is a residential commuter neighborhood that is not gentrifying. Specific policies related to transit-oriented development are in place at Hollywood/Western to mitigate change, while more general policies linking greenhouse gas reduction to land use and transportation have been adopted in Chinatown. Economic and community development efforts have been proposed for Watts over the decades.

## Chinatown, San Francisco

Chinatown is situated at the center of San Francisco's booming real estate market, with close proximity to the Financial District, Downtown, and affluent neighborhoods such as Russian Hill. Due to its prime location, it was expected that Chinatown would have succumbed to the pressures of development and speculation that have transformed surrounding areas and much of San Francisco. However, deliberate anti-displacement zoning policies, widespread rent control, and a well-organized community have preserved Chinatown as an Asian-American and low-income enclave.

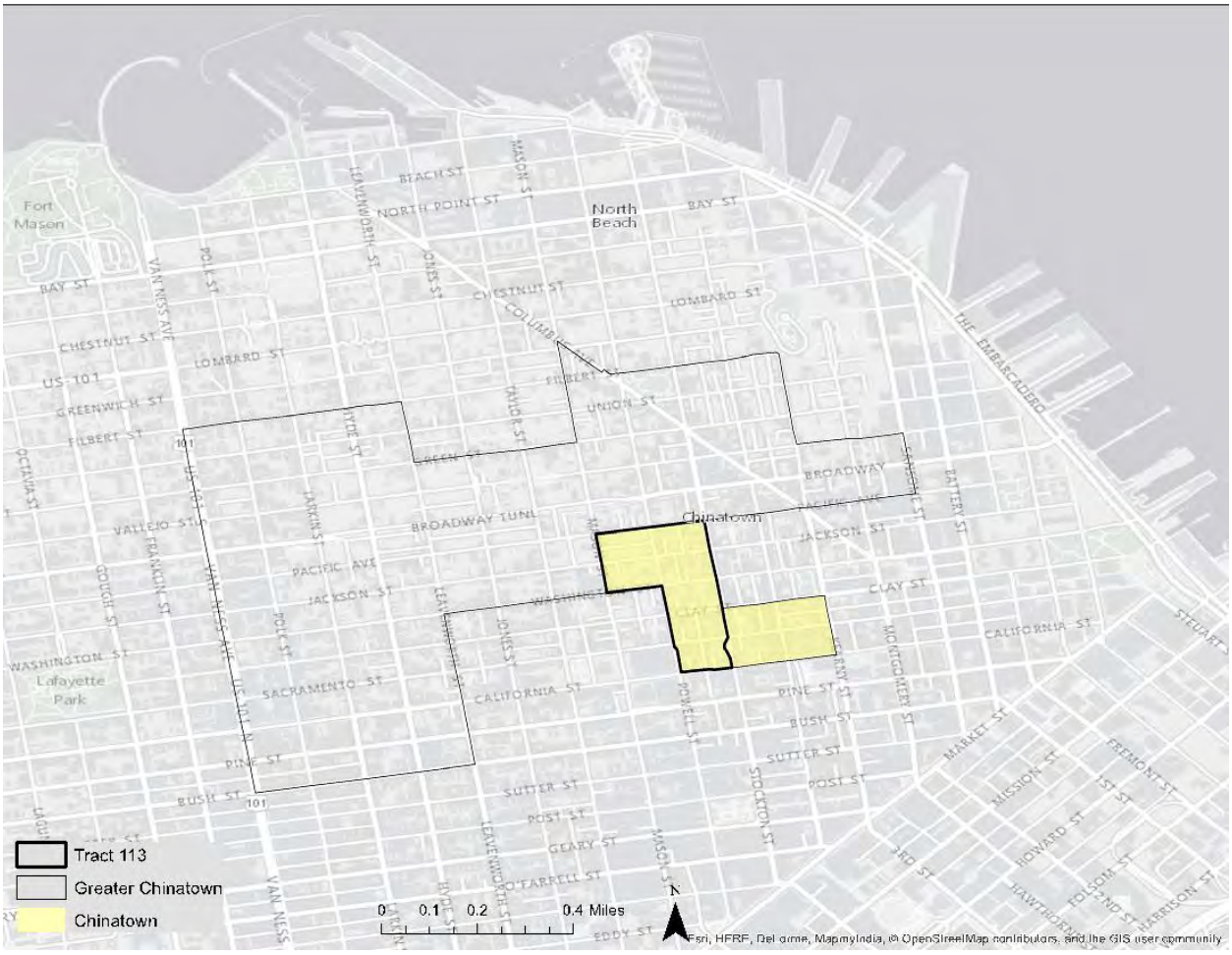



**Figure 5.11: Tract 113, Chinatown, and Greater Chinatown**

In this case study, we discuss Chinatown as a whole, but focus specifically on one census tract within this area: Tract 113, which closely mirrors the core of Chinatown (Figure 5.11). After outlining the history of Chinatown, we provide an overview of its demographic and housing characteristics, today and historically, before discussing the anti-displacement policies that have preserved the neighborhood.

### *History of Chinatown*

As one of the oldest ethnic enclaves in the U.S., San Francisco's Chinatown has been a major immigrant gateway as well as a cultural, economic, and residential hub for the Bay Area's Chinese-American and Asian-American communities for over 150 years.

Chinatown's current location was established after the original neighborhood was destroyed in the 1906 earthquake and fire that razed over 80% of San Francisco. To this day, the official Chinatown neighborhood remains a relatively small land area (Figure 5.11). With the rapid growth of the Chinese--American population beginning in the 1960s, neighborhoods adjacent to the core area became home to many Chinese-American families, and businesses and institutions serving the Chinese-American community likewise began establishing themselves beyond the boundaries of Chinatown.

Much of Chinatown's housing was built as single-room occupancy (SRO) residential hotels or small rooms in commercial structures or community spaces. Chinese immigrants, who were barred from property ownership, were subjected to discriminatory housing practices by absentee landlords seeking to maximize profits. Housing was thus poorly maintained and often overcrowded (Yip 1985).

In the 1960s, the liberalization of U.S. immigration policy led to a population boom and subsequent shortage of affordable housing. Chinatown quickly became one of the densest neighborhoods in the country, with an overwhelming majority low-income renter population. SROs and other small residential units were often overcrowded, in poor condition, and yet still expensive for very low-income residents (Tan 2008).

The Chinese community's spatial segregation and social isolation contributed to the development of "an impenetrable social, political, and economic wall" between Chinatown and the rest of San Francisco (Wang 2007). While the neighborhood's insularity allowed for the formation of strong social networks and a self-sufficient system of community institutions, small businesses, and cultural activity (Yip 1985), it also reinforced a language barrier that still presents a challenge for socioeconomic integration and contributes to persistently high poverty and unemployment rates (Wang 2007).

### *Relative Demographic Stability, 1980-2013*

Since the 1960s, Chinatown's population has included a large percentage of foreign-born, low-income Chinese-American and Asian-American families. The population in the tract increased by 13% between 1980 and 2009-2013 (from 2,840 to 3,204 residents), with a concurrent growth in the housing stock from 1,152 units to 1,617 units[17].

Asians decreased in their share of the population from 86% in 1980 to 78% in 2009-2013. However, the proportion of residents who are foreign-born only decreased slightly in that same time frame: from 69% to 67%. Seniors (60 and older) have also consistently made up a significant share of the population.

[17] Data in this section comes from the U.S. Census for the years 1980, 1990, 2000, and 2010, and the Geolytics database for 2013.

Poverty has increased as incomes have fallen: the poverty rate rose from 18% in 1980 to 26% in 2013, while median household income dropped from $45,797 to $23,261 (both in 2010 dollars). Today, Greater Chinatown is still primarily renter-occupied, though the share of owner-occupied housing units has grown slightly in recent years. With an estimated residential density of 85,000 people per square mile (Tan 2008), overcrowding and housing affordability remain pressing issues for the community: 19% of renter households are overcrowded (more than one person per room). Most (88%) housing units are rented, rather than owner-occupied. Median gross rent increased only slightly, from $535 in 1980 to $654 in 2013 (both in 2010 dollars). Even with these relatively low rents, 54% of renters pay more than 30% of their income on rent.

Rental prices have deviated significantly by area. Figure 5.12 shows that in contrast to other areas and San Francisco overall, median rent in Chinatown has remained exceptionally stable since 1990. This is primarily due to the large number of subsidized and rent-controlled units in Chinatown. This is powerful evidence of Chinatown's unlikely preservation as a place affordable to low-income people.

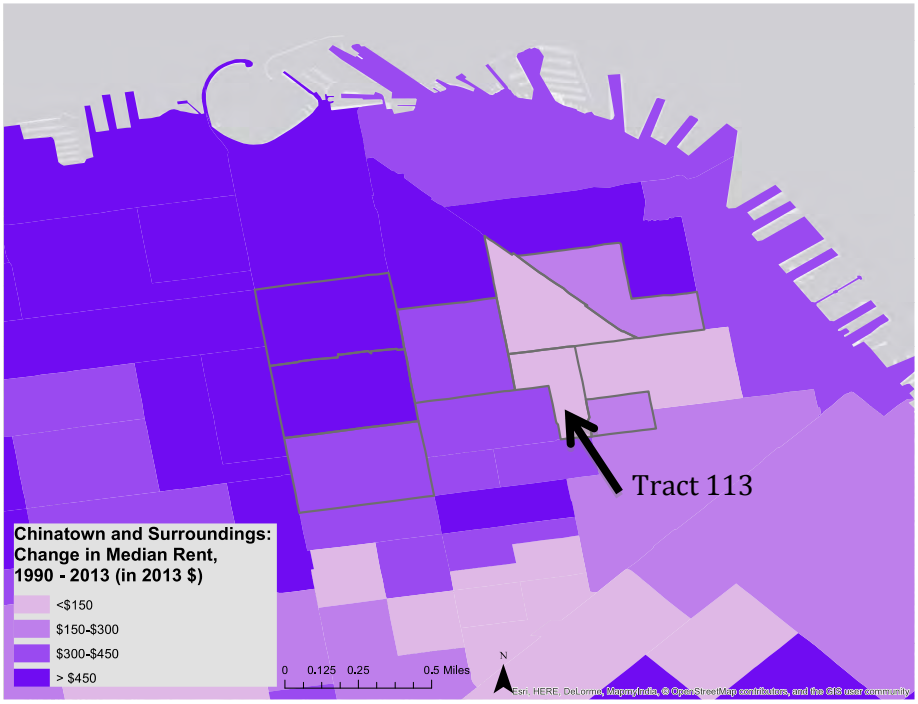



**Figure 5.12: Change in Median Rent in Chinatown (Tract 113) and Surrounding Tracts**

***Anti-Displacement Policy in Chinatown***

In the face of external pressures of gentrification, a number of key policies and planning efforts have uniquely allowed Chinatown to maintain its historic character and accessibility to low-income San Franciscans. One of the most influential and comprehensive policy changes took place in 1986, with the adoption of the City Planning Department's official Chinatown Rezoning Plan as an amendment to the General Plan, which resulted in the designation of Chinatown as a mixed use area distinct from Downtown.

The Chinatown Resource Center (predecessor to the currently existing Chinatown Community Development Center), led this planning effort with the Chinese Chamber of Commerce and Asian Neighborhood Design. In the years prior, Chinatown Resource Center had worked tirelessly to stave

off infringing developers, many of whom sought to purchase land for office uses (Chinn 2014). From the mid-1970s to mid-1980s, approximately 1,700 residential units in Chinatown were converted to office use, and at the same time, an influx of capital from Asian firms drove up both commercial and residential rents (C. Li 2011). As these factors exacerbated the threat of displacement, the Chinatown Resource Center realized the unsustainability of this project-by-project approach and switched course toward advocating for structural changes to the neighborhood's land use policy in an attempt to slow development (Chinn 2014).

They organized residents behind a proposed set of zoning regulations that were originally conceived of as part of a Chinatown community planning process that took place over several years prior (Chinn 2014), during which the San Francisco Planning Department had proposed a new Downtown Plan, and housing experts across the city sought to limit the proliferation of office buildings to preserve affordable housing (C. Li 2011). With the growing threat of speculation and encroaching development from Downtown, residents, community-based organizations, and city officials all exhibited political will for policy change, agreeing that action must be taken to preserve Chinatown's character and culture for its existing residents (Chinn 2014).

The proposal, which specifically addressed the core portion of Chinatown, sought to downzone the neighborhood by setting lower height limits that would curb the neighborhood's development potential. Previous zoning had set limits at much higher than the prevailing scale of most existing buildings. This was due to the fact that Chinatown had originally been zoned as "a creature of downtown," resulting in regulations that did not align with the neighborhood's distinct character (Chinn 2014). The community's proposal was thus broadly viewed as a necessary, sensible shift toward land use policy that was indigenous to Chinatown and "was the single most important achievement of Chinatown CDC in its first 35 years," according to its longtime director (Chinn 2014; Chin 2015, p. 140).

The 1986 Rezoning Plan's central aim was to protect what the Planning Department acknowledged was a "virtually irreplaceable" resource of affordable housing in Chinatown. The plan effectively prohibited demolition, allowing it only "if that is the only way to protect public safety or for a specific use in which there is a high degree of community need," and furthermore banned conversion of residential buildings into different uses (San Francisco Planning Department, n.d.).

Chinatown's large stock of SROs was granted protection by the 1980 citywide Residential Hotel Ordinance, which made it very difficult for developers to convert residential hotel rooms to commercial use by requiring replacement of lost affordable units and mandating that 80 percent of the replacement cost be paid by developers to the City for conversions or demolitions (Fribourg 2009).

With these requirements in place, approximately 50%of the Chinatown Core's housing stock has remained SRO hotels (Tan 2008), and an estimated 92% of units are protected by the 1979 San Francisco Rent Control Ordinance (Figure 5.13) (San Francisco Department of Public Health). A portion of these were purchased and by CCDC to preserve as low-rent housing (Chin 2015, p. 115).

Figure 5.13 also shows that there has not been a single no-fault eviction in Chinatown. According to one expert, "a large majority of these units continue to be owned by individuals that care about preserving Chinatown such as ethnic Chinese landlords and family associations"(Eng 2015).

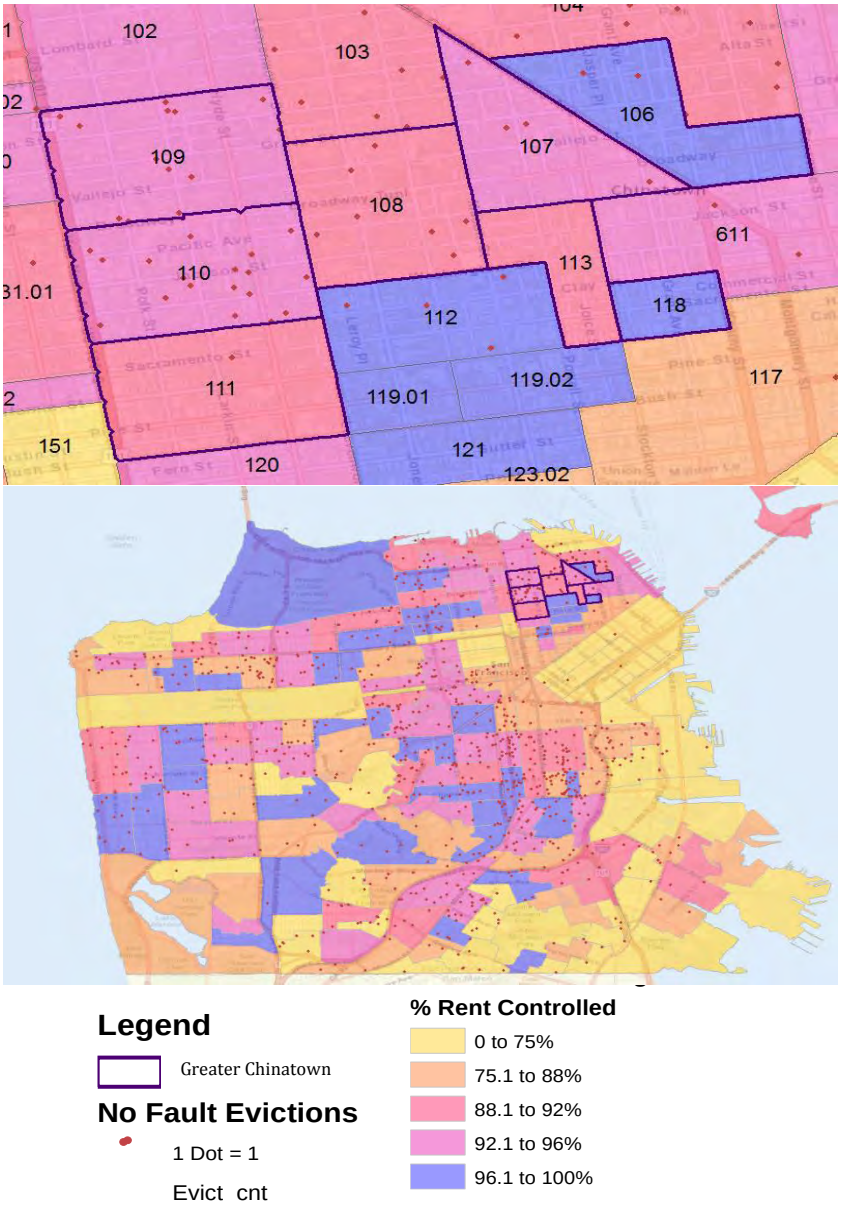



**Figure 5.13: Instances of No-Fault Evictions and Percentage of Rent-Controlled Units in San Francisco by Census Tract and Chinatown and Surroundings**

*Source: San Francisco Department of Public Health*

Thirty years later, the 1986 effort can thus be considered to have essentially achieved its policy objectives to "preserve the distinctive urban character of Chinatown" and "retain and reinforce Chinatown's mutually supportive functions as a neighborhood, capital city, and visitor attraction" (San Francisco Planning Department, n.d.).

While these policies did effectively preserve existing affordable housing, the construction of new affordable housing in Chinatown—desperately needed for San Francisco overall—has been limited; the small stock of 342 subsidized and public units has not increased since 1990, despite increasing need (CHPC 2014). Thus, the neighborhood's land use policy has given rise to other unresolved challenges of supplying sufficient housing in San Francisco. Plus, the housing in Chinatown is aging,

meaning there is a declining quality of housing as buildings have deteriorated (Chinn 2014). According to one stakeholder, the zoning limits in the area limit the ability to rebuild existing buildings as affordable housing—"if they fall in an earthquake, we lose that [affordable] housing" (interview with authors).

However, constraints surrounding both redevelopment and rehabilitation have made Chinatown somewhat less desirable to residential real estate speculators, limiting displacement (Chinn 2014). Since many buildings would likely require major rehabilitation and potentially demolition to allow for conversion into condos or tenancies in common, a conversion project would be a much more difficult and costly undertaking in Chinatown compared to other San Francisco neighborhoods that have been systematically impacted by such types of redevelopment. In some senses, then, Chinatown has avoided gentrification because other areas were—and continue to be—more susceptible to gentrification, or lucrative for speculators seeking to flip residential properties (Chinn 2014).

### *Community Resistance to Displacement*

A profound sense of community identity persists among Asian-American residents as well as a broader set of Asian-American individuals who live outside the area yet remain deeply connected to Chinatown's culture, institutions, and spaces. The driving force behind this sense of cohesion is a high rate of civic engagement, which has continued to shape Greater Chinatown's built environment since the 1986 rezoning victory (Fujioka 2014). The presence of many non-profit organizations also helps with this community-building (Eng 2015).

Even before these successes, a cohesive Chinese-American community had begun forming in the 1960s, occurring in the context of the "fight against 'urban renewal'" and through several major fights, including over the International Hotel, a playground, and the Mei Yuen Affordable Housing Project (Chin 2015).

With affordable housing as an unceasing concern in Greater Chinatown as well as all of the Bay Area, the Chinatown Community Development Center (CCDC) and other community-based organizations have formed resilient organizing networks with citywide reach. They have also brought their resident base into the broader movement around the right to the city. Recent campaigns have taken on the uptick in owner-move-in evictions that singled out elderly residents as well as Ellis Act evictions. Informed by a commitment to community-based neighborhood planning from the ground up, CCDC, together with tenant groups such as the 1,000-member Community Tenants Association, have won new eviction protections for seniors and residents with disabilities.

In preserving community spaces and connections throughout Chinatown, strong political engagement has also preserved tight social networks among Chinese-American residents. These social connections have also played a key role in the neighborhood's ability to resist gentrification.

### *Conclusion*

Despite its success, Chinatown faces ongoing challenges, including the opening of a new subway station there in 2019 (which could spur new gentrification) and eviction pressures in SRO-buildings and elsewhere as young professionals move in (Har 2015; Dineen 2015). While part of the broader picture of San Francisco's affordability crisis, the unduplicated factors that shape Chinatown's built form require a locally-tailored approach to preserving the neighborhood's

livability and vibrancy. As with the 1986 Rezoning Plan, the neighborhood's effectively mobilized resident base allows for potential solutions to new problems to be indigenous to the community. Continued organizing efforts by community groups like CCDC will be critical as both the population and the neighborhood's infrastructure continue to evolve.

## East Palo Alto, San Mateo County

East Palo Alto is located on the San Francisco Peninsula in the heart of Silicon Valley. It is a small city with a population of about 29,000, bordered by the affluent cities of Palo Alto and Menlo Park. A young city, it was incorporated in 1983 in the face of claims from critics that the city could not generate enough revenue to sustain itself. Peninsula Interfaith Action, an advocacy group, notes that incorporation was intended to ensure that, as a community of color, the city would be led by people of color (SFO/PIA 2014). Incorporation prevailed despite numerous lawsuits from special interest groups seeking to frustrate the process, and East Palo Altans have great pride in their rich history of community activism and their struggle to achieve self-determination. Strong protections for renters and support for affordable housing are crucial aspects of the city's identity. As one interviewee active in the incorporation movement put it, "part of our political history is that we became a city and the first ordinance was to freeze the rents, [because] in the county there was nothing in place [to protect renters]" (interview with authors).

The city has long served as a pocket of affordability for low-income households who might otherwise be excluded from the affluent region. In recent years, two census tracts that comprise the bulk of the city (6119 and 6120[18]) have experienced less gentrification than would be expected (Figure 5.14).

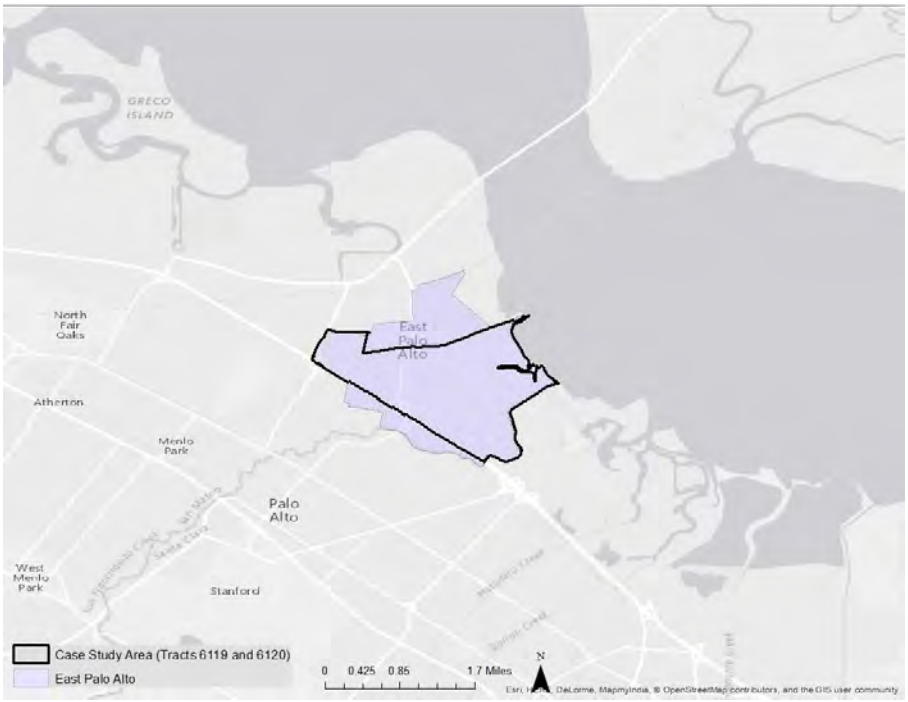



**Figure 5.14: East Palo Alto and Case Study Area**

[18] In this case study, we refer to these tracts as "the case study area."

With a focus on these two tracts, this case study outlines the anti-displacement policies in East Palo Alto that have helped limit gentrification there. The city has consistently enacted policies in favor of affordable housing. Tenant protections, inclusionary zoning, and housing subsidies help explain the lack of displacement in East Palo Alto. However, other factors, like a lack of good schools and access to amenities, a lingering perception of the city as unsafe, and overcrowding have also probably played a significant role in limiting gentrification.

Before discussing these policies and other factors in more detail, we outline the demographic and housing characteristics of East Palo Alto, which show how little gentrification has occurred.

***Demographic and Housing Characteristics***

The case study area's population grew by 22% (from 14,379 residents to 17,492 residents) between 1990 and 2013[19]. The area's population growth may be attributed to its access to job opportunities as well as the limited affordable housing opportunities in San Mateo County. Many residents who have moved to East Palo Alto within the past five to 15 years have done so because they get a job nearby, often with Stanford University in neighboring Palo Alto, which employs a large number of janitors and food service workers (SFO/PIA 2014). Residents have also arrived in the city after being displaced from neighboring jurisdictions, or because the relatively low cost of homes provided a home purchase opportunity for families (SFO/PIA 2014).

In this way, East Palo Alto has not only avoided the displacement of its existing residents, but has welcomed additional low-income households[20]: their number increased from 2,102 to 2,298 from 1990 to 2013, when 58% of households were low-income. The vast majority of households in the case study area are families: 79% in 2013.

The population growth is largely due to an influx of 5,000 Latino residents between 1990 and 2013, who ultimately made up 61% of the population. Concurrently, the city lost much of its historic African-American community; their population decreased by 3,773 people—from 43% of the population to 14%—between 1990 and 2013. The racial demographics of the case study area are notably different from San Mateo County, which has a majority white and Asian/Pacific Islander population, with 40% of residents foreign-born as of 2013.

According to the California Employment Development Department, the annual income needed in San Mateo County to rent a two-bedroom fair-market apartment is $71,800, a significantly higher figure than the case study area's estimated $59,341 median income in 2013[21] (Hepler 2014a). One stakeholder believed that there may be some under-reporting of income in this community given how many people work in the cash economy in fields such as construction (interview with authors). The total number of housing units in the case study area has grown between 1990 and 2013: from 3,819 to 4,247; the vacancy rate (vacant units divided by total units) also increased from 4% to 7%. The case study area is primarily single-family detached homes; these make up 74% of housing units; 51% of occupied housing units are rented. The housing stock is in fair condition: a

[19] Unless otherwise noted, data in this case study comes from the 1980, 1990, 2000, and 2010 Census, accessed via the Geolytics Database, and from the 2009-2013 American Community Survey.

[20] Low-income defined as 80% or lower than the surrounding county's median income.

[21] $59,341 is the average of each tract's median incomes, which were $63,105 in Tract 119 and $55,577 in Tract 120. All figures in this sentence in 2013 dollars. Note that the median income has stayed about the same since 1990, when it was $54,586 (in 2013 dollars).

stakeholder described the community as having about 40% of homes well-maintained by homeowners, another 40% experiencing neither deferred maintenance nor much "sprucing up," and the rest in poor shape (interview with authors).

Median rent has doubled from 1990 to 2013: from $882 to $1,654 (in 2013 dollars.) These rents are still lower than in San Mateo County; East Palo Alto in fact offers some of the most affordable rents anywhere in the county.

While housing costs are lower than in San Mateo County and nearby cities, households face significant housing cost burdens: 73% of renter households pay more than 30% of their income towards rent.

One method East Palo Altans use to cope with high housing costs burdens is by living with family members or renting out rooms in their homes, as indicated by the high percentage of overcrowded units: 34% of rented units were overcrowded in 2013.[22]

While presenting a risk for gentrification in the future, the city has remarkably held on to its low-income population. How did this happen? We turn to this question in the next sections.

***Anti-Displacement Policies in East Palo Alto***

The following policies are in place in East Palo Alto (11 of the 14 inventoried):

- Just-Cause Eviction Ordinance
- Rent Control
    - East Palo Alto is one of just a handful of cities in the Bay Area to have such an ordinance, and is the smallest by population of those cities. However, the Costa Hawkins state legislation explicitly excluded single-family homes from being covered under rent control policies; since 75% of the housing stock in the case study area is single-family homes, rent control likely was not the main reason for the neighborhood's stability.
- Rent Review/Mediation Boards
- Preservation of Mobile Homes (Rent Stabilization Ordinance)
- Condominium Conversion regulations
    - These policies are very strict; one stakeholder believed there had been no applications in at least 9 years.
- Foreclosure Assistance
    - This is provided by a community development corporation in East Palo Alto and funded by the city, according to a stakeholder.
- Housing Development Impact Fee (or Jobs-Housing Linkage Fee)
    - The fee is quite substantial: $21 per square foot, according to a stakeholder.
- Inclusionary Zoning/Housing
    - In East Palo Alto, the law applies only to ownership housing. While nothing has been entitled since 2013, prior to that time 80 below-market-rate homes were built through this policy, according to a stakeholder.
- Local Density Bonus Ordinance (above state requirements)
    - The ordinance was passed in 2008; since then, there has been "minimal" entitlement activity, according to a stakeholder.

[22] Overcrowding is defined as having more than one person per room.

- Community Land Trusts
- First Source Hiring Ordinances

Which of these policies might be contributing to the lack of gentrification in the case study area?

Subsidies and Inclusionary Zoning

The city enacted a Below Market Rate Inclusionary Housing Program in 2002, requiring that at least 20% of residential units in all new buildings be made available to households making between 30% and 80% of the area median income. This program was undermined by legal challenges to inclusionary housing at the state level, but the City Council has now unanimously endorsed a housing impact fee for new market-rate developments in order to fund low-income housing (Dremann, 2014).

Subsidies and inclusionary zoning together produced seven affordable housing developments in this part of East Palo Alto between 1990 and 2013, according to a stakeholder. The addition of these units likely helped preserve the low-income population in the area.

Just-Cause Evictions

Several stakeholders cited renter protections, such as the just-cause evictions policy—which applies to single-family homes (unlike other rent control provisions), which comprise the bulk of housing units in the case study area—as a reason for the case study area's stability. A legal services provider commented that, while in other areas outside the city there have been many cases of a landlord issuing a 60-day notice of eviction on a tenant who has paid rent on time and followed other guidelines, in East Palo Alto, this would not be allowed due to the just-cause evictions policy. In this way, the city has established a first defense against displacement.

***Other Reasons for Stability of Low-Income Population***

Besides these anti-displacement policies helping the community to avoid gentrification, several other aspects of the neighborhood seem likely to have played a role in limiting the gentrification, including low-quality schools and amenities, an (out-of-date) image of the city as unsafe and full of crime, and overcrowding.

Schools and Amenities

East Palo Alto residents attend school in the Ravenswood City School District, which also includes portions of Menlo Park and Palo Alto. The district has been "notorious for essentially not being able to figure out how to improve" their low scores, even after trying many things, according to a stakeholder, who believes that the poor quality of the school district may be dissuading higher-income people from moving into the neighborhood (interview with authors).

Furthermore, this part of the city lacks many amenities, including transit, and access to social institutions on the west side of the city is made difficult by the difficult-to-cross Highway 101 and University Avenue that run through the city. This kind of "in-between" place along hard urban edges often retains social diversity longer than more homogeneous neighborhoods (Talen 2006). Much of this part of the city has also lacked sidewalks, though that started changing in the late 1990s, according to a stakeholder (interview with authors).

Image as Unsafe

In the late 1980s and early 1990s, there was an "epidemic" of drugs and violence, making East Palo Alto infamous as a crime capital, a place where "you could drive into and have a cornucopia of drugs laid at your feet," according to one stakeholder. While task forces and local social institutions helped to address these issues by the late 1990s, the reputation has stuck, so much so that an outside consultant told the city, as recently as 2011, that the perception of East Palo Alto as unsafe was scaring developers off.

Overcrowding

As discussed above, 34% of housing units are overcrowded in the case study area. In the face of significantly rising rents in East Palo Alto, such doubling or tripling up of families can help low-income families stay in their neighborhood. This is particularly true for single-family homes—the bulk of the housing stock here—where families can squeeze into a shed in the back, a garage, or more; this is easier to get away with than overcrowding in an apartment. A stakeholder recalled seeing "tell-tale signs" of overcrowding: a window in a garage, tape around a garage door, etc. This phenomenon helps explain some of the stability in the low-income population here: low-income families can hold on to their housing even with rising rents.

***Conclusion***

East Palo Alto is distinctive for its government's commitment to ensuring the city remains affordable to low-income households, and for a strong legacy of community organizing that holds the City government accountable to that commitment. The city is home to many low-income households already burdened by their housing costs, and vulnerability is compounded for undocumented immigrants. Because so little affordable housing is available in surrounding cities, the stakes are high for households that leave. Numerous interviewees highlighted that households that cannot afford East Palo Alto may be forced to leave the region altogether, and are relocating as far away as Tracy, Manteca, and the Central Valley. This is why the city's suite of anti-displacement policies is particularly important.

## Diridon Station Area, San Jose

Within the Bay Area, San Jose stands out for long providing affordable homes for a wide range of incomes, and an ethnically diverse population including many immigrants. By annexing more and more land throughout the 20th- Century, San Jose's sprawling housing development has "carried the burden of housing for decades" in Silicon Valley, in the words of former Mayor Chuck Reed (Hepler 2014b). It is now the biggest city in the Bay Area, and city leaders have their sights set on jobs, with a "jobs first" general plan meant to correct its jobs-housing imbalance.

One major site of attention is Diridon Station, a transit hub on the western edge of downtown San Jose, with stops for Caltrain, Amtrak, VTA light rail, Altamont Commuter Express (ACE), and multiple bus lines. The station is also a planned stop for BART's extension to San Jose, and for high-speed rail. While there is significant vacant and non-residential land surrounding Diridon, there are also surrounding neighborhoods that are home to low- and middle-income residents where

displacement spurred by rising housing costs is a major concern. Despite San Jose's strong track record of building housing, including deed-restricted affordable housing, housing costs in San Jose are now at an all-time high, while wages for low-income workers are stagnant.

However, one of the census tracts in the area (5019), while vulnerable for gentrification in 2000, had not experienced the gentrification expected as of 2013. This area is the focus of this case study (Figure 5.15). Housing production—market-rate and affordable—as well as rent stabilization are probably responsible for the lack of gentrification here.

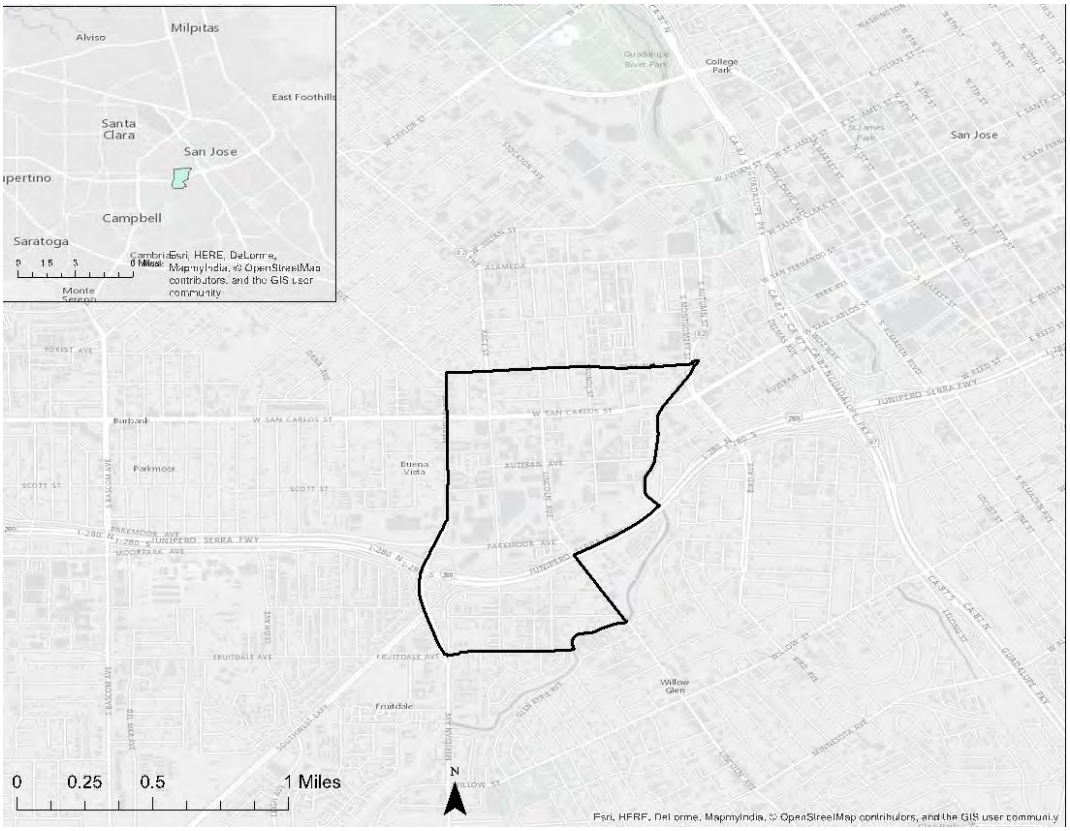



**Figure 5.15: San Jose Diridon Station Case Study Area Map (Census Tract 5019)**

***Neighborhood Overview***

The area surrounding Diridon Station is home to a wide range of neighborhoods and land uses, including industrial and commercial areas, residential neighborhoods dominated by single-family homes, new luxury condominium development, and lower-income renter communities. While Diridon Station itself is considered to be in downtown San Jose, Highway 87 creates a barrier between the station area and the denser parts of downtown; though one can walk or drive directly from the station to downtown, the highway limits high-density development in this area. This may be a stabilizing factor for the neighborhood (Talen 2006) .

The case study area, called West San Carlos, hosts a commercial corridor surrounded by older residential neighborhoods which have experienced varying levels of change. It has been slated as an "Urban Village" in the San Jose General Plan. A planner described this commercial corridor as "full service, with a gritty character… it is the most practical street in the whole city! … [P]eople think of it as pretty funky, and we got push back from the community – we want to keep the funk."

### *Demographic and Housing Changes*

Several features of the case study area (Census Tract 5019) indicate it has experienced some change consistent with gentrification—population growth, much construction, fewer families, increased educational attainment and incomes, declining renter population, and increased rent—and some inconsistent with gentrification and displacement—increasing people of color, and, most significant, an increase in the number of low-income households.

The case study area showed a steady increase in population throughout the decades: from 2,220 in 1990 to 3,300 in 2000 to 5,745 in 2013. Enabling this population growth has been a significant spurt of construction, particularly in for-sale housing. Between 2000 and 2013, 1,087 new units of market-rate housing were built.[23] Of these, 589 were for-sale units, which comprise 76% of the owner-occupied housing stock in the area.

These new residents have been more likely not to be families, to be highly educated, and to earn higher salaries:

- Since 1980, the area has had a significantly lower percentage of family households than San Jose as a whole. Just under half of the households in the area were families in 2013. By way of comparison, three-quarters of San José's 300,000 households were family households in 2013.
- The case study area has seen major changes in educational attainment in the past 30 years. The percentage of residents with college degrees increased from 22% to 44% between 2000 and 2013.
- Accompanying this shift was an increase in median incomes: from $47,891 to $82,192, both in 2013 dollars, from 1990 to 2013.

The study area has been dominated by renter households since 1990, when 81% of occupied housing units were rented; in 2000, the figure was roughly the same, 85%. But by 2013, the figure had dropped to 67%, indicating an increase in owner-occupied housing units as new condominium units were built. However, the share of renter occupied units is still higher than in San Jose as a whole, where 42% of occupied housing units are rented.

Rents have been climbing in the study area (from $1,073 in 1990 to $1,404 in 2013, in 2013 dollars), although historically they have been lower than in the city as a whole. Yet advocates have expressed concern that it is really within the last several years that housing costs have skyrocketed, and the recently released draft Housing Element confirms that rents in the city at large are at an all-time high with the average rent now at $2,169. This average underestimates the cost of newly constructed rental housing which can range between $2,200-$2,700 per month for a one-bedroom unit and between $3,000-$3,500 for a two-bedroom unit in North San Jose (City of San Jose 2014).

However, even in the face of all these signs of gentrification, the area has expanded its low-income population: the number of low-income households[24] has increased from 681 in 1990 to 1,092 in 2013. This change is concurrent with the loss of all the area's naturally affordable rental housing stock, from 184 units to none between 1990 to 2013. To stay in this area, some families are squeezing more people into their units to afford rent (17% of rented units were overcrowded in 2013); low-income households are paying a higher portion of their income to afford rent (49% pay

[23] Source: US Census 2000, American Community Survey 2009-2013, CHPC Dataset, 2014.
[24] Low-income defined as at or below 80% of the county's median income.

more than 30% of their income, in 2013); and others live in some of the many new subsidized affordable housnig units constructed here (discussed below).

In terms of race/ethnicity, all racial groups have increased their numbers from 2000 to 2013, with Asian-Americans increasing the most dramatically (by 837 people—nearly 300%), African-Americans by 185%, while whites and Hispanic/Latinos increased at a lesser rate (whites by 36% and Hispanics by 21%) (Figure 5.16). Between 1990 and 2013, the percentage of residents who were not white increased from 46% to 72%.

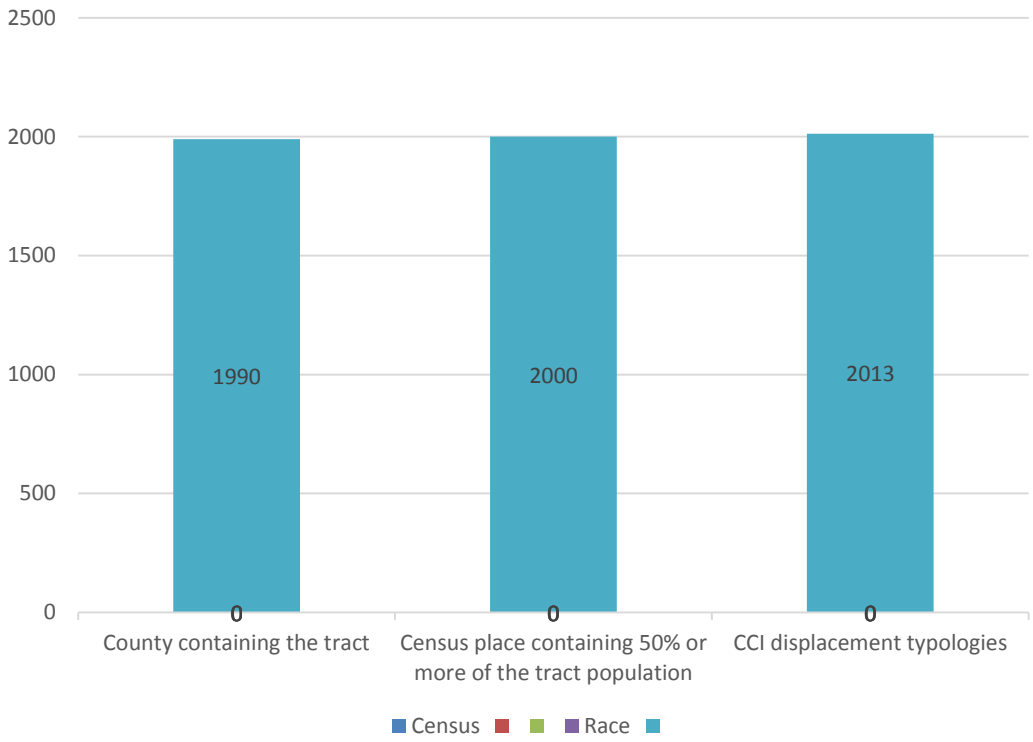



**Figure 5.16: Race/Ethnicity and Population Change, 1990-2013**
*Source: U.S. Census 1980, 1990, 2000 (Geolytics 2014); American Community Survey 2009-2013*

### *Anti-Displacement Policy*

The city of San Jose has the following anti-displacement policies in place (of the 14 from our inventory):

- Rent Review Board
- Rent Stabilization
- Mobile Home Rent Control
- Housing Impact fee
- Inclusionary Zoning
- Foreclosure Assistance
- Housing Trust Fund

What is responsible for the area's lack of displacement? We consider three possible contributing factors: market-rate housing production, affordable housing production, and rent control.

Housing Production

Besides these policies, a key to this area's success at not displacing low-income households seems to be its high levels of housing production. New, higher-income households could be living in these units, which may have taken pressure off the existing housing stock, allowing low-income households to stay there, albeit at higher rents, as discussed above.

Affordable Housing Production

Besides this increase in market rate supply, the case study area also gained 322 subsidized housing units between 1990 and 2000, including the following developments:

- Parkview Senior Apartments – 1998 – 138 units
- Parkview Family Apartments – 1997 – 88 units
- La Fenetre Apartments – 1995 – 50 units
- Willow Apartments – 1999 – 46 units

Overall, about 10% of housing units are subsidized.

Several city policies enable this production of affordable housing. The housing impact fee is too new to have funded these units, but the city's use of Federal funds (HOME, CDBG, and others) and its Housing Trust Fund have been available as sources for affordable development.

Rent Stabilization

A fair number of units (496) in this area fall under San Jose's rent stabilization ordinance (Figure 5.17). The protection of these units from dramatic rent increases likely helped low-income people continue to afford living in the area.

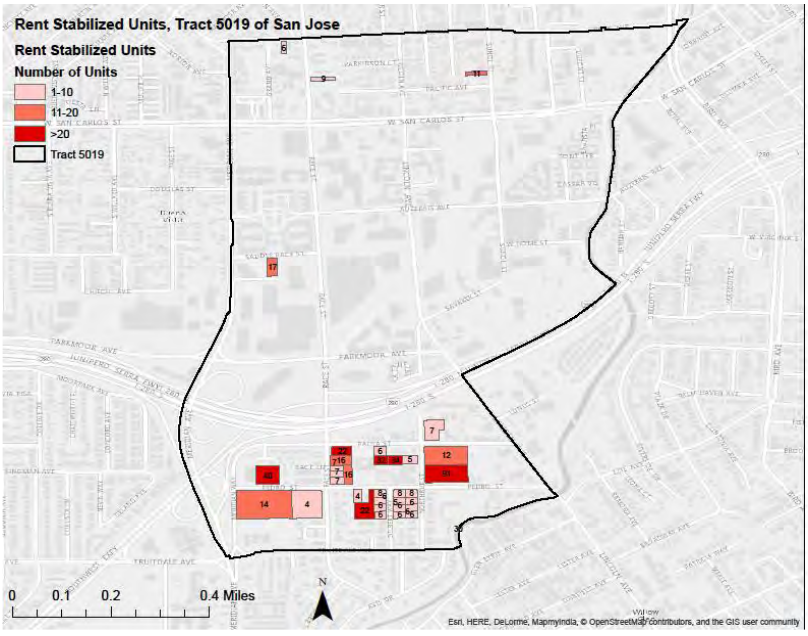



**Figure 5.17: Rent Stabilized Units in Tract 5019, San Jose**

*Source: San Jose's Roster of Rent Controlled Units Through 1979, obtained through personal correspondence.*

***Conclusion***

While housing production and rent stabilization seems to have helped this neighborhood retain its low-income population, one local expert thought it was reaching its "tipping point" when displacement would really kick in. The neighborhood is facing "encroachment" from all sides, with already-gentrified neighborhoods all around it. The expert thinks that the gritty and uneven character of West San Carlos has perhaps kept the neighborhood from gentrifying as dramatically as these surrounding places, but that in time it would, too. The development of more affordable housing (using the city's funds from its linkage fees and affordable housing trust fund) could help retain the area's low-income population in the face of such changes.

## Chinatown, Los Angeles

Chinatown is a mixed-use, ethnic neighborhood at risk of gentrification with few formal transit-specific planning efforts to mitigate the changes taking place (See Task 2H). The area is considered an Asian-American enclave due to its high concentration of Asian-American residents (Mai, Randy & Chen, Bonnie, 2013); however, it also has considerable numbers of Latino residents (See Table 5.11). The neighborhood is disproportionately composed of renters, and is facing a housing affordability problem as the quality and type of its housing stock has changed while incomes have remained stagnant.

***History of Chinatown***

Anti-immigration sentiment and racial backlash often forced immigrants to settle in ethnic enclaves. In the 1800s, Chinese immigrants in Los Angeles were barred from citizenship and owning of property. As a result, many became tenants of major landowners around the El Pueblo Plaza area in Downtown Los Angeles. By the 1870s, a notable Los Angeles Chinatown was formed (Cheng and Knok, n.d.). In 1931, however, the construction of Union Station led to the displacement of this Chinese community and their relocation to Los Angeles's historical Little Italy neighborhood, an area north of the Plaza.

In 1938, Peter Soohoo, a Los Angeles-born Chinese-American proposed the building of New Chinatown as a tourist attraction (Cheng and Knok n.d.). What began as an 18-unit commercial project soon expanded to more than 60 commercial and apartment units. The most famous remnant of these efforts is the East Gate.

By 1960, however, Chinatown had limited resources with few jobs, low wages, and high rents. Many residents worked as laborers in the local garment factories. According to the 1960 census, one-third of all housing in Chinatown was below required standards (W. Li 2009). By this time, those with higher incomes began to migrate to the San Gabriel Valley.

The 1965 immigration law and the end of the Vietnam War brought an influx of Southeast Asian refugees to Los Angeles Chinatown; they were poor, low-educated, and predominantly ethnic Chinese from Vietnam, Laos, and Cambodia (W. Li 2009). This new influx changed the demographics of Chinatown, which can be seen in the multilingual signs that exist today.

Today, Chinatown is typically defined as the area bound by the 110 Pasadena Freeway on the West, Cesar Chavez to the South, Alameda Street to the East, and Cottage Home Street to the North

("Mapping LA: Chinatown" 2013). This case study focuses on the census tracts that lie partially or completely within a half- mile radius of the Chinatown Metro rail station (See Figure 5.18).
Small businesses and local merchant shops in Los Angeles Chinatown continue to survive not only as shopping centers for residents but also as tourist shops for many visitors. Chinatown's proximity to downtown Los Angeles also attracts many young professionals to the area. These businesses, however, have declined from their heyday due to competition from other Chinese establishments in the San Gabriel Valley.




**Figure 5.18: Chinatown, LA Study Area by Census Tract (2010 Boundaries)**

### *Chinatown's Demographics*

The population in Chinatown has increased steadily since the 1960s (see Table 5.12). Today, the area is home to more than 23,000. Over the past three decades, the area has not only become more diverse but has also changed (Mai, Randy and Chen, Bonnie 2013). Chinatown is considered an Asian-American enclave due to its high concentration of Asians relative to Los Angeles County (Mai, Randy and Chen, Bonnie 2013). However, it was not until the 1990s that Asians became the majority in the neighborhood (54%). Since then, however, their share has declined to about 42% of residents. There is also a considerable Latino population in Chinatown, which has consistently

accounted for about one-third of residents for the past three decades. Over the years the share of Black residents has fluctuated and has been on a steady decline while that of Non-Hispanic whites has increased slightly. The share of immigrant residents has also been on a decline.

**Table 5.12: Chinatown, LA Demographics**

| | 1970 | 1980 | 1990 | 2000 | 2010 | 2009-2013 |
|---|---|---|---|---|---|---|
| Total Population | 17,715 | 20,509 | 18,166 | 26,144 | 23,954 | 23,120 |
| Race/Ethnicity | | | | | | |
| Asian | 26% | 38% | 54% | 40% | 43% | 42% |
| Black | 18% | 13% | 7% | 17% | 14% | 12% |
| NHW | | 10% | 6% | 10% | 11% | 13% |
| Hispanic | | 36% | 32% | 33% | 31% | 31% |
| Elderly (60 and older) | 10% | 10% | 14% | 13% | 16% | 16% |
| Foreign Born | 34% | 56% | 63% | 48% | 48% | 47% |
| Poverty Rate | 24% | 39% | 31% | 32% | 41% | 41% |
| | | | | | | |
| Total Housing Units | 4,113 | 4,365 | 5,136 | 5,389 | 6,718 | 6,724 |
| Vacancy Rate | 4.1% | 2.3% | 5.2% | 4.4% | 6.7% | 11.6% |
| % Renters | 83% | 86% | 88% | 88% | 91% | 91% |
| Multi-Unit Housing | 64% | 74% | 80% | 79% | 85% | 85% |
| Mean HH Income (2013$) | | 36,608 | 43,973 | 40,213 | | 38,267 |
| Mean Rent Range (2013$) | | 606 | 851 | 713 | | 1,017 |

*Source: US2010 Project available at http://www.s4.brown.edu/us2010/Researcher/Bridging.htm; and 2009-2013 ACS tabulated by authors; data are for 2010 census tracts completely or partially within 1/2mi of the rail station.*

Chinatown has a high prevalence of new construction on residential parcels (See Task 2H), and the development of multi-unit housing in the area has also been on the rise, increasing from 65% of the housing stock in 1970 to 85% by 2010. Median rents have almost doubled, from about $600 in 1980 to more than $1,000 by 2013. These trends signal a shift in the housing stock and affordability of the area as the quality and type of stock changes. Further, while Los Angeles has always been a majority renter metro area, with a percent of renters fluctuating between 51-52% since 1970 (Ray, Ong, & Jimenez 2014), residents in Chinatown are disproportionately renters, with the share of renters increasing from 81% in 1970 to over 90% by 2010.

Chinatown residents are facing a housing affordability problem. In 2013, more than half of Chinatown renters (55%) were burdened by housing costs. The area is also becoming increasingly poor, with the mean household income declining since 2000, a likely result of the recession. In 2013, about four out of 10 residents lived in poverty, double the ratio of 1970. This may be related to demographic shifts. For instance, the number of elderly residents in the area has more than doubled since the 1970s, and today they account for about 16% of the population.
Further, there is an income disparity. The average household income in Chinatown is less than half of the average household income in Los Angeles County (about $38,300 compared to $81,400, respectively in 2013). Understanding the housing needs of the poor and elderly is critical as the housing affordability and stock of the area changes. Chinatown has had affordable senior housing since the 1980s, but many of the affordable units have expired or are set to expire, and some affordable senior units are converting into market rate units (Chinatown Community for Equitable Development, personal communication, April 15, 2015).

### *Anti-Displacement Policies*

Chinatown is within the boundaries of Los Angeles, and therefore the nine anti-displacement policies adopted in the city apply to Chinatown. These include condo conversion regulations, policies to encourage the preservation of mobile homes, affordable housing trust funds, local density bonuses, SRO preservation, rent stabilization and control, community land trusts, and a first source hiring ordinance. There are three plans that will impact development in Chinatown: the Central City North Community Plan, the CASP, and the Union Station Master Plan. The Central City North Community Plan is currently undergoing revisions and the Union Station Master Plan is currently being worked on (SEACA, personal communication, November 16, 2015). There is limited information publicly available on the future contents of these plans; therefore, this section will focus on the CASP.

The CASP was adopted in 2013, and is one of the city's newest community plans. It is also the first community plan to include regulatory controls to guide development near transit stations. The CASP is designed to serve as a blue print for all future TODs in the City of Los Angeles (SEACA, personal communication, November 16, 2015).There are three Gold Line rail stations located in the plan area: Chinatown, Heritage Square, and Lincoln/Cypress stations. The plan proposes lower-density development but encourages developers to take advantage of the California Affordable Housing Density Bonus program. The plan's development standards encourage a variety of housing types. Additional value is also added to property through land use/zoning changes, i.e. up-zoning, which can be leveraged to provide benefits for the community, including the provision of affordable housing, open space, and other community benefits. The CASP also created a unique Super Density bonus program from the city's and the state's. The city's allows up to a 35% density bonus in exchange for affordable housing; the CASP provides up to a 100% density bonus and provides incentives for extremely low-income housing. This is the first plan in the city to do so. (SEACA, personal communication, November 16, 2015).

The zoning section of the plan encourages affordable and mixed-income housing. There are also several benefits a developer could gain by providing affordable housing units. One incentive is the Floor Area Bonus: project applicants may obtain additional floor area rights by complying with the Affordable Housing Bonus Option and/or the Community Benefit Bonus Options.

The plan also outlines several "off-menu" incentives such as additional floor area. One of the requirements for qualifying for these additional bonuses mentions the need to show that the extra square footage is required to provide affordable units. In order to receive the variety of bonus options, the plan also states that developers shall sign and record a covenant that would guarantee affordability. Restricted Affordable Units are exempt from Unbundled Parking requirements.

### *Community Involvement, Response and Resistance to Displacement*

Strong relationships between CBOs and public agencies in TOD areas are necessary to develop plans and policies to encourage development that provides equitable community benefits. In the Chinatown area, this discussion was mostly happening through the CASP.

The CASP was prompted by the development of three infrastructure improvements in the area: the development of a regional public park, the Los Angeles River Master Plan, and the extension of the Gold Line. These broader development efforts prompted public agencies to seek community engagement, including public meetings. While the plan does not mention displacement or gentrification explicitly, there is a strong emphasis on incorporating affordable housing in new

development through density bonuses. This emphasis is the result of organizing efforts by advocacy organization such as SEACA, who pushed for acknowledgement of gentrification and displacement in the writing of the plan (SEACA, personal communication November 16, 2015).

Further, while a community coalition was successful in pushing for strong environmental and economic justice goals in the revision of the CASP (Henao 2013), currently there is no active formal process for CBOs and public agencies to interact. Further, there are no active engagement efforts as part of the CASP.

CBOs have expressed concerns about residential and commercial gentrification. One concern is that a number of new neighborhood businesses are not catering to the needs of long-term Chinatown residents, such as providing culturally appropriate retail that meets the needs of the elderly, affordable food and retail, and in some cases, jobs (Mai, Randy & Chen, Bonnie, 2013). Representatives from CBOs indicated that new development and incoming retailers like Starbucks and Walmart are instead catering to new residents or more affluent commuters (SEACA, personal communication February 4, 2015). Flipping of commercial properties was also reported (Chinatown Community for Equitable Development, personal communication April 15, 2015). Between 2007-2014, at least 14 Ellis Act evictions have occurred in the census tracts within a half-mile of the transit station. One CBO representative reported that tenants are often offered “buyouts "and move out of their units (Chinatown Community for Equitable Development, personal communication April 15, 2015).

Currently, the major CBOs in Chinatown provide social and health services, and affordable housing, along with advocating for tenant rights and a higher minimum wage. Strategies include a mix of professional programs and efforts at capacity building for residents and other stakeholders. An organization playing an active role in the development of Chinatown is The Chinatown Service Center, which has created the Community Planning and Housing Division aimed at sustaining affordable housing and services for residents. They have completed two affordable housing projects: Casanova Gardens in 1999 and Cesar Chavez Gardens in 2003 (“Affordable Housing Services” n.d.). Additionally, the Chinese Chamber of Commerce and the Chinatown Business Improvement District have played significant roles in fostering business development in Chinatown to revitalize the area as a shopping, dining, and visitor destination (“The Organization” n.d.). However, there seems to be limited involvement in developing broader policy efforts to address displacement.

## Hollywood/Western, Los Angeles

The Hollywood/Western Red Line station is a below-grade, subterranean stop located in East Hollywood in one of the most densely populated areas of Los Angeles. The neighborhood is notable as the home of ethnic enclaves, including Little Armenia and Thai Town. Most residents in the area are non-Hispanic white (many of Russian and Armenian descent), Latino, and immigrant. The neighborhood is a mixed-use, regional destination at risk of gentrification (See Task 2H). Certain formal planning efforts specifically focusing on the transit-oriented nature of new developments seek to mediate the risk of gentrification in the area.

### *History of Hollywood/Western*

The Hollywood/Western Metro rail station is located near the intersection of Hollywood and Western Blvd. in East Hollywood (See Figure 5.19). East Hollywood was annexed to the City of Los

Angeles in 1910. Around this time, it was still a predominantly farming village and mostly populated by non-Hispanic whites (East Hollywood Neighborhood Council 2015). After its annexation, East Hollywood increasingly served the growing movie industry – which is still present in the area today.

During the 1920s, many immigrants around the world came to East Hollywood, including Russians escaping the Bolshevik Revolution and Armenians escaping the Armenian genocide. It was during the 1950s when most of the area's apartment buildings were built (East Hollywood Neighborhood Council 2015). The building of the Hollywood Freeway a few years earlier, however, had led to the destruction of many houses and relocation of residents.

Beginning in the 1960s, many immigrant communities from around the world settled in East Hollywood: from East Asia, Southeast Asia, Latin America, the former Soviet Union, and the Middle East. Each community continues to leave its mark on this neighborhood, including its ethnic businesses.

In 1992, East Hollywood was affected in the Los Angeles Riots as many of its businesses were looted. Additionally, the area sustained significant damage in the 1994 Northridge earthquake. However, the late 1990s saw a period of economic boom and recovery for East Hollywood, and in 1999 the Hollywood/Western station opened that linked the area to downtown Los Angeles. Part of the area's revitalization includes designations of "Thai Town" and "Little Armenia," which represents the diversity of East Hollywood today.

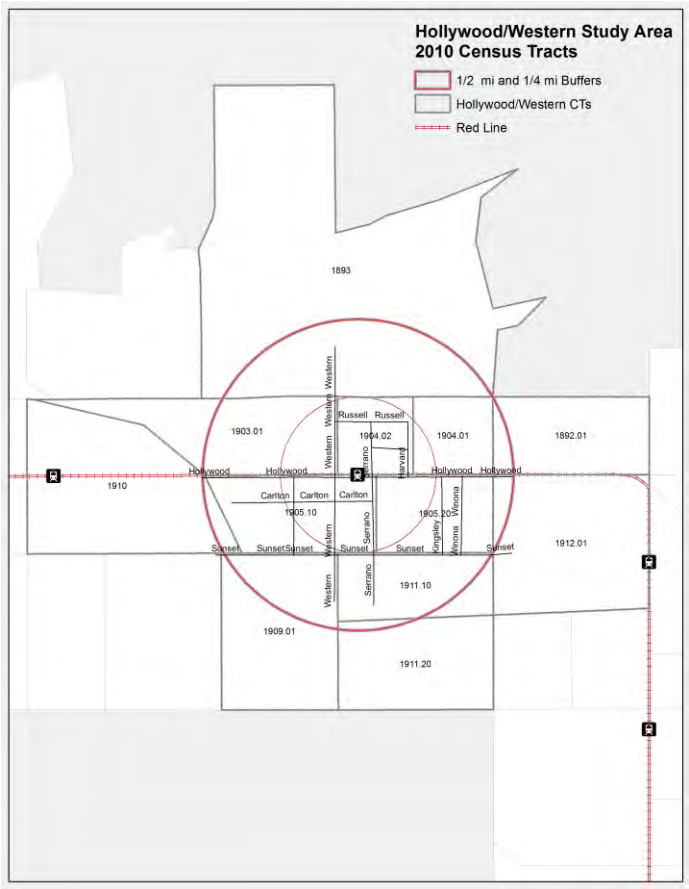



**Figure 5.19: Hollywood/Western Study Area by Census Tract (2010 Boundaries)**

### *Demographics*

The population of the Hollywood/Western neighborhood has increased since the 1960s to more than 45,000 by 2013 (Table 5.13). Non-Hispanic whites make up the highest proportion of residents in the area at about 48%. While their proportion declined in the 1990s and 2000s, there has been a slight increase in the past decade. This group includes those of whites of European, American, or Middle Eastern descent (Armenians being the most prevalent in this group). Hispanics also make up a large percentage of Hollywood/Western (at 36%), although there has been a small decline since 1990 (when they represented 41% of the residents). Over the years, the share of Asian-American and black residents has remained steady at about 10% and 5%, respectively. Although the share of foreign-born residents has declined since 1990, immigrant residents still make up about half of the neighborhood's population. The number of elderly residents has been on the decline.

**Table 5.13: Hollywood/Western Demographics**

| | 1970 | 1980 | 1990 | 2000 | 2010 | 2009-2013 |
|---|---|---|---|---|---|---|
| Total Population | 32,963 | 41,488 | 50,128 | 48,839 | 44,739 | 45,455 |
| Race/Ethnicity | | | | | | |
| Asian | 4% | 9% | 9% | 10% | 12% | 10% |
| Black | 1% | 5% | 4% | 4% | 5% | 4% |
| NHW | | 58% | 45% | 41% | 46% | 48% |
| Hispanic | | 23% | 41% | 39% | 35% | 36% |
| Elderly (60 and older) | 25% | 19% | 15% | 14% | 17% | 15% |
| Foreign Born | 30% | 53% | 64% | 61% | 53% | 50% |
| Poverty Rate | 15% | 22% | 27% | 30% | 25% | 27% |
| | | | | | | |
| Total Housing Units | 18,884 | 19,603 | 20,022 | 19,849 | 21,100 | 21,088 |
| Vacancy Rate | 5.6% | 4.5% | 7.1% | 3.5% | 9.4% | 8.3% |
| % Renter | 86% | 87% | 88% | 88% | 90% | 88% |
| Multi-Unit Housing | 80% | 82% | 83% | 83% | 86% | 84% |
| Mean HH Income (2013$) | | 48,982 | 56,927 | 55,802 | | 55,705 |
| Mean Rent Range (2013$) | | 732 | 923 | 811 | | 1,035 |

*Source: US2010 Project available at http://www.s4.brown.edu/us2010/Researcher/Bridging.htm; and 2009-2013 ACS tabulated by authors.*

There are at least 21,000 units in the Hollywood/Western TOD area. The area continues to be densely populated with more than 80% of the stock multi-family housing. The mean rent has increased by over 40% since 1980 (from about $730 in 1980 to over $1,000 in 2013), which is not proportionally matched with the 14% increase in mean household income during the same period. The mean household income for those in this neighborhood is slightly over $55,000, about $25,000 less than the county average. This disproportionate trend becomes significant since 88% of residents in Hollywood/Western are renters. Moreover, about 59% are rent burdened, and about 37% spend half or more of their income on rent. Though less than in Chinatown, the poverty rate of residents in Hollywood/Western is still relatively high, with over one-fourth of the resident population living below the poverty line. Providing affordable housing in the Hollywood/Western neighborhood is important in maintaining the area's ethnic diverse history. Despite the existence of

some anti-displacement policies and efforts, about 9% of all residential parcels have seen some housing improvement, which suggests a possible gentrification (see Task 2H).

***Anti-Displacement Policies***

Because the Hollywood/Western case study area is located within the City of Los Angeles boundaries, the city's nine anti-displacement policies apply to this neighborhood.

Aside from the citywide ordinances, the Vermont Western Station Neighborhood Area Plan (SNAP) applies to the Hollywood/Western Station. The Vermont Western SNAP was adopted in 2001. It is a specific plan created to encourage TOD around the Red Line in East Hollywood, which applies to four stations: Hollywood/Western, Vermont/Beverly, Vermont/Santa Monica, and Vermont/Sunset. The SNAP permits greater heights and densities for mixed-use and residential projects, and reduces parking requirements by 15% for projects built within 1,500 feet of a station. The specific plan further reduces the cost of building TOD, mixed-use development by eliminating the requirement that developers provide additional parking when they change the use of a building.

SNAP regulations for residential areas are intended to conserve the scale of existing neighborhoods. In community centers located around Red Line stations the SNAP provides floor area incentives for commercial, hospital, and medical uses. Commercial corridors connecting the community centers are designated as mixed-use boulevards. The plan mandates equitable development through its community benefit elements. For example, the SNAP's childcare facility component requires mixed-use or commercial projects with 100,000 square feet or more of nonresidential floor area to include childcare facilities to accommodate the needs of employees.
There are three references to low-income and affordable housing within the TOD.

- Under the Purpose of the Plan, Section 2 D states that the plan intends to "Improve the quality of housing stock in the neighborhood through the construction of affordable housing units available for homeownership in Mixed Use buildings along transit corridors."
- Section 6F.2b of the plan, states that two types of affordable housing developments are exempt from the Park First Program Fees. These include:
    - Senior Citizen and Student Housing. Residential units with fewer than three habitable rooms reserved exclusively for seniors or full-time students and which both (i) qualify as low- and very-low-income housing as defined by HUD and (ii) are subsidized with public funds and/or federal or state tax credits with affordability covenants of at least 30 years are exempt from the Parks First Trust Fund fee.
    - Low- and Very-Low-Income Housing. All residential units in a project containing low- and very-low-income residential units as defined by HUD that are subsidized with public funds and/or federal or state tax credits with affordability covenants of at least 30 years are exempt from the Parks First Trust Fund fee.

The plan calls for a walkable, transit-friendly urban community, with existing residential neighborhoods preserved, future population and commercial growth channeled into mixed-use buildings along transit corridors, and unique activity centers at each of the four subway stations. Public services, especially parks, childcare, community police stations, libraries, and schools are to be expanded and placed in sites among the neighborhoods and along commercial corridors.

One significant component of the plan that should be of interest to small and local businesses is the Local Jobs Incentives that are a set of policies and code incentives or exemptions for both small and larger businesses to come into and remain in the Plan Area. Live/work spaces, and small assembly

workshops are allowed to facilitate business start-ups. Existing commercial buildings are allowed lower parking standards in order to attract a wider range of tenants.

***Community Involvement, Response and Resistance to Displacement***

As the station areas become more desirable to live in, existing, long-term residents are at higher risk of eviction and displacement. Community-based organizations (CBOs) worry that real estate speculation will lead to development that may force out long-term, low-income renters. Stories of displacement from rising rents have been noted by neighborhood CBOs in Hollywood. An LA Voice organizer estimated that 30% of the Hollywood church congregation the organization serves moved to the San Fernando Valley because of rising rents in Hollywood (LA Voice, personal communication April 10, 2015).

CBOs in the area have developed valued partnerships with public agencies. In 2003, the Thai Community Development Center (Thai CDC) conducted a needs assessment of area (Thai Community Development Center 2003). The study related to the Vermont/Western TOD plan and found that East Hollywood is a community with especially sizable Latino, Armenian, and Thai populations. It is a predominately low-income community with a high density of smaller-than-average businesses, and a low rate of property ownership among business owners and local residents. Thai CDC worked with the city planning department and Councilmember Jackie Goldberg to organize various community stakeholders around the SNAP.

A Thai CDC staff member discussed an evaluation of the SNAP's impact conducted by the organization. The evaluation indicated that the specific plan had achieved many of its affordable housing and neighborhood preservation goals (Thai CDC, personal communication February 17, 2015). However, the staff member mentioned that some developers have objected to SNAP's local hiring and childcare space requirements. As a result, SNAP's community benefit elements may impede neighborhood economic development, if developers cannot obtain a variance from requirements. A Council District 13 staff member echoed these sentiments (personal communication April 16, 2015). He stated that the cost of providing community benefits might discourage developers from investing in the specific plan area. The staff member believes that TOD plans should not regulate development to the extent that they stifle economic growth.

Currently, Thai CDC, East Hollywood Neighborhood Council, and LA Metro are trying to form a partnership to create a small-business incubator near the Hollywood/Western Station (personal communication March 9, 2015). However, where CBOs are not actively involved in neighborhood councils, there is potential that they can be left out of the planning process. Further, limited opportunities and resources for community engagement have been identified as challenges to successful community planning around TODs by both CBOs and public agencies. CBOs felt the common forms of public input, such as public hearings and community plan updates, are ineffective at encouraging public participation and capturing the input of all interested parties. According to organizers from LA Voice, rigid public hearing agendas have constrained their capacity to advocate in formal public forums (LA Voice, personal communication April 10, 2015).

## 103rd St./Watts Towers, Los Angeles

The 103rd St./Watts Tower station is an at-grade stop on Metro's Blue Line that is located near the intersection of Grandee Avenue and 103rd St.. The station is situated in the heart of the Watts Neighborhood in South Los Angeles and is immediately adjacent to the historic Watts Tower Art

Center. The area gained an African-American majority in the 1940s as a result of the Great Migration from the American South. Presently, the area has a Latino majority with African-Americans retaining a significant minority. Of the station study areas, this stop, which opened in 1990, has been in operation the longest. The 103rd St./Watts Towers neighborhood shows some signs of residential gentrification, while commercial gentrification appears to be minimal.

***History of Watts Neighborhood***

Watts was first settled as Rancho La Tajuata in the early 1820s by Spanish Mexican settlers, and its economy was primarily based on agriculture until the arrival of the railroad station around the turn of the 19th Century. After the establishment of the station, the settlement grew rapidly, and the City of Watts was incorporated in 1907 (Watts Neighborhood Council 2015). It was annexed by the City of Los Angeles in 1926.

As a result of the Great Migration of African-Americans from the South for better opportunities, the area gained an African-American majority in the 1940s. During World War II, the city built several public housing projects for the new industrial workers, but by the 1960s these buildings housed almost exclusively African-American residents, since whites had moved out to suburban areas (Watts Neighborhood Council 2015).

The neighborhood suffered through the Watts uprisings in 1965, during which 75 people were injured and dozens of buildings burned (Queally 2015). Tensions rose due to racial profiling, discriminatory treatment, inadequate public services, and the passage in 1964 of Proposition 14, which repealed the Rumford Fair Housing Act (Queally 2015)[25]. In the 1970s, a wave of gang-related violence arose that lasted until the early 2000s, but has since subsided (Empower LA 2015). Currently, many Latinos have settled in Watts, making up about 74% of the population, with African-Americans retaining a significant minority at 25%.

As a largely residential commuter district, the neighborhood is not proximate to the downtown central business district or other large employment areas. Unsurprisingly, the station area also has a low jobs-housing ratio (UCLA Comprehensive Project 2015). The area is a single-use zoned district, with absence of mixed-use development, and serves predominantly commuters, who travel to more job-rich employment areas (UCLA Comprehensive Project 2015). Figure 5.20 shows the study area boundaries.

[25] The Rumford Fair Housing Act of 1963 prohibited discrimination based on race, religion, color, national origin, and ancestry in private housing in California.

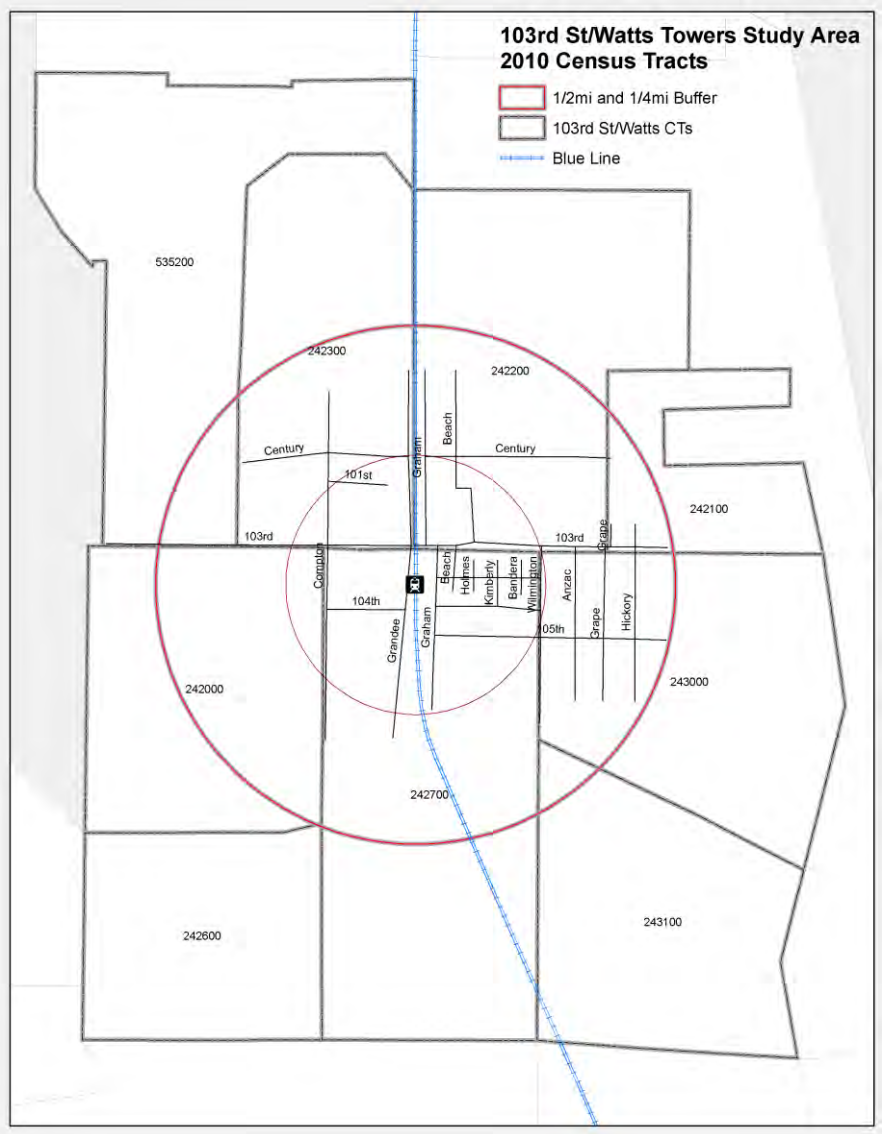



**Figure 5.20: 103rd St./Watts Towers Study Area by Census Tract (2010 Boundaries)**

***Demographics***

Of all the Los Angles case studies, the 103rd St./Watts area has seen the greatest increase in population since the 1980s (Table 5.14). In 2013, Watts was home to more than 45,000 residents, which is a 46% increase since the lowest point in 1980. Historically, the area was an African-American community; however, by 2000, Latinos had become the majority. The considerable increase in the immigrant population coincides with the influx of Latinos.

The African-American community continues to have a considerable presence. About one-quarter of residents in the case study area are black, which is almost three-times the share for Los Angeles County (24% compared to 8%, respectively in 2013). Non-Hispanic whites and Asians are underrepresented in the area, with each accounting for no more than 1% of the population.

The share of the elderly population in the station area has declined since the 1980s and is currently at about 7%. The share of the population living below the federal poverty line, which was 51% in

1980, started declining until 2010, during a period of economic prosperity for the region. However, between 2010 and 2013, there was a jump of residents below the poverty line from 37% to 40%. The average household in Watts also makes about $38,500, which is significantly below the county average.

**Table 5.14: 103rd St./Watts Towers Demographics**

| | 1970 | 1980 | 1990 | 2000 | 2010 | 2009-2013 |
|---|---|---|---|---|---|---|
| Total Population | 32,714 | 30,835 | 36,567 | 40,188 | 45,413 | 45,122 |
| Race/Ethnicity | | | | | | |
| Asian | 0% | 0% | 0% | 0% | 0% | 0% |
| Black | 92% | 85% | 55% | 37% | 27% | 24% |
| NHW | | 0% | 0% | 1% | 1% | 1% |
| Hispanic | | 14% | 44% | 62% | 71% | 74% |
| Elderly (60 and older) | 9% | 10% | 8% | 7% | 7% | 7% |
| Foreign Born | 2% | 9% | 26% | 34% | 32% | 32% |
| Poverty Rate | 47% | 51% | 49% | 47% | 37% | 40% |
| | | | | | | |
| Total Housing Units | 9,201 | 8,869 | 9,475 | 10,339 | 11,099 | 11,271 |
| Vacancy Rate | 7.1% | 4.7% | 4.8% | 9.8% | 7.3% | 9.3% |
| % Renter | 67% | 68% | 67% | 66% | 68% | 69% |
| Multi-Unit Housing | 32% | 37% | 38% | 36% | 34% | 36% |
| Mean HH Income (2013$) | | 29,118 | 33,436 | 42,042 | | 38,513 |
| Mean Rent Range (2013$) | | 470 | 700 | 667 | | 901 |

*Source: US2010 Project available at http://www.s4.brown.edu/us2010/Researcher/Bridging.htm; and 2009-2013 ACS tabulated by authors.*

The area has a lower percentage of renters than the other two case study neighborhoods, but the renters' share has increased about 3% since 2000. In 2013, 66% of renters were burdened by housing costs in 2013. Mean rents have increase by about $300, while mean household income in the area has declined by more than $3,500 since 1980.

The vacancy rate in the area is somewhat higher than that of Los Angeles County (9% compared to about 6% in 2013, respectively). As with the other case study areas, the number of multi-family housing units has increased over the years. The 103rd St./Watts Towers shows some signs of residential gentrification, while commercial gentrification in the neighborhood appears to be minimal. For instance, observations of the area indicate that Watts has a high rate of property turnover, with corresponding indicators of physical renovations to residential properties. Relative to the other case study areas, however, there may be a lower perception of gentrification due to a low presence of non-Hispanic whites (UCLA Comprehensive Project 2015).

The presence of institutional uses such as churches may also contribute to a difference between actual and perceived gentrification; 17% of surveyed land uses in Watts are characterized as institutional (UCLA Comprehensive Project 2015). The difficulty in adaptively reusing or demolishing these properties prevents significant land use changes. This can contribute to a

perceived lack of neighborhood change as these properties act as historical and cultural flagships (UCLA Comprehensive Project 2015).

### *Anti-Displacement Policies*

The case study station falls within the boundaries of the Southeast L.A. Community Plan Implementation Overlay (CPIO) zone, which applies to the wider South Los Angeles area. However, it is worth mentioning that the area adjacent to the station is also covered by the South L.A. CPIO. Both plans are in draft form and have not been adopted. Both CPIOs have TOD sections and propose Floor Area to Ratio (FAR) incentives in order to encourage mixed-income projects.

The TOD section of the Southeast L.A. draft plan outlines the various benefits for 100% affordable, as well as mixed-income, housing in the different TOD subareas. Single-family homes are prohibited in some TOD subareas, while in other areas only mixed-use projects are permitted (meaning that 100% residential units are prohibited). Developers may utilize an R4 density for the purpose of calculating a baseline residential density when 100% of the dwelling units (minus any required manager unit) are set aside for households of moderate, low, very low or extra low income. Mixed-income housing projects that qualify for a density bonus may utilize additional incentives; for instance reducing the required parking for the entire project by 50% as a third parking option. There are also incentives for mixed-income housing (30 units or more).

The Jordan Downs Urban Village Specific Plan aims to create high-quality transit areas, protect community resources, and provide equitable economic opportunities. For example, the plan seeks to improve connectivity between the aging Jordan Downs public housing project and the 103rd St./Watts Towers station located a half-mile to the west. This plan has the potential to transform Jordan Downs into a mixed-income development. Importantly, the specific plan calls for a one-to-one replacement of existing affordable units. However, the redevelopment effort currently lacks the necessary funding (Garrison 2013).

Most of the formal planning efforts in Watts focus on new residential development. South Los Angeles CBOs like SAJE have noted many instances of illegal evictions and slum conditions in South Los Angeles (personal communication April 16, 2015). CBOs are able to mitigate some of the issues associated with displacement around station areas through organizing and education, policy research, community control of land, and community benefit agreements.

### *Community Involvement, Response and Resistance to Displacement*

CBO representatives believe that Watts is underserved, and economic and community development efforts in the area have been largely unsuccessful. For instance, the area continues to have a need for more jobs (See task 2H), and poverty is on the rise (Table 5.143). Los Angeles Alliance for a New Economy (LAANE), a Los Angeles-based non-profit, has developed a TOD policy agenda encouraging equitable investments that provide good jobs and healthy options in South Los Angeles neighborhoods like Watts that have been overlooked (personal communication February 13, 2015).

Organizing has been used to advance community needs in specific developments or educate residents on the impacts of TOD. The focus of organizing efforts has ranged from renters' rights to technical aspects of city planning. For example, the United Neighbors in Defense Against Displacement (UNIDAD) coalition's organizing effort mobilized community members leading to the inclusion of affordable housing and community serving retail in the Grand Metropolitan development in South Los Angeles (SAJE, personal communication, 2015). It is a new private

project approved by the City Council in August 2015 that will create affordable housing and local jobs and promote economic development in the area. The effort was undertaken in collaboration with a number of community organizations, including SAJE and the Esperanza Community Housing Corporation with the Public Counsel legal firm negotiating the terms (SAJE personal communication, 2015).

Community Benefit Agreements (CBAs) have also been negotiated for a number of developments in and around TODs in the wider South LA by SAJE, Esperanza Community Housing, and other South Los Angeles CBOs. Included in CBAs are provisions for labor, community resources, and affordable housing benefits for low-income residents. These South Los Angeles CBAs are important examples of equitable TOD, although they are outside this study's station areas (Esperanza Community Housing, personal communication 2015).

Because developers may not incorporate community input when forming plans for a new project, CBOs seek other strategies to ensure that community input is prioritized. These efforts can involve community land trusts focused on affordable housing. Education is used as a means of uniting and empowering community members to ensure that development provides positive community outcomes. In South L.A., SAJE has regularly hosted the People's Planning School, an effort to shape policy and planning through grassroots community advocacy (UCLA Comprehensive Project 2015).

CBOs with the requisite resources have purchased and developed land for community use and to ensure perpetual housing affordability. TRUST South LA, believes that a CBO must own the land so that its community is considered a stakeholder by institutional organizations (personal communication, February 20, 2015). As an interviewee stated, the ability to purchase property gives CBOs a greater stake in the neighborhood (TRUST South LA, personal communication, February 20, 2015). Community-controlled land allows CBOs to better dictate what they and their constituents would like to see developed and allows them to have more control over the development process.

# Chapter 5 Conclusion

The range of anti-displacement and affordable housing policies is wide. Some policies (like inclusionary zoning and condo conversions) have been adopted in many places; others (like rent control) in only a few. Bay Area cities generally have more policies on the books than cities in Los Angeles County, even though the latter is arguably less affordable.

Some policies show clear results, like those that fund affordable housing projects—you can see and count the units once they are built. There appears to be a correlation between cities with production policies in place and construction of more affordable housing: preliminary evidence that these policies may be working as intended. Others are difficult to track, like inclusionary zoning, or show their effectiveness only through counter-factuals (e.g., the amount of condo conversions would have been higher without laws on the books).

Stakeholders helped us see that political considerations are essential for understanding why some policies get implemented and others do not. They also drew our attention to many loopholes in the policies, showing the importance of interrogating the laws "on the ground" as compared to "on the books." For example, condominium conversion ordinances can be limited by loopholes that allow developers to escape their rental housing replacement requirements and rent control laws can only

slightly slow the rising rents, given state law that insists on vacancy decontrol. Given these aspects of anti-displacement policy, assessing their effectiveness on a systematic basis is difficult, and an important direction for future research.

Regional funding for station area plans, at least in the Bay Area, has included requirements around affordable housing, and most plans do include goals around displacement and affordability. In Los Angeles, plans may not mention gentrification explicitly, but many include provisions around displacement and affordability. However, these plans have limited reach; many cities rely on their citywide policies to reach their TOD-specific goals; in the Bay Area, more grant funds have not gone to cities with more policies; and evaluation of these plans is very difficult.

Across our six case studies, a unifying feature is the key role community organizing plays in winning the passage and implementation of anti-displacement strategies. Besides this, the features of the neighborhoods vary considerably.

In San Francisco's Chinatown, neighborhood-level zoning and rental housing policies protected this area from the displacement occurring around it. In East Palo Alto, citywide tenant protection and affordable housing production policies helped limit displacement, but other features of the community—poor schools, lack of amenities, and an image of the neighborhood as unsafe—probably played a large role in limiting the amount of gentrification in the neighborhood, and in keeping displacement pressures at bay. Would the city's anti-displacement measures have prevented displacement if market conditions had encouraged more gentrification?

In San Jose's Diridon Station area, rent stabilization likely limited dramatic rent increases at nearly 500 units. Also, pro-market-rate housing production policies, while not explicitly anti-displacement, seemed to have allowed the scale of development necessary to accommodate the influx of higher-income residents without displacing existing residents.

Meanwhile, the Los Angeles case studies focused more on the role of station area plans in addressing displacement. While some of these plans indicate the need and desire from the part of the planners for more affordable housing, and offer incentives such as density bonuses to developers, it is very early to assess their effectiveness. Similar to the Bay Area, CBOs and non-profits in the Los Angeles area case studies are actively advocating against displacement and for more affordable housing and living-wage jobs.

From these case studies, it is clear that anti-displacement policies are important. However, they are rarely the whole story, and, instead, features of the neighborhood play an equally important role. Advocates need to consider the unique features of their place in deciding which policies to organize around.

Even with this plethora of policy options, it is not clear that the policies we have developed today, as currently implemented, come anywhere close to addressing the displacement occurring around transit, nor to filling the enormous gap in affordable housing. Stronger enforcement of existing policies, expansion of policies, and more organizing will be necessary to ensure the stability of low-income populations going forward.

Of 14 anti-displacement policies inventoried across the two regions, inclusionary zoning and condo conversion ordinances are most popular; rent control and just-cause policies are rarer. Bay Area cities generally have more policies on the books than cities in Los Angeles County. Yet, their effectiveness is not well-studied, and it remains unclear whether they can successfully scale up to

address the dire need for affordable housing in California. At present, many station area plans include requirements for the production of affordable housing, and often the reduction of displacement as well. However, the level of funding to date has been insufficient to produce significant amounts of housing and to stabilize the low-income communities living near transit. Case studies demonstrate the key role community organizing can play in winning the passage and implementation of anti-displacement strategies.

# Conclusion

Fixed-rail transit has a significant impact on the stability of the surrounding neighborhood. In transit neighborhoods, housing costs tend to increase, changing the demographic composition of the area and resulting in the loss of low-income households. We find that low-income households both near and farther away from rail stations have lower VMT than high-income households, but that higher-income households either reduce their driving more in response to being near rail, or that there is no difference in VMT impacts between income categories when considered at a regional level.

Our findings generally confirm earlier research on gentrification and displacement, but extend previous work by explicitly linking transit investment to gentrification and displacement, and investigating how income and proximity to transit influence VMT.

Via several different models, we find a significant and positive relationship between TOD and gentrification, and in some cases the loss of affordable housing or low-income households as well. In general, TOD has a more significant impact in the core cities of the SF Bay Area and Downtown Los Angeles. Yet, the timeframe of impacts is less clear. In some cases, it seems to take decades, and in others, much less time. Moreover, other variables—such as historic housing stock and changes in affordability—compound the effects of TOD, sometimes with a more significant effect.

Proximity to rail is associated with lower VMT for both lower-income households and higher-income households. Given the lack of appropriate data, it is hard to predict how households will alter their VMT with displacement, for instance as high-income households replace low-income households near transit. In general, our study predicts that displacement induced by gentrification will either reduce net regional VMT or have no effect. However, increases of VMT may occur to the extent that very-low-income households are displaced by those of moderate income, or if gentrification results in a reduction of the population living near rail. More research is needed to understand the dynamic impacts that occur as residents adjust their travel behavior in new locations.

Since fixed-rail transit impacts neighborhood stability, and public investment subsidizes transit in California, it is appropriate for policy makers to take action that will reduce displacement. Yet, there is no simple recipe for mitigating displacement. The effectiveness of policy solutions varies by context, and it is unclear whether any of the existing approaches are sufficient to address displacement in the core neighborhoods where it is most prevalent. More research is needed to develop responsive policy tools, as well as to understand better the trade-offs between anti-displacement and VMT reduction goals.

Despite these remaining concerns, it is not too soon to begin incorporating these results into existing regional models (PECAS and UrbanSim) to analyze different investment scenarios and market conditions. We also recommend that practitioners begin to use our off-model tool to help identify the potential risk of displacement.

# References


Abraham, J.E., S. Cho, and G.T Hill. 2015a. “New Developments in the PECAS SD Module.” HBA Specto Incorporated.

Abraham, J.E., S. Cho, and G.T Hill. 2015b. “Representing Displacement In PECAS.” HBA Specto Incorporated.

Abraham, John Edward, Jamie Bridges, Charles Baber, Abdel Muhsen, and De Silva Dimantha. 2011. “Investigating Zoning Policy with the Baltimore PECAS Model.” In *Proceedings of the 12th International Conference on Computers in Urban Planning and Urban Management*. Lake Louise, AB.

Abraham, J.E., and J. D Hunt. 2007. “Random Utility Location, Production, and Exchange Choice ; Additive Logit Model ; and Spatial Choice Microsimulations.” *Transportation Research Record.*, no. 2003: 1–6.

Acharya, Gayatri, and Lynne Lewis Bennett. 2001. “Valuing Open Space and Land-Use Patterns in Urban Watersheds.” *The Journal of Real Estate Finance and Economics* 22 (2-3): 221–37. doi:10.1023/A:1007843514233.

Adkins, William G. 1959. “Land Value Impacts Of Expressways In Dallas, Houston, And San Antonio, Texas.” *Highway Research Board Bulletin*, no. 227. http://trid.trb.org/view.aspx?id=134044.

Ben-Akiva, Moshe E., and Steven R. Lerman. 1987. *Discrete Choice Analysis: Theory and Application to Travel Demand*. MIT Press.

Alameda County Transportation Commission. 2016. “Priority Development Area Investment and Growth Strategy : Alameda CTC.” *Alameda County Transportation Commission*. Accessed October 20. http://www.alamedactc.org/app_pages/view/10385.

Allbee, Allison, Jeffrey Lubell, and Rebecca Johnson. 2015. “Preserving, Protecting, and Expanding Affordable Housing: A Policy Toolkit for Public Health.” ChangeLabSolutions. http://changelabsolutions.org/publications/affordable_housing_toolkit.

American Planning Association. 2006. “Section 4.4 Model Affordable Housing Density Bonus.” American Planning Association. https://www.smartgrowthamerica.org/app/legacy/images/IH-model-ordinance-APA%20.pdf.

Anderson, Soren T., and Sarah E. West. 2006. “Open Space, Residential Property Values, and Spatial Context.” *Regional Science and Urban Economics* 36 (6): 773–89. doi:10.1016/j.regsciurbeco.2006.03.007.

Association of Bay Area Governments (ABAG). 2015. “Bay Area Housing Policy Databse v.1.0.” http://abag.ca.gov/planning/housing/research.html.

Association of Bay Area Governments (ABAG). 2016. “Final Regional Housing Need Allocation Adopted.” Accessed October 20. http://www.abag.ca.gov/planning/housingneeds/.

Association of Bay Area Governments (ABAG), and Metropolitan Transportation Commission (MTC). 2013. “Plan Bay Area: Strategy for a Sustainable Region.” http://files.mtc.ca.gov.s3.amazonaws.com/pdf/Plan_Bay_Area_FINAL/pbafinal/index.html.

Atkinson, Rowland. 2000. “Measuring Gentrification and Displacement in Greater London.” *Urban Studies* 37 (1): 149–65. doi:10.1080/0042098002339.

Atkinson, Rowland, Maryann Wulff, Margaret Reynolds, and Angela Spinney. 2011. “Gentrification and Displacement: The Household Impacts of Neighbourhood Change.” Australian Housing and Urban Research Institute. https://www.ahuri.edu.au/__data/assets/pdf_file/0007/2122/AHURI_Final_Report_No160_Gentrification_and_displacement_the_household_impacts_of_neighbourhood_change.pdf.

Atlanta Regional Commission. 2016. “Atlanta TOD Collaborative.” *Atlanta Regional Commission*. Accessed October 20. http://www.atlantaregional.com/land-use/transit-oriented-development/atlanta-tod-collaborative.
Baar, Kenneth. 2011. “The Economics of Mobilehome Ownership and Mobilehome Park Ownership in the City of Los Angeles and a Comparison of Local Regulations of Mobilehome Park Space Rents.” commissioned by the City of Los Angeles.
Bajic, Vladimir. 1983. “The Effects of a New Subway Line on Housing Prices in Metropolitan Toronto.” *Urban Studies* 20 (2): 147–58. doi:10.1080/00420988320080291.
Bakker, John. 2005. “Condominium Conversions: They’re Back: A Brief Primer on Condominiums Conversions and Conversion Ordinances and Some Thoughts from One Suburban Battleground.” http://www.cacities.org/UploadedFiles/LeagueInternet/c5/c5e504c3-e261-4986-b983-c964db35d7c0.pdf.
Barton, Stephen. 1998. “The Success and Failure of Strong Rent Control in the City of Berkeley, 1978-1995.” In *Rent Control: Regulation and the Rental Housing Market*, edited by W. Dennis Keating, Michael B. Teitz, and Andrejs Skaburskis. : Center for Urban Policy Research, Rutgers - The State University of New Jersey.
Bates, Lisa. 2013. “Gentrification and Displacement Study: Implementing an Equitable Inclusive Development Strategy in the Context of Gentrification.” http://www.portlandoregon.gov/bps/article/454027.
Beauregard, Robert. 1986. “The Chaos and Complexity of Gentrification.” In *Gentrification of the City Edited by Neil Smith and Peter Williams*. Boston: Allen & Unwin.
Bianchini, F., J. Grove, and R. Evans. 1992. “Flagship Projects in Urban Regeneration.” In *Rebuilding the City: Property-Led Urban Regeneration*, edited by P. Healy, S. Davoudi, S. Tavsanoglu, M. O’Toole, and D. Usher. London: Chapman & Hall.
Bloom, Joshua. n.d. “Commercial District Gentrification.” http://www.preservationnation.org/main-street/resources/public/RMS_Gentrification.pdf.
Bluestone, Barry, Mary Huff Stevenson, and Russell Williams. 2008. *The Urban Experience: Economics, Society, and Public Policy*. 1 edition. Oxford ; New York: Oxford University Press.
Bolitzer, B, and N. R Netusil. 2000. “The Impact of Open Spaces on Property Values in Portland, Oregon.” *Journal of Environmental Management* 59 (3): 185–93. doi:10.1006/jema.2000.0351.
Bostic, Raphael W., and Richard W. Martin. 2003. “Black Home-Owners as a Gentrifying Force? Neighbourhood Dynamics in the Context of Minority Home-Ownership.” *Urban Studies* 40 (12): 2427–49. doi:10.1080/0042098032000136147.
Boyd, Michelle. 2005. “The Downside of Racial Uplift: Meaning of Gentrification in an African American Neighborhood.” *City & Society* 17 (2): 265–88. doi:10.1525/city.2005.17.2.265.
Boyer, Christine. 1992. “Cities for Sale: Merchandising History at South Street Seaport.” In *Variations on a Theme Park: The New American City and the End of Public Space*. Macmillan.
Bridge, Gary, Tim Butler, and Loretta Lees. 2012. *Mixed Communities: Gentrification by Stealth?*. Policy Press.
Briggs, Xavier de Souza, ed. 2005. *The Geography of Opportunity: Race and Housing Choice in Metropolitan America*. Washington D.C: Brookings Institution Press.
Brinckerhoff, Parsons. 2001. “The Effect of Rail Transit on Property Values: A Summary of Studies.” Project S 21439, Task 7. Cleveland, Ohio: NEORail II. https://drcog.org/documents/The_effect_of_Rail_Transit_on_Property_Values_Summary_of_Studies1.pdf.
Brown, Ann. 2014. “Neighborhood Change Along the Orange Line.” UCLA Lewis Center for Regional Policies. http://www.lewis.ucla.edu/wp-content/uploads/sites/2/2014/11/ABrown-GIS-CompetitionPoster-final.pdf.
Brown-Saracino, Japonica. 2004. “Social Preservationists and the Quest for Authentic Community.” *City & Community* 3 (2): 135–56. doi:10.1111/j.1535-6841.2004.00073.x.

Brown-Saracino, Japonica. 2009. *A Neighborhood That Never Changes: Gentrification, Social Preservation, and the Search for Authenticity*. Fieldwork Encounters and Discoveries. Chicago: University of Chicago Press. http://www.press.uchicago.edu/ucp/books/book/chicago/N/bo8066321.html.

Bruch, Elizabeth E., and Robert D. Mare. 2006. "Neighborhood Choice and Neighborhood Change." *American Journal of Sociology* 112 (3): 667–709. doi:10.1086/507856.

Bucholtz, Shawn, Jacqueline Geoghegan, and Lori Lynch. 2003. "Capitalization of Open Spaces into Housing Values and the Residential Property Tax Revenue Impacts of Agricultural Easement Programs." *Agricultural and Resource Economics Review* 32 (1). http://econpapers.repec.org/article/agsarerjl/31352.htm.

Burgess, Ernest Watson. 1925. "The Growth of the City." In *The City:Suggestions of Investigation of Human Behavior in the Urban Environment*, edited by Robert Ezra Park, 47–62. Chicago: University of Chicago Press.

Calavita, Nico, and Kenneth Grimes. 1992. "The Establishment of the San Diego Housing Trust Fund: Lessons for Theory and Practice." *Journal of Planning Education and Research* 11 (3): 170–84. doi:10.1177/0739456X9201100302.

Calavita, Nico, and Kenneth Grimes. 1998. "Inclusionary Housing in California: The Experience of Two Decades." *Journal of the American Planning Association* 64 (2): 150–69. doi:10.1080/01944369808975973.

Calavita, Nico, Kenneth Grimes, and Alan Mallach. 1997. "Inclusionary Housing in California and New Jersey: A Comparative Analysis." *Housing Policy Debate* 8 (1): 109–42. doi:10.1080/10511482.1997.9521249.

Calavita, Nico, Alan Mallach, and Lincoln Institute of Land Policy. 2010. "United States: From Radical Innovation to Mainstream Housing Policy." In *Inclusionary Housing in International Perspective: Affordable Housing, Social Inclusion, and Land Value Recapture*. Cambridge, Mass.: Lincoln Institute of Land Policy.

California Coalition for Rural Housing, and Non-Profit Housing Association of Northern California. 2003. "Inclusionary Housing in California: 30 Years of Innovation." http://www.wellesleyinstitute.com/wp-content/uploads/2013/01/NPH-IHinCAfor30years2003.pdf.

California Department of Finance. 2015. "Housing, Permits & Starts, California and United States." http://www.dof.ca.gov/HTML/FS_DATA/LatestEconData/FS_Construction.htm.

California Department of Housing and Community Development (HCD). 2012. "Identification and Analysis of Developments At-Risk of Conversion." June. http://www.hcd.ca.gov/housing-policy-development/housing-element/ehn_atrisk.php.

California Housing Partnership Corporation (CHPC). 2013. "'Building and Preserving Affordable Homes Near Transit: Affordable TOD as a Greenhouse Gas Reduction and Equity Strategy. Working Paper.'" http://www.scanph.org/files/FullReport_CHPCAffordableTOD013113.pdf.

California Housing Partnership Corporation (CHPC). 2015. "Update On California's Affordable Housing Crisis: The Critical Role of Housing Access and Affordability in Reducing Poverty." http://chpc.net/wp-content/uploads/2015/11/1-2015StatewideHousingNeedReportFINAL.pdf.

Cao, Xinyu, and Daniel Chatman. 2015. "How Will Smart Growth Land-Use Policies Affect Travel? A Theoretical Discussion on the Importance of Residential Sorting." *Environment and Planning B: Planning and Design*, August, 0265813515600060. doi:10.1177/0265813515600060.

Card, David, Alexandre Mas, and Jesse Rothstein. 2008. "Tipping and the Dynamics of Segregation." *The Quarterly Journal of Economics* 123 (1): 177–218. doi:10.1162/qjec.2008.123.1.177.

Casazza, John. 1982. *Condominium Conversions*. Urban Land Institute.

Caulfield, Jon. 1994. *City Form and Everyday Life: Toronto's Gentrification and Critical Social Practice*. University of Toronto Press. http://www.jstor.org/stable/10.3138/j.ctt2ttx4p.

Center for Community Change. 2013. “City Housing Trust Funds 2013.” http://housingtrustfundproject.org/wp-content/uploads/2013/09/City-htfund-admin-and-date-2013.pdf.
Center for Community Change. 2015. “County Housing Trust Funds 2015.” http://housingtrustfundproject.org/wp-content/uploads/2015/05/County-htfund-admin-and-date-2015.pdf.
Center for Transit-Oriented Development (CTOD). 2004. “Hidden in Plain Sight: Capturing The Demand For Housing Near Transit.” Reconnecting America. http://ctod.org/pdfs/2004HiddenPlainSight.pdf.
Center for Transit-Oriented Development (CTOD), Nelson Nygaard, and t, Community Design + Architecture CD+A. 2014. “TOD Policy Status Report.” Prepared for Metropolitan Transportation Commission. http://files.mtc.ca.gov/pdf/Final-MTC-TOD-Policy-Update_2014.pdf.
Cervero, Robert. 2004. *Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects*. Transportation Research Board.
Cervero, Robert. 2005. “Progressive Transport and the Poor: Bogota’s Bold Steps Forward.” *ACCESS Magazine* 1 (27). http://escholarship.org/uc/item/3mj7r62w.
Cervero, Robert. 2006. “Effects of Light and Commuter Rail Transit on Land Prices: Experiences in San Diego County.” *University of California Transportation Center*, September. http://escholarship.org/uc/item/75n1b5xc.
Cervero, Robert. 2013. “Transport Infrastructure and the Environment: Sustainable Mobility and Urbanism.” *IURD Working Paper 2013-03*, October. http://escholarship.org/uc/item/3690j6pw.
Cervero, Robert, and Michael Duncan. 2002a. “Transit’s Value-Added Effects: Light and Commuter Rail Services and Commercial Land Values.” *Transportation Research Record: Journal of the Transportation Research Board* 1805 (January): 8–15. doi:10.3141/1805-02.
Cervero, Robert, and Michael Duncan. 2002b. “Land Value Impacts of Rail Transit Services in Los Angeles County.” Washington, D.C.: Prepared for National Association of Realtors Urban Land Institute. http://realtorbenefitsprogram.org/wps/wcm/connect/e7187a004e88a38db7bcf76019b6e772/losangeles.pdf?MOD=AJPERES&CACHEID=e7187a004e88a38db7bcf76019b6e772.
Cervero, Robert, and Michael Duncan. 2002c. “Benefits of Proximity to Rail on Housing Markets: Experiences in Santa Clara County.” *Journal of Public Transportation*, June. http://www.nctr.usf.edu/2002/06/benefits-of-proximity-to-rail-on-housing-markets-experiences-in-santa-clara-county/.
Cervero, Robert, and Michael Duncan. 2004. “Neighbourhood Composition and Residential Land Prices: Does Exclusion Raise or Lower Values?” *Urban Studies* 41 (2): 299–315. doi:10.1080/0042098032000165262.
Chambers, Robert. 2005. “Pushed Out: A Call for Inclusionary Housing Programs in Local Condominium Conversion Legislation Comment.” *California Western Law Review* 42: 355–76.
Chapin, Timothy S. 2004. “Sports Facilities as Urban Redevelopment Catalysts: Baltimore’s Camden Yards and Cleveland’s Gateway.” *Journal of the American Planning Association* 70 (2): 193–209. doi:10.1080/01944360408976370.
Chapple, Karen. 2009. “Mapping Susceptibility to Gentrification: The Early Warning Toolkit.” Berkeley, CA: Center for Community Innovation. http://communityinnovation.berkeley.edu/reports/Gentrification-Report.pdf.
Chapple, Karen. 2014. “The Highest and Best Use? Urban Industrial Land and Job Creation.” Economic Development Quarterly 28 (4): 300–313. doi:10.1177/0891242413517134.

Chapple, Karen, Shannon Jackson, and Anne J. Martin. 2010. "Concentrating Creativity: The Planning of Formal and Informal Arts Districts." *City, Culture and Society*, Advancing the Creative Economy Approach for Urban Studies, 1 (4): 225–34. doi:10.1016/j.ccs.2011.01.007.
Chapple, Karen, and Rick Jacobus. 2009. "Retail Trade as a Route to Neighborhood Revitalization." In *Urban and Regional Policy and Its Effects*. Vol. 2. Washington, D.C.: Brookings Institution Press. http://www.rjacobus.com/resources/archives/Retail%20Trade%20Proof.pdf.
Chapple, Karen, Jake Wegmann, Alison Nemirow, and Colin Dentel-Post. 2012. "Yes in My Backyard: Mobilizing the Market for Secondary Units." http://communityinnovation.berkeley.edu/reports/secondary-units.pdf.
Charles, Camille Zubrinsky. 2000. "Neighborhood Racial-Composition Preferences: Evidence from a Multiethnic Metropolis." *Social Problems* 47 (3): 379–407. doi:10.2307/3097236.
Charles, Camille Zubrinsky. 2003. "The Dynamics of Racial Residential Segregation." *Annual Review of Sociology* 29: 167–207.
Chaskin, Robert J. 2013. "Integration and Exclusion Urban Poverty, Public Housing Reform, and the Dynamics of Neighborhood Restructuring." *The ANNALS of the American Academy of Political and Social Science* 647 (1): 237–67. doi:10.1177/0002716213478548.
Chatman, Daniel. 2003. "How Density and Mixed Uses at the Workplace Affect Personal Commercial Travel and Commute Mode Choice." *Transportation Research Record: Journal of the Transportation Research Board* 1831 (January): 193–201. doi:10.3141/1831-22.
Chatman, Daniel G. 2009. "Residential Choice, the Built Environment, and Nonwork Travel: Evidence Using New Data and Methods." *Environment and Planning A* 41 (5): 1072–89. doi:10.1068/a4114.
Chatman, Daniel G. 2013. "Does TOD Need the T?" *Journal of the American Planning Association* 79 (1): 17–31. doi:10.1080/01944363.2013.791008.
Chatman, Daniel G. 2014. "Estimating the Effect of Land Use and Transportation Planning on Travel Patterns: Three Problems in Controlling for Residential Self-Selection." *Journal of Transport and Land Use* 7 (3): 47–56. doi:10.5198/jtlu.v7i3.729.
Chatman, Daniel G., Nicholas K. Tulach, and Kyeongsu Kim. 2012. "Evaluating the Economic Impacts of Light Rail by Measuring Home Appreciation A First Look at New Jersey's River Line." *Urban Studies* 49 (3): 467–87. doi:10.1177/0042098011404933.
Cheng, Suellen, and Munson Kwok. 2016. "History of Old Chinatown Los Angeles." *Los Angeles Old Chinatown Merchants Association*. Accessed October 21. http://oldchinatownla.com/history.html.
Chen, Hong, Anthony Rufolo, and Kenneth Dueker. 1998. "Measuring the Impact of Light Rail Systems on Single-Family Home Values: A Hedonic Approach with Geographic Information System Application." *Transportation Research Record: Journal of the Transportation Research Board* 1617 (January): 38–43. doi:10.3141/1617-05.
Chen, Kan, Elena G. Irwin, Ciriyam Jayaprakash, and Keith Warren. 2005. "The Emergence of Racial Segregation in an Agent-Based Model of Residential Location: The Role of Competing Preferences." Computational and Mathematical Organization Theory 11: 333–38.
Chinatown Buisness District. 2016. "Chinatown Buisness District: The Organization." Chinatown Los Angeles. Accessed October 20. http://www.chinatownla.com/cbid.php.
Chinatown Service Center. 2016. "Affordable Housing Services." *Chinatown Service Center*. Accessed October 20. http://cscla.org/services/family-services/affordable-housing/.
Chin, Gordon. 2015. *Building Community, Chinatown Style: A Half Century of Leadership in San Francisco Chinatown*. San Francisco, California: Friends of CCDC.
Chinn, Alton. 2014. Interview.
Chipman, Jonathan, Richard Wright, Mark Ellis, and Steven R. Holloway. 2012. "Mapping the Evolution of Racially Mixed and Segregated Neighborhoods in Chicago." *Journal of Maps* 8 (4): 340–43. doi:10.1080/17445647.2012.740431.

City/County Association Of Governments Of San Iviateo Cot]Nty. 2014. “San Mateo County Priorify Development Area Investment and Growth Strategy.” http://ccag.ca.gov/wp-content/uploads/2014/06/CMEQ-042913-Full-Packet.pdf.
City of Banning. 2005. “California Jurisdictions with Mobilehome Park Rent Stabilization Ordinances.” http://www.ci.banning.ca.us/archives/48/Appendix%201%20-%20carentcontroljurisdictionmodified2.pdf.
City of San Jose. 2014. “City of San José Housing Element 2014-2023 - ADMINISTRATIVE DRAFT.” http://www.sanjoseca.gov/DocumentCenter/View/34556.
Civic Economics. 2012. “The Civic Economics of Retail: Ten Years of Studies.” http://nebula.wsimg.com/eb1a35cadd85dd440dcba5cb1eba005e?AccessKeyId=8E410A17553441C49302&disposition=0&alloworigin=1.
Clark, W. A. V., and W. F. J. Van Lierop. 1986. “Residential Mobility and Household Location Modelling.” Handbook of Regional and Urban Economics. Elsevier Science Publishers. http://econpapers.repec.org/bookchap/eeeregchp/1-03.htm.
Clark, William A. V., and Mark Fossett. 2008. “Understanding the Social Context of the Schelling Segregation Model.” *California Center for Population Research*, June. http://escholarship.org/uc/item/9nx9x9pf.
Clay, Phillip L. 1979. *Neighborhood Renewal: Middle-Class Resettlement and Incumbent Upgrading in American Neighborhoods*. Lexington, Mass: Lexington Books.
Couch, Kenneth A., and David C. Wittenburg. 2001. “The Response of Hours of Work to Increases in the Minimum Wage.” *Southern Economic Journal*, 171–77.
Coulton, C. J., J. Chow, E. C. Wang, and M. Su. 1996. “Geographic Concentration of Affluence and Poverty in 100 Metropolitan Areas, 1990.” *Urban Affairs Review* 32 (2): 186–216. doi:10.1177/107808749603200203.
Crane, Jonathan. 1991. “The Epidemic Theory of Ghettos and Neighborhood Effects on Dropping Out and Teenage Childbearing.” *American Journal of Sociology* 96 (5): 1226–59.
Crooks, A. T. 2010. “Constructing and Implementing an Agent-Based Model of Residential Segregation through Vector GIS.” *International Journal of Geographical Information Science* 24 (5): 661–75. doi:10.1080/13658810903569572.
Crowder, Kyle, Jeremy Pais, and Scott J. South. 2012. “Neighborhood Diversity, Metropolitan Constraints, and Household Migration.” *American Sociological Review* 77 (3): 325–53. doi:10.1177/0003122412441791.
Crowder, Kyle, Matthew Hall, and Stewart E. Tolnay. 2011. “Neighborhood Immigration and Native Out-Migration.” American Sociological Review 76 (1): 25–47. doi:10.1177/0003122410396197.
Crowder, Kyle, and Scott J. South. 2005. “Race, Class, and Changing Patterns of Migration between Poor and Nonpoor Neighborhoods.” *American Journal of Sociology* 110 (6): 1715–63. doi:10.1086/428686.
Daniel, Frattin. 2013. “Governor Scuttles Palmer Fix.” *Reuben, Junius & Rose*. October 17. http://www.reubenlaw.com/index.php/rj/singleUpdate/governor_scuttles_palmer_fix.
Danyluk, Martin, and David Ley. 2007. “Modalities of the New Middle Class: Ideology and Behaviour in the Journey to Work from Gentrified Neighbourhoods in Canada.” *Urban Studies* 44 (11): 2195–2210. doi:10.1080/00420980701520277.
Dawkins, Casey, and Rolf Moeckel. 2014. “Transit-Induced Gentrification: Who Will Stay, and Who Will Go?” presented at the Transit, Transit Oriented Development, and Urban Form: A Bi-National Symposium Featuring Paris, France, and Washington, DC, October 18. http://smartgrowth.umd.edu/assets/tod_gentrification_v3.pdf.
Debrezion, Ghebreegziabiher, Eric Pels, and Piet Rietveld. 2007. “The Impact of Railway Stations on Residential and Commercial Property Value: A Meta-Analysis.” *The Journal of Real Estate Finance and Economics* 35 (2): 161–80. doi:10.1007/s11146-007-9032-z.

Dewees, D. N. 1976. “The Effect of a Subway on Residential Property Values in Toronto.” *Journal of Urban Economics* 3 (4): 357–69. doi:10.1016/0094-1190(76)90035-8.
Diappi, Lidia, and Paola Bolchi. 2013. “Redevelopments and Gentrification: A MAS Model of the Urban Housing Market in Milan.” In *Emergent Phenomena in Housing Markets*, edited by Lidia Diappi, 85–99. Physica-Verlag HD. http://link.springer.com/chapter/10.1007/978-3-7908-2864-1_4.
Diaz, Roderick. 1999. “Impacts Of Rail Transit On Property Values.” *RTD FasTracks* Track 3 - Partnering. http://www.rtd-fastracks.com/media/uploads/nm/impacts_of_rail_transif_on_property_values.pdf.
Diaz, Roderick, and Donald Schneck. 2000. “Bus Rapid Transit Technologies in the Americas: An Overview.” *Transportation Research Record: Journal of the Transportation Research Board* 1731 (January): 3–9. doi:10.3141/1731-01.
Dineen, J. K. 2015. “Chinatown Hotel next up in S.F. Gentrification Wars.” *SFGate*, March 27. http://www.sfgate.com/bayarea/article/Chinatown-hotel-next-up-in-S-F-gentrification-6161916.php.
Dominie, Will. 2012. “Is Just Growth Smarter Growth? The Effects of Gentrification on Transit Ridership and Driving in Los Angeles’ Transit Station Area Neighborhoods.” UCLA.
Doucouliagos, Hristos, and Tom D. Stanley. 2009. “Publication Selection Bias in Minimum-Wage Research? A Meta-Regression Analysis.” *British Journal of Industrial Relations* 47 (2): 406–28.
Dreier, Peter, John H. Mollenkopf, and Todd Swanstrom. 2004. *Place Matters: Metropolitics for the Twenty-First Century*. University Press of Kansas.
Dremann, Sue. 2014. “East Palo Alto Endorses Affordable-Housing Fee for Developers.” *Palo Alto Weekly*, July 2. http://www.paloaltoonline.com/news/2014/07/02/east-palo-alto-approves-developers-affordable-housing-fee.
Dube, Arindrajit, T. William Lester, and Barry Eidlin. 2007. “Firm Entry and Wages: Impact of Wal-Mart Growth on Earnings Throughout the Retail Sector.” *Institute for Research on Labor and Employment*, August. http://escholarship.org/uc/item/22s5k4pv.
Dubin, Robin A., and Allen C. Goodman. 1982. “Valuation of Education and Crime Neighborhood Characteristics through Hedonic Housing Prices.” *Population and Environment* 5 (3): 166–81. doi:10.1007/BF01257055.
DuBois, W. E. Burghardt. 2003. “The Health and Physique of the Negro American.” *American Journal of Public Health* 93 (2): 272–76. doi:10.2105/AJPH.93.2.272.
Duncan, Michael. 2008. “Comparing Rail Transit Capitalization Benefits for Single-Family and Condominium Units in San Diego, California.” *Transportation Research Record: Journal of the Transportation Research Board* 2067 (December): 120–30. doi:10.3141/2067-14.
Duncan, Michael. 2010. “The Impact of Transit-Oriented Development on Housing Prices in San Diego, CA.” *Urban Studies*, May. doi:10.1177/0042098009359958.
Dwyer, Rachel E. 2010. “Poverty, Prosperity, and Place: The Shape of Class Segregation in the Age of Extremes.” *Social Problems* 57 (1): 114–37. doi:10.1525/sp.2010.57.1.114.
East Hollywood Neighborhood Council. 2016. “The History oF East Hollywood.” *East Hollywood Neighborhood Council*. Accessed October 21. http://www.easthollywood.net/history.
Ellen, Ingrid Gould, Keren Horn, and Katherine O’Regan. 2012. “Pathways to Integration: Examining Changes in the Prevalence of Racially Integrated Neighborhoods.” *Cityscape* 14 (3): 33–53.
Ellen, Ingrid Gould, and Brendan O’Flaherty. 2013. “Chapter 4. How New York and Los Angeles Housing Policies Are Different--and Maybe Why.” In *New York and Los Angeles: The Uncertain Future*. New York: Oxford University Press.
Ellen, Ingrid Gould, and Katherine M. O’Regan. 2011. “How Low Income Neighborhoods Change: Entry, Exit, and Enhancement.” *Regional Science and Urban Economics* 41 (2): 89–97. doi:10.1016/j.regsciurbeco.2010.12.005.

Ellen, Ingrid Gould, and Margery Austin Turner. 1997. "Does Neighborhood Matter? Assessing Recent Evidence." *Housing Policy Debate* 8 (4): 833–66. doi:10.1080/10511482.1997.9521280.
Ellis, Mark, Steven R. Holloway, Richard Wright, and Christopher S. Fowler. 2012. "Agents of Change: Mixed-Race Households and the Dynamics of Neighborhood Segregation in the United States." *Annals of the Association of American Geographers* 102 (3): 549–70. doi:10.1080/00045608.2011.627057.
Eng, Tiffany. 2015. "Living Histories and Thriving Families: Opportunities for Implementing a Cultural District Strategy in San Francisco's Chinatown." Berkeley, CA.
Fainstein, Susan S. 2010. *The Just City*. Ithaca, NY: Cornell University Press.
Farrell, Chad R., and Barrett A. Lee. 2011. "Racial Diversity and Change in Metropolitan Neighborhoods." *Social Science Research* 40 (4): 1108–23. doi:10.1016/j.ssresearch.2011.04.003.
Ficano, Carlena Cochi. 2013. "Business Churn and the Retail Giant: Establishment Birth and Death from Wal-Mart's Entry*." *Social Science Quarterly* 94 (1): 263–91. doi:10.1111/j.1540-6237.2012.00857.x.
Fischel, William A. 1985. *The Economics of Zoning Laws: A Property Rights Approach to American Land Use Controls*. Baltimore: Johns Hopkins University Press.
Fischer, Claude S. 1984. *The Urban Experience*. 2 Sub edition. San Diego: Harcourt.
Fischer, Claude S. 2010. *Made in America: A Social History of American Culture and Character*. University of Chicago Press.
Fischer, Claude S. 2013. "Segregation by Culture." *Boston Review: A Political and Literary Forum*. December 4.
Fischer, Claude S., Gretchen Stockmayer, Jon Stiles, and Michael Hout. 2004. "Distinguishing the Geographic Levels and Social Dimensions of U.S. Metropolitan Segregation, 1960-2000." *Demography* 41 (1): 37–59. doi:10.2307/1515212.
Fishman, Charles. 2006. *The Wal-Mart Effect: How the World's Most Powerful Company Really Works--and HowIt's Transforming the American Economy*. Reprint edition. New York: Penguin Books.
Florida, Richard. 2002. *The Rise Of The Creative Class: And How It's Transforming Work, Leisure, Community And Everyday Life*. First Printing edition. Princeton, N.J.: Basic Books.
Fluit, Heather. 2015. "HUD Announces Final Rule on Affirmatively Furthering Fair Housing." *U.S. Department of Housing and Urban Development*. July 8. http://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2015/HUDNo_15-084.
Freeman, Lance. 2005. "Displacement or Succession? Residential Mobility in Gentrifying Neighborhoods." *Urban Affairs Review* 40 (4): 463–91. doi:10.1177/1078087404273341.
Freeman, Lance. 2006. *There Goes the Hood: Views of Gentrification from the Ground Up*. Philadelphia, Pa: Temple University Press.
Freeman, Lance, and Frank Braconi. 2004. "Gentrification and Displacement New York City in the 1990s." Journal of the American Planning Association 70 (1): 39–52. doi:10.1080/01944360408976337.
Fribourg, Aimée. 2009. *San Francisco's Single-Room Occupancy (SRO) Hotels: A Strategic Assessment of Residents and Their Human Service Needs : A Study Conducted for the San Francisco Human Services Agency (SF-HSA), San Francisco, California*.
Frieden, Bernard J., and Lynne B. Sagalyn. 1989. *Downtown, Inc., How America Rebuilds Cities*. Cambridge, Mass.
Fry, Richard, and Paul Taylor. 2012. "The Rise of Residential Segregation by Income." *Pew Research Center's Social & Demographic Trends Project*. Accessed January 18. http://www.pewsocialtrends.org/2012/08/01/the-rise-of-residential-segregation-by-income/.
Fujioka, Gen. 2014. Chinatown and Adjoining Neighborhoods.

Furman Center for Real Estate and Urban Policy. 2006. “Housing Policy in New York City: A Brief History.” http://furmancenter.org/files/publications/AHistoryofHousingPolicycombined0601_000.pdf.
Galster, George C. 2010. “The Mechanism(s) of Neighbourhood Effects: Theory, Evidence, and Policy Implications.” In *Neighbourhood Effects Research: New Perspectives*, edited by Maarten van Ham, David Manley, Nick Bailey, Ludi Simpson, and Duncan Maclennan, 23–56. Springer Netherlands. http://link.springer.com/chapter/10.1007/978-94-007-2309-2_2.
Gatzlaff, Dean H., and Marc T. Smith. 1993. “The Impact of the Miami Metrorail on the Value of Residences near Station Locations.” *Land Economics* 69 (1): 54–66. doi:10.2307/3146278.
Geoghegan, Jacqueline. 2002. “The Value of Open Spaces in Residential Land Use.” *Land Use Policy* 19 (1): 91–98. doi:10.1016/S0264-8377(01)00040-0.
Geolytics, Inc. 2014. “Geolytics Neighborhood Change Database in 2010 Boundaries.” Somerville, NJ: Geolytics, Inc.
Giuliano, G. 1989. “New Directions for Understanding Transportation and Land Use.” *Environment and Planning A* 21 (2): 145–59. doi:10.1068/a210145.
Giuliano, Genevieve. 1989. “New Directions for Understanding Transportation and Land Use.” *eScholarship*. http://escholarship.org/uc/item/3gz976p8.
Giuliano, Genevieve, and Ajay Agarwal. 2010. “Public Transit as a Metropolitan Growth and Development Strategy.” *Urban and Regional Policy and Its Effects* 3: 205–52.
Glaeser, Edward L. 2003. “Does Rent Control Reduce Segregation?” *Swedish Economic Policy Review* 10: 179–202.
Glass, Ruth Lazarus. 1964. *London: Aspects of Change*. London: MacGibbon & Kee.
Goetz, Edward. 1994. “Expanding Possibilities in Local Development Policy: An Examination of U.S. Cities.” *Political Research Quarterly* 47 (1): 85–109. doi:10.1177/106591299404700105.
Goetz, Edward. 2003. *Clearing the Way: Deconcentrating the Poor in Urban America*. Washington, D.C: Rowman & Littlefield Publishers.
Goetz, Edward. 2013. *New Deal Ruins: Race, Economic Justice, and Public Housing Policy*. Ithaca, NY: Cornell University Press.
Goldfarb Lipman LLP. 2015. “Law Alert: California Supreme Court Greenlights Affordable Housing Ordinances.” http://nonprofithousing.org/wp-content/uploads/GL-LLP-Law-Alert-CA-Supreme-Court-Greenlights-Affordable-Housing-Ordinances.pdf.
Gose, Joe. 2014. “CONDO CONVERSION CRAZE.” *National Real Estate Investor*. June 1. http://nreionline.com/content/condo-conversion-craze.
Great Communities Collaborative. 2007. “Preventing Displacement Policy Fact Sheet.” http://www.greatcommunities.org/wp-content/uploads/pdf/2007%2011%20Preventing%20Displacement%20Policy%20Fact%20Sheet.pdf.
Greene, William H. 2002. *Econometric Analysis*. 5th edition. Boston: Pearson Education.
Grier, George W, Eunice S Grier, United States, Department of Housing and Urban Development, and Office of the Secretary. 1978. *Urban Displacement: A Reconnaissance*. Bethesda, Md.: Grier Partnership.
Guerra, Erick, Robert Cervero, and Daniel Tischler. 2011. “The Half-Mile Circle: Does It Best Represent Transit Station Catchments?” *University of California Transportation Center*, August. http://escholarship.org/uc/item/68r764df.
Gyourko, Joseph, and Peter Linneman. 1989. “Equity and Efficiency Aspects of Rent Control: An Empirical Study of New York City.” *Journal of Urban Economics* 26 (1): 54–74.
Hackworth, Jason, and Josephine Rekers. 2005. “Ethnic Packaging and Gentrification The Case of Four Neighborhoods in Toronto.” *Urban Affairs Review* 41 (2): 211–36. doi:10.1177/1078087405280859.

Hall, Peter. 2002. *Cities of Tomorrow: An Intellectual History of Urban Planning and Design in the Twentieth Century*. 3 edition. Oxford, UK ; Malden, MA: Wiley-Blackwell.
Halpern, Robert. 1995. *Rebuilding the Inner City*. New York: Columbia University Press.
Haltiwanger, John, Ron Jarmin, and C. J. Krizan. 2010. "Mom-and-Pop Meet Big-Box: Complements or Substitutes?" *Journal of Urban Economics*, Special Issue: Cities and Entrepreneurship Sponsored by the Ewing Marion Kauffman Foundation (www.kauffman.org), 67 (1): 116–34. doi:10.1016/j.jue.2009.09.003.
Hammer, Jon, and Hammer Ventures. 2004. "The Conversion Crusade." *The Daily Transcript*. June 29. http://www.sddt.com/news/article.cfm?SourceCode=20040629rp.
Hamnett, Chris. 1991. "The Blind Men and the Elephant: The Explanation of Gentrification." *Transactions of the Institute of British Geographers* 16 (2): 173–89. doi:10.2307/622612.
Hamnett, Chris. 2003. "Gentrification and the Middle-Class Remaking of Inner London, 1961-2001." *Urban Studies* 40 (12): 2401–26. doi:10.1080/0042098032000136138.
Hannigan, John. 1998. *Fantasy City: Pleasure and Profit in the Postmodern Metropolis*. London ; New York: Routledge.
Har, Janie. 2015. "San Francisco's Chinatown Clings to Roots amid Tech Boom." *SF Gate*. July 25. http://www.sfgate.com/news/article/San-Francisco-s-Chinatown-clings-to-roots-amid-6403628.php?cmpid=email-mobile#photo-7902776.
Harrison Institute for Public Law, Georgetown University Law Center. 2006. "An Analysis of the Strengths and Deficiencies of Washington, D.C.'s Tenant Opportunity to Purchase Act." http://content.knowledgeplex.org/kp2/cache/documents/1834/183436.pdf.
Helper, Lauren. 2014. "San Jose Mayor Chuck Reed on Housing Element Affordability, Urban Villages, Density." *Silicon Valley Business Journal*, October. http://www.bizjournals.com/sanjose/news/2014/10/01/san-jose-sets-housing-vision-mayor-chuck-reed-on.html.
Henao, Lizzeth. 2013. "CASP: Community Involvement in Planning Yields Great(er) Results." *Alliance for Community Transit-Los Angeles*. February 4. http://www.allianceforcommunitytransit.org/casp-community-involvement-in-planning-yields-greater-results-2/.
Hepler, Lauren. 2014. "Silicon Valley's Affordable Housing Crisis: The Shadow of Success." *Silicon Valley Business Journal. California*. http://www. bizjournals. com/sanjose/print-edi tion/2014/01/31/silicon-valleys-affordable-housing. html.
Hess, Daniel Baldwin, and Tangerine Maria Almeida. 2007. "Impact of Proximity to Light Rail Rapid Transit on Station-Area Property Values in Buffalo, New York." *Urban Studies* 44 (5-6): 1041–68. doi:10.1080/00420980701256005.
Hickey, Robert. 2013. "After the Downturn: New Challenges and Opportunities for Inclusionary Housing." Inclusionary Housing: A Series of Research & Policy Briefs. Center for Housing Policy. http://www.centerforhousingpolicy.org/media/files/Solutions2013/IC-6.IZpaperflier.pdf.
Hickey, Robert. 2014. "Inclusionary Upzoning: Tying Growth to Affordability." http://www.nhc.org/Inclusionary-Upzoning.pdf.
Hickey, Robert, and Lisa Sturtevant. 2015. "Public Land & Affordable Housing in the Washington DC Region: Best Practices and Recommendations." http://washington.uli.org/wp-content/uploads/sites/56/2015/02/ULI_PublicLandReport_Final020215.pdf.
Hickey, Robert, Lisa Sturtevant, and Emily Thaden. 2014. "Achieving Lasting Affordability through Inclusionary Housing." http://communitylandtrust.org/wp-content/uploads/2014/08/CLT-inclusion-July2014-LincLandInst.pdf.
Hipp, John R. 2012. "Segregation Through the Lens of Housing Unit Transition: What Roles Do the Prior Residents, the Local Micro-Neighborhood, and the Broader Neighborhood Play?" *Demography* 49 (4): 1285–1306. doi:10.1007/s13524-012-0121-0.

Hirsch, Arnold Richard. 1983. *Making the Second Ghetto: Race and Housing in Chicago, 1940-1960*. CUP Archive.
Hirsch, Werner Z., and Anthony M. Rufolo. 1999. "The Regulation of Immobile Housing Assets under Divided ownership1." *International Review of Law and Economics* 19 (3): 383–97. doi:10.1016/S0144-8188(99)00012-5.
Hofmann, Michelle. 2005. "Condo Crazy, Again." *Los Angeles Times*, May 22. http://articles.latimes.com/2005/may/22/realestate/re-condo22.
Howell, Kathryn Leigh. 2013. "Transforming Neighborhoods, Changing Communities : Collective Agency and Rights in a New Era of Urban Redevelopment in Washington, DC," December. http://repositories.lib.utexas.edu/handle/2152/23193.
Huang, Qingxu, Dawn C Parker, Tatiana Filatova, and Shipeng Sun. 2013. "A Review of Urban Residential Choice Models Using Agent-Based Modeling." Environment and Planning B: Planning and Design 40: 1–29. doi:10.1068/b120043p.
Huang, W. 1994. "The Effects of Transportation Infrastructure on Nearby Property Values: A Review of the Literature." IURD. http://trid.trb.org/view.aspx?id=447572.
Hunt, J.D., and J.E. Abraham. 2005. "Design and Implementation of PECAS: A Generalized System for the Allocation of Economic Production, Exchange and Consumption Quantities." In *Integrated Land-Use and Transportation Models: Behavioural Foundations*, edited by Martin Lee-Gosselin and Sean Doherty. Amsterdam; Boston: Elsevier Science Ltd.
Hunt, J.D., and J.E. Abraham. 2009. "PECAS - For Spatial Economic Modelling: Theoretical Formulation." HBA Specto Incorporated. http://www.hbaspecto.com/pecas/downloads/files/PECASTheoreticalFormulation.pdf.
Hunt, J.D., J.E. Abraham, and S. Cho. 2011. "Development of PECAS Spatial Economic Model of Los Angeles." Banglalore, India. http://www.hbaspecto.com/pecas/downloads/files/PECASTheoreticalFormulation.pdf.
Hunt, J.E., J.D. Abraham, D. De Silva, M. Zhong, J. Bridges, and J. Mysko. 2007. "Microsimulating Space Development in Baltimore." In *Proceedings of the 12th International Conference on Computers in Urban Planning and Urban Management*. Hong Kong.
Hwang, Jackelyn, and Robert J. Sampson. 2014. "Divergent Pathways of Gentrification Racial Inequality and the Social Order of Renewal in Chicago Neighborhoods." *American Sociological Review* 79 (4): 726–51. doi:10.1177/0003122414535774.
Hyra, Derek S. 2008. *The New Urban Renewal: The Economic Transformation of Harlem and Bronzeville*. Chicago: University Of Chicago Press.
Imbroscio, David. 2012. "Beyond Mobility:the Limits of Liberal Urban Policy." *Journal of Urban Affairs* 34 (1): 1–20. doi:10.1111/j.1467-9906.2011.00578.x.
Ioffee, Karina. 2015. "Richmond: Rent Control Ordinance Finalized." *East Bay Times*. August 6. http://www.eastbaytimes.com/2015/08/06/richmond-rent-control-ordinance-finalized/.
Irwin, Elena G. 2002. "The Effects of Open Space on Residential Property Values." *Land Economics* 78 (4): 465–80. doi:10.3368/le.78.4.465.
Irwin, Elena G., and Nancy E. Bockstael. 2001. "The Problem of Identifying Land Use Spillovers: Measuring the Effects of Open Space on Residential Property Values." *American Journal of Agricultural Economics* 83 (3): 698–704.
Jackson, Jeremy, Benjamin Forest, and Raja Sengupta. 2008. "Agent-Based Simulation of Urban Residential Dynamics and Land Rent Change in a Gentrifying Area of Boston." *Transactions in GIS* 12 (4): 475–91. doi:10.1111/j.1467-9671.2008.01109.x.
Jackson, Kenneth. 1987. *Crabgrass Frontier: The Suburbanization of the United States*. 1st ed. Oxford University Press, USA.
Jacobus, Rick. 2015. "CA's Surprisingly Strong Stand in Support of Inclusionary Housing." *Rooflines*. June 16.

http://www.rooflines.org/4165/cas_surprisingly_strong_stand_in_support_of_inclusionary_housing/.
Jargowsky, Paul. 2001. "The Social Consequences of Income Inequality and Economic Segregation for Young Adults: Estimates Using Metropolitan Level Data."
Jargowsky, Paul A. 1997. *Poverty and Place: Ghettos, Barrios, and the American City*. New York: Russell Sage Foundation.
Jarzab, J. T., J. Lightbody, and E. Maeda. 2002. "Characteristics of Bus Rapid Transit Projects: An Overview." *Journal of Public Transportation* 5 (2). http://trid.trb.org/view.aspx?id=726756.
Jencks, Christopher, Susan Mayer, Laurence E. Jr. Lynn, and Michael G. H. McGeary. 1990. "The Social Consequences of Growing Up in a Poor Neighborhood." In *Inner-City Poverty in the United States*. Washington, D.C.: National Academies Press. http://www.nap.edu/catalog/1539.
Johnson, Andrew M. 2003. "Bus Rapid Transit and Land Use: Illuminating the Interaction." *Journal of Public Transportation* 6 (4). http://trid.trb.org/view.aspx?id=684254.
Johnston, Robert A., and Michael C. McCoy. 2006. "Assessment of Integrated Transportation/ Land Use Models."
Jones, Charisse. 2005a. "Soaring Numbers of Rentals Go Condo." *USA Today*. July 7. http://usatoday30.usatoday.com/news/nation/2005-07-06-condos-renters_x.htm.
Jones, Charisse. 2005b. "Condo Conversions on Rise in U.S." *USA Today*. July 8. http://the.honoluluadvertiser.com/article/2005/Jul/08/bz/507080344.html.
Joseph, Mark L. 2006. "Is Mixed-income Development an Antidote to Urban Poverty?" *Housing Policy Debate* 17 (2): 209–34. doi:10.1080/10511482.2006.9521567.
Judson, Victoria A. 1983. "Defining Property Rights: The Constitutionality of Protecting Tenants from Condominium Conversion." *Harvard Civil Rights-Civil Liberties Law Review* 18: 179–230.
Juergensmeyer, Julian, and Thomas Roberts. 2013. "Land Use Planning & Development Regulation Law." *Faculty Publications By Year*, January. http://readingroom.law.gsu.edu/faculty_pub/823.
Kahn, Matthew E. 2007. "Gentrification Trends in New Transit-Oriented Communities: Evidence from 14 Cities That Expanded and Built Rail Transit Systems." *Real Estate Economics* 35 (2): 155–82. doi:10.1111/j.1540-6229.2007.00186.x.
Karner, A., and D. Niemeier. 2012. "Alternative Scenarios, Affordable Housing, and Vehicle-Miles Traveled in the Bay Area. Unpublished Memorandum to Parisa Fatehi-Weeks of Public Advocates."
Katz, Michael B. 2012. *Why Don't American Cities Burn?* The City in the Twenty-First Century. Philadelphia: University of Pennsylvania Press.
Keating, Dennis, and Mitch Kahn. 2001. "Rent Control in the New Millennium." *NHI Shelterforce Online*. http://www.nhi.org/online/issues/117/KeatingKahn.html.
Keating, W. Dennis, Michael B. Teitz, and Andrejs Skaburskis. 1998. *Rent Control: Regulation and the Rental Housing Market*. New Brunswick, N.J: CUPR/Transaction.
Kennedy, Maureen, and Paul Leonard. 2001. "Dealing with Neighborhood Changes: A Primer on Gentrification and Policy Choices." The Brookings Institution Center on Urban and Metropolitan Policy and PolicyLink. http://community-wealth.org/content/dealing-neighborhood-changes-primer-gentrification-and-policy-choices.
Kilpatrick, John, Ronald Throupe, John Carruthers, and Andrew Krause. 2007. "The Impact of Transit Corridors on Residential Property Values." *Journal of Real Estate Research* 29 (3): 303–20. doi:10.5555/rees.29.3.lg5hq60530884755.
Kim, Eunice. 2011. "Mitigating Displacement Due to Gentrification: Tools for Portland, Oregon." Tufts University. http://www.oregonmetro.gov/sites/default/files/Mitigating_displacement_pdx_tools_Eunice_Kim_2011.pdf.

Kinney, Aaron. 2015a. “San Mateo County: Affordable Housing Crisis Inspires Talks about Rent Control.” *The Mercury News*. March 1. http://www.mercurynews.com/2015/03/01/san-mateo-county-affordable-housing-crisis-inspires-talks-about-rent-control/.
Kinney, Aaron. 2015b. “San Mateo County Supervisors Deal Blow to Rent Control Hopes.” *The Mercury News*. March 17. http://www.mercurynews.com/2015/03/17/san-mateo-county-supervisors-deal-blow-to-rent-control-hopes/.
Knaap, Gerrit J., Chengr Ding, and Lewis D. Hopkins. 2001. “Do Plans Matter? The Effects of Light Rail Plans on Land Values in Station Areas.” *Journal of Planning Education and Research* 21 (1): 32–39. doi:10.1177/0739456X0102100103.
Knight, Robert L., and Lisa L. Trygg. 1977. “Evidence of Land Use Impacts of Rapid Transit Systems.” Transportation 6 (3): 231–47.
Koebel, C. Theodore. 2002. “Analyzing Neighborhood Retail and Service Change in Six Cities.” Blacksburg, VA: Center for Housing Research, Virginia Polytechnic Institute and State University.
Kolko, Jed. 2011. “Employment Location, Neighborhood Change, and Gentrification.” SSRN Scholarly Paper ID 1662548. Rochester, NY: Social Science Research Network. https://papers.ssrn.com/abstract=1662548.
Kontokosta, Constantine E. 2013. “Mixed-Income Housing and Neighborhood Integration: Evidence from Inclusionary Zoning Programs.” *Journal of Urban Affairs* 36 (4): 716–41. doi:10.1111/juaf.12068.
Krysan, Maria, Mick P. Couper, Reynolds Farley, and Tyrone Forman. 2009. “Does Race Matter in Neighborhood Preferences? Results from a Video Experiment.” *AJS; American Journal of Sociology* 115 (2): 527–59.
Kushto, Emily R., and Joseph L. Schofer. 2008. “Travel and Transportation Impacts of Urban Gentrification: Chicago, Illinois Case Study.” TRB meeting Impact of Changing Demographics on the Transportation System Conference, October. http://www.iti.northwestern.edu/publications/schofer/Kushto_and_Schofer-2008-Travel_and_Transportation_Impacts_of_Urban_Gentrification_Chicago_Illinois_Case_Study.pdf.
L.A. Housing and Community Investment Department. 2014. “Affordable Housing Trust Fund.” L.A. Housing and Community Investment Department. http://lahd.lacity.org/lahdinternet/AffordableHousingTrustFund/tabid/126/Default.aspx.
Landis, John D. 2016. “Tracking and Explaining Neighborhood Socioeconomic Change in U.S. Metropolitan Areas Between 1990 and 2010.” *Housing Policy Debate* 26 (1): 2–52. doi:10.1080/10511482.2014.993677.
Landis, John, Subhrajit Guhathakurta, William Huang, and Ming Zhang. 1995. “Rail Transit Investments, Real Estate Values, and Land Use Change: A Comparative Analysis of Five California Rail Transit Systems.” *University of California Transportation Center*, July. http://escholarship.org/uc/item/2hf9s9sr.
Landry, Charles. 2008. *The Creative City: A Toolkit for Urban Innovators*. 2nd edition. New Stroud, UK : London ; Sterling, VA: Routledge.
Lane, Michael, and Libby Seifel. 2015. “Untapped Resources: Potential Bay Area Sites for Affordable Transit-Oriented Development.” The Non-Profit Housing Association of Northern California. http://nonprofithousing.org/wp-content/uploads/FINAL_Untapped-Resources-Full-Report.pdf.
Lee, Barret A, and Peter B Wood. 1991. “Is Neighborhood Racial Succession Place-Specific?” *Demography* 28 (1): 21–40.
Lees, L. 1996. “In the Pursuit of Difference: Representations of Gentrification.” *Environment and Planning A* 28 (3): 453–70. doi:10.1068/a280453.
Lees, Loretta. 2003. “Super-Gentrification: The Case of Brooklyn Heights, New York City.” *Urban Studies* 40 (12): 2487–2509. doi:10.1080/0042098032000136174.

Lees, Loretta, Tom Slater, and Elvin Wyly. 2008. *Gentrification*. 1 edition. New York: Routledge/Taylor & Francis Group.
LePage, Andrew. 2004. "'Condo Craze' Sows Seeds of Controversy: Entry-Level Homes Increase but Apartments Decline." *Sacramento Bee*, September 13, sec. D1.
Lerman, Steven R. 1977. "Location, Housing, Automobile Ownership, and Mode to Work: A Joint Choice Model." *Transportation Research Record* 610: 6–11.
Lester, Thomas William. 2009. "Towards a Living Wage in the New Economy: The Politics and Economics of Building Labor Market Institutions at the Urban Scale." Ph.D., United States -- California: University of California, Berkeley. http://search.proquest.com/dissertations/docview/503636701/abstract/A5AD46F923A24F9EPQ/1.
Levinson, Herbert, Samuel Zimmerman, Jennifer Clinger, and G. Rutherford. 2002. "Bus Rapid Transit: An Overview." *Journal of Public Transportation* 5 (2). doi:http://dx.doi.org/10.5038/2375-0901.5.2.1.
Levy, Diane K., Jennifer Comey, and Sandra Padilla. 2006. "Keeping the Neighborhood Affordable: A Handbook of Housing Strategies for Gentrifying Areas." Text. http://webarchive.urban.org/publications/411295.html.
Levy, Diane K., Z McDade, and Kassie Dumlao Bertumen. 2011. "Effects from Living in Mixed-Income Communities for Low-Income Families: A Review of the Literature." Text. January 28. http://www.urban.org/publications/412292.html.
Lewis-Workman, Steven, and Daniel Brod. 1997. "Measuring the Neighborhood Benefits of Rail Transit Accessibility." *Transportation Research Record: Journal of the Transportation Research Board* 1576 (January): 147–53. doi:10.3141/1576-19.
Ley, David. 1994. "Gentrification and the Politics of the New Middle Class." *Environment and Planning D: Society and Space* 12 (1): 53–74. doi:10.1068/d120053.
Ley, David. 1996. *The New Middle Class and the Remaking of the Central City*. Oxford University Press.
Ley, David. 2003. "Artists, Aestheticisation and the Field of Gentrification." *Urban Studies* 40 (12): 2527–44. doi:10.1080/0042098032000136192.
Ley, David, and Cory Dobson. 2008. "Are There Limits to Gentrification? The Contexts of Impeded Gentrification in Vancouver." *Urban Studies* 45 (12): 2471–98. doi:10.1177/0042098008097103.
Lichter, Daniel T., Domenico Parisi, and Michael C. Taquino. 2012. "The Geography of Exclusion: Race, Segregation, and Concentrated Poverty." *Social Problems* 59 (3): 364–88. doi:10.1525/sp.2012.59.3.364.
Li, Chuo. 2011. "Chinatown and Urban Redevelopment: A Spatial Narrative of Race, Identity, and Urban Politics 1950–2000." Ph.D., United States -- Illinois: University of Illinois at Urbana-Champaign. http://search.proquest.com/dissertations/docview/920126026/abstract.
Li, Wei. 2009. *Ethnoburb: The New Ethnic Community in Urban America*. University of Hawaii Press.
Lin, Jane. 2002. "Gentrification And Transit In Northwest Chicago." *Journal of the Transportation Research Forum* 56 (4). https://trid.trb.org/view.aspx?id=728134.
Litman, Todd. 2007. "Build for Comfort, Not Just Speed: Valuing Service Quality Impacts in Transportation Planning." Victoria Transport Policy Institute. /view.aspx?id=1155071.
Litman, Todd. 2011. "Measuring Transportation: Traffic, Mobility and Accessibility." Victoria Transport Policy Institute. http://www.vtpi.org/measure.pdf.
Logan, John R. 2013. "The Persistence of Segregation in the 21st Century Metropolis." *City & Community* 12 (2): 160–68. doi:10.1111/cico.12021.
Logan, John R., and Harvey Luskin Molotch. 1987. *Urban Fortunes: The Political Economy of Place*. Berkeley, CA: University of California Press.

Logan, John R., and Charles Zhang. 2010. “Global Neighborhoods: New Pathways to Diversity and Separation.” *AJS; American Journal of Sociology* 115 (4): 1069–1109. doi:10.1086/649498.
Los Angeles County Metropolitan Transportation Authority. 2015. “Los Angeles County Metropolitan Transportation Authority.” http://media.metro.net/projects_studies/joint_development/images/JDP_policies_process_2015-07.pdf.
Los Angeles Times. 2016. “Mapping LA: Chinatown.” *Los Angeles Times*. Accessed October 20. http://maps.latimes.com/neighborhoods/neighborhood/chinatown/.
Loukaitou-Sideris, Anastasia. 2002. “REGENERATION OF URBAN COMMERCIAL STRIPS: ETHNICITY AND SPACE IN THREE LOS ANGELES NEIGHBORHOODS.” *Journal of Architectural and Planning Research* 19 (4): 334–50.
Ludwig, Jens, Helen F. Ladd, Greg J. Duncan, Jeffrey Kling, and Katherine M. O’Regan. 2001. “Urban Poverty and Educational Outcomes [with Comments].” *Brookings-Wharton Papers on Urban Affairs*, 147–201.
Lund, Hollie, Robert Cervero, and Richard Willson. 2004. “Travel Characteristics of Transit-Oriented Development in California.” “Statewide Planning Studies”—FTA Section 5313 (b). http://staging.community-wealth.org/sites/clone.community-wealth.org/files/downloads/report-lund-cerv-wil.pdf.
Lutzenhiser, Margot, and Noelwah R. Netusil. 2001. “The Effect of Open Spaces on a Home’s Sale Price.” *Contemporary Economic Policy* 19 (3): 291–98. doi:10.1093/cep/19.3.291.
Mai, Randy, and Bonnie Chen. 2013. “The State of Chinatown Los Angeles.” UCLA Urban Planning Minor’s Program. http://164.67.121.27/files/UP/chinatownfull.pdf.
Marcuse, Peter. 1986. “Abandonment, Gentrification, and Displacement: The Linkages in New York City.” In *Gentrification of the City*, edited by Neil Smith and Peter Williams. London: Routledge.
Marcuse, Peter. 1997. “The Enclave, the Citadel, and the Ghetto What Has Changed in the Post-Fordist U.S. City.” *Urban Affairs Review* 33 (2): 228–64. doi:10.1177/107808749703300206.
Marcuse, Peter. 2004. “The Future of Housing Advocacy and Research.” *University of Toronto Centre for Urban and Community Studies: Research Bulletin* 25. http://citiescentre.webservices.utoronto.ca/Assets/Cities+Centre+2013+Digital+Assets/Cities+Centre/Cities+Centre+Digital+Assets/pdfs/researchbulletins/CUCS_RB_25_Marcuse_Futu.pdf
Massey, Douglas S., and Nancy A. Denton. 1993. *American Apartheid: Segregation and the Making of the Underclass*. 1st Paperback Edition edition. Cambridge, Mass.: Harvard University Press.
Massey, Douglas S., Jonathan Rothwell, and Thurston Domina. 2009. “The Changing Bases of Segregation in the United States.” *The ANNALS of the American Academy of Political and Social Science* 626 (1): 74–90. doi:10.1177/0002716209343558.
Max, Sarah. 2004. “School, What Is It Good for? When It Comes to Home Prices, Schools Matter. Buyers Will Pay a Premium to Live near Top Schools.” *CNN Money*. August 30. http://money.cnn.com/2004/08/27/real_estate/buying_selling/schools/.
McKinnish, Terra, Randall Walsh, and Kirk White. 2010. “Who Gentrifies Low-Income Neighborhoods?” Working Paper 14036. National Bureau of Economic Research. http://www.nber.org/papers/w14036.
Meltzer, Rachel, and Jenny Schuetz. 2011. “Bodegas or Bagel Shops? Neighborhood Differences in Retail and Household Services.” Economic Development Quarterly, 0891242411430328.
Metropolitan Transportation Commission. 2005. “MTC Resolution 3434 Transit Oriented Development (TOD) Policy for Regional Transit Expansion Projects.”.” http://mtc.ca.gov/sites/default/files/Resolution%203434%20TOD_policy.pdf.
Metropolitan Transportation Commission. 2012a. “Resolution No. 4035.” http://mtc.ca.gov/sites/default/files/Resolution%203434%20TOD_policy.pdf.

Metropolitan Transportation Commission. 2012b. “Resolution No. 4035, Appendix A: Cycle 2 / OBAG 1 Program Project Selection Criteria and Programming Policy.” http://mtc.ca.gov/sites/default/files/Resolution%203434%20TOD_policy.pdf.
Metropolitan Transportation Commission. 2012c. “Resolution No. 4035, Appendix A6: PDA Investment & Growth Strategy.” http://mtc.ca.gov/sites/default/files/Resolution%203434%20TOD_policy.pdf.
Minton, Jeffrey James. 1996. “Rent Control: Can and Should It Be Used to Combat Gentrification.” *Ohio NUL Rev.* 23: 823.
Mohring, Herbert. 1961. “Land Values and the Measurement of Highway Benefits.” *Journal of Political Economy* 69 (3): 236–49.
Montojo, Nicole. 2015. “OBAG Funding Distribution Analysis: OneBayArea Grant Program, Analysis of Cycle II CMA Grants.” Great Communities Collaborative.
Moore, Kesha S. 2009. “Gentrification in Black Face?: The Return of the Black Middle Class to Urban Neighborhoods.” *Urban Geography* 30 (2): 118–42. doi:10.2747/0272-3638.30.2.118.
Mukhija, Vinit, Lara Regus, Sara Slovin, and Ashok Das. 2010. “Can Inclusionary Zoning Be an Effective and Efficient Housing Policy? Evidence from Los Angeles and Orange Counties.” *Journal of Urban Affairs* 32 (2): 229–52. doi:10.1111/j.1467-9906.2010.00495.x.
Mullins, J.A., E. Washington, and R.W. Stokes. 1990. “Land Use Impacts of the Houston Transitway System.” *Transportation Research Record* 1237: 29–38.
Munch, Jakob Roland, and Michael Svarer. 2002. “Rent Control and Tenancy Duration.” *Journal of Urban Economics* 52 (3): 542–60. doi:10.1016/S0094-1190(02)00502-8.
National Institute for Advanced Studies. 1981. “Market Generated Displacement: A Single City Case Study.” National Institute for Advanced Studies. http://www.torontopubliclibrary.ca/detail.jsp?Entt=RDM1587388&R=1587388.
Nelson, A. C. 1992. “EFFECTS OF ELEVATED HEAVY-RAIL TRANSIT STATIONS ON HOUSE PRICES WITH RESPECT TO NEIGHBORHOOD INCOME.” *Transportation Research Record*, no. 1359. https://trid.trb.org/view.aspx?id=371633.
Neumark, David, Junfu Zhang, and Stephen Ciccarella. 2008. “The Effects of Wal-Mart on Local Labor Markets.” *Journal of Urban Economics* 63 (2): 405–30. doi:10.1016/j.jue.2007.07.004.
Newman, Kathe, and Elvin K. Wyly. 2006. “The Right to Stay Put, Revisited: Gentrification and Resistance to Displacement in New York City.” *Urban Studies* 43 (1): 23–57. doi:10.1080/00420980500388710.
Newman, Sandra J., and Michael S. Owen. 1982. “Residential Displacement: Extent, Nature, and Effects.” Journal of Social Issues 38 (3): 135–48. doi:10.1111/j.1540-4560.1982.tb01775.x.
Newmark, Gregory, and Peter Haas. 2015. “Income, Location Efficiency, and VMT: Affordable Housing as a Climate Strategy.” Chicago, Il: Center for Neighborhood Technology. http://www.cnt.org/sites/default/files/publications/CNT%20Working%20Paper%20revised%202015-12-18.pdf.
Noll, Roger G., and Andrew Zimbalist, eds. 1997. *Sports, Jobs, and Taxes: The Economic Impact of Sports Teams and Stadiums*. Washington D.C: Brookings Institution Press.
Non-Profit Housing Assocation of Northern California. 2007. “Affordable by Choice: Trends in California Inclusionary Housing Programs.” Non-Profit Housing Assocation of Northern California, California Coalition for Rural Housing, San Diego Housing Federation and the Sacramento Housing Alliance.
Non-Profit Housing Association of Northern California. 2007. “Affordable by Choice: Trends in California Inclusionary Housing Programs.” http://www.wellesleyinstitute.com/wp-content/uploads/2013/01/NPH-IHinCA2006.pdf.
O’Connor, Alice. 2002. Poverty Knowledge: Social Science, Social Policy, and the Poor in Twentieth-Century U.S. History. Reprint edition. Princeton, N.J.: Princeton University Press.

Oak Ridge National Laboratory. 2001. "Developing a Best Estimate of Annual Vehicle Mileage for 2009 NHTS Vehicles." Prepared for FHWA National Household Travel Survey. http://nhts.ornl.gov/2009/pub/BESTMILE.pdf.
Oates, Wallace E. 1969. "The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis." *Journal of Political Economy* 77 (6): 957–71.
Ong, Paul, Chhandara Pech, and Rosalie Ray. 2014. "TOD Impacts on Businesses in Four Asian American Neighborhoods." UCLA Center for the Study of Inequality. http://www.urbandisplacement.org/sites/default/files/images/overall_tod_final.pdf.
Osman, Suleiman. 2011. *The Invention of Brownstone Brooklyn: Gentrification and the Search for Authenticity in Postwar New York*. Oxford University Press.
O'Sullivan, David. 2002. "Toward Micro-Scale Spatial Modeling of Gentrification." Journal of Geographical Systems 4 (3): 251–74. doi:10.1007/s101090200086.
Ottens, Cale. 2013. "Condo Conversions Inch up in L.A." *Los Angeles Times*, August 9. http://articles.latimes.com/2013/aug/09/business/la-fi-condo-conversion-20130809.
Ottensmann, John R., David H. Good, and Michael E. Gleeson. 1990. "The Impact of Net Migration on Neighbourhood Racial Composition." *Urban Studies* 27 (5): 705–17. doi:10.1080/00420989020080671.
Owens, Ann. 2012. "Neighborhoods on the Rise: A Typology of Neighborhoods Experiencing Socioeconomic Ascent." *City & Community* 11 (4): 345–69. doi:10.1111/j.1540-6040.2012.01412.x.
Page-Adams, Deborah, and Michael Sherraden. 1997. "Asset Building as a Community Revitalization Strategy." *Social Work* 42 (5): 423–34. doi:10.1093/sw/42.5.423.
Pais, Jeremy, Scott J. South, and Kyle Crowder. 2012. "Metropolitan Heterogeneity and Minority Neighborhood Attainment: Spatial Assimilation or Place Stratification?" *Social Problems* 59 (2): 258–81. doi:10.1525/sp.2012.59.2.258.
Palen, J. John, and Bruce London. 1984. "Introduction: Some Theoretical and Practical Issues Regarding Inner City Revitalization." In *Gentrification, Displacement, and Neighborhood Revitalization*. SUNY Press.
Park, Robert Ezra. 1925. *The City: Suggestions of Investigation of Human Behavior in the Urban Environment*. Chicago: University of Chicago Press.
Park, Robert Ezra. 1936. "Human Ecology." *American Journal of Sociology* 42 (1): 1–15. doi:10.2307/2768859.
Pattillo, Mary. 2008. *Black on the Block: The Politics of Race and Class in the City*. Reprint edition. Chicago: University Of Chicago Press.
Perk, Victoria A., and Martin Catala. 2009. "Land Use Impacts of Bus Rapid Transit: Effects of BRT Station Proximity on Property Values along the Pittsburgh Martin Luther King, Jr. East Busway." Washington, DC: Federal Transit Administration. http://www. nbrti. org/docs/pdf/Property% 20Value% 20Impacts% 20of% 20BRT_NBRTI. pdf.
Peterson, Paul E. 1981. *City Limits*. University of Chicago Press.
Pinjari, Abdul R., Chandra R. Bhat, and David A. Hensher. 2009. "Residential Self-Selection Effects in an Activity Time-Use Behavior Model." *http://www.sciencedirect.com/science/journal/01912615*. https://repositories.lib.utexas.edu/handle/2152/23818.
Pitarre, Alyson. 2005. "Conversion Craze Hits the West." *Builder & Developer Magazine*, February.
Plowman, Jonathan. 2014. "What Happens to Retail When Neighborhoods Gentrify? Evidence from California Metro Areas." University of California at Berkeley.
Policy, Committee on National Urban, Commission on Behavioral and Social Sciences and Education, Division of Behavioral and Social Sciences and Education, and National Research Council. 1990. *Inner-City Poverty in the United States*. National Academies Press.

Policy Link. 2008. “Equitable Development Toolkit: Transit Oriented Development.” http://www.policylink.org/sites/default/files/transit-oriented-development_0.pdf.
Policy Link. 2015. “Equitable Development Toolkit: Local Hiring.” http://policylink.org/sites/default/files/local-hiring.pdf.
Pollack, Stephanie, Barry Bluestone, and Chase Billingham. 2010. “Maintaining Diversity in America’s Transit-Rich Neighborhoods: Tools for Equitable Neighborhood Change.” http://www.northeastern.edu/dukakiscenter/wp-content/uploads/2011/12/TRN_Equity_final.pdf.
Polzin, Steven, and Michael Baltes. 2002. “Bus Rapid Transit: A Viable Alternative?” *Journal of Public Transportation* 5 (2). doi:http://dx.doi.org/10.5038/2375-0901.5.2.3.
Popkin, S. J., L. F. Buron, D. K. Levy, and M. K. Cunningham. 2000. “The Gautreaux Legacy: What Might Mixed-Income and Dispersal Strategies Mean for the Poorest Public Housing Tenants?” *ResearchGate* 11 (4): 911–42.
Porter, M. E. 1995. “The Competitive Advantage of the Inner City.” *Long Range Planning* 28 (4): 132–132.
Portman, Janet, and David W. Brown. 2013. *California Tenants’ Rights*. Nolo.
Powell, Benjamin, and Edward Peter Stringham. 2005. “The Economics of Inclusionary Zoning Reclaimed: How Effective Are Price Controls?” SSRN Scholarly Paper. Rochester, NY: Social Science Research Network. https://papers.ssrn.com/abstract=1674474.
Powell, John, and Marguerite Spencer. 2002. “Giving Them the Old One-Two: Gentrification and the K.O. of Impoverished Urban Dwellers of Color.” *Howard Law Journal*, January, 433.
Pucher, J., and J. L. Renne. 2003. “SOCIOECONOMICS OF URBAN TRAVEL: EVIDENCE FROM THE 2001 NHTS.” *Transportation Quarterly* 57 (3). https://trid.trb.org/view.aspx?id=662423.
Queally, James. 2015. “Watts Riots: Traffic Stop Was the Spark That Ignited Days of Destruction in L.A.” *Los Angeles Times*, July 29. http://www.latimes.com/local/lanow/la-me-ln-watts-riots-explainer-20150715-htmlstory.html.
Quercia, Roberto G., and George C. Galster. 2000. “Threshold Effects and Neighborhood Change.” *Journal of Planning Education and Research* 20 (2): 146–62. doi:10.1177/0739456X0002000202.
Quigley, John. 1976. “Housing Demand in the Short Run: An Analysis of Polytomous Choice.” NBER Chapters. National Bureau of Economic Research, Inc. http://econpapers.repec.org/bookchap/nbrnberch/9079.htm.
Reardon, Sean F., and Kendra Bischoff. 2011. “Income Inequality and Income Segregation.” *American Journal of Sociology* 116 (4): 1092–1153. doi:10.1086/657114.
Reardon, Sean F., Stephen A. Matthews, David O’Sullivan, Barrett A. Lee, Glenn Firebaugh, Chad R. Farrell, and Kendra Bischoff. 2008. “The Geographic Scale of Metropolitan Racial Segregation.” *Demography* 45 (3): 489–514.
Reback, Randall. 2005. “House Prices and the Provision of Local Public Services: Capitalization under School Choice Programs.” *Journal of Urban Economics* 57 (2): 275–301.
Reconnecting America. 2077. “Station Area Planning Manual.” *Reconnecting America*. November 1. http://www.reconnectingamerica.org/resource-center/books-and-reports/2007/station-area-planning-manual/.
Reibel, Michael, and Moira Regelson. 2011. “Neighborhood Racial and Ethnic Change: The Time Dimension in Segregation.” *Urban Geography* 32 (3): 360–82. doi:10.2747/0272-3638.32.3.360.
Roback, Lori S. 1985. “Regulating Condominium Conversions: Do Municipal Ordinances Adequately Protect Tenants’ and Owners’ Constitutional Rights Comment.” *Arizona State Law Journal* 1985: 935–72.
Rodriguez, Daniel, and Felipe Targa. 2004. “Value of Accessibility to Bogotá’s Bus Rapid Transit System.” *Transport Reviews* 24 (5): 587–610. doi:10.1080/0144164042000195081.

Rose, D. 1984. “Rethinking Gentrification: Beyond the Uneven Development of Marxist Urban Theory.” *Environment and Planning D: Society and Space* 2 (1): 47–74. doi:10.1068/d020047.
Sage Computing, Inc. 2009. “Revitalizing Foreclosed Properties with Land Banks.” http://www.huduser.org/portal/publications/landbanks.pdf.
Sampson, Robert J. 2012. *Great American City: Chicago and the Enduring Neighborhood Effect*. Reprint edition. Chicago; London: University Of Chicago Press.
Sampson, Robert J., Jeffrey D. Morenoff, and Thomas Gannon-Rowley. 2002. “Assessing ‘Neighborhood Effects’: Social Processes and New Directions in Research.” *Annual Review of Sociology* 28: 443–78.
Sampson, Robert J., and Patrick Sharkey. 2008. “Neighborhood Selection and the Social Reproduction of Concentrated Racial Inequality.” *Demography* 45 (1): 1–29.
Sanders, Heywood T. 2002. “Convention Myths and Markets: A Critical Review of Convention Center Feasibility Studies.” *Economic Development Quarterly* 16 (3): 195–210. doi:10.1177/08942402016003001.
San Francisco Mayor’s Office of Housing and Community Development. 2014. “SF Inclusionary Housing Program Completion and Pipeline Data 2014 Q1.” http://sf-moh.org/index.aspx?page=295.
San Francisco Planning Department. 1995. “San Francisco General Plan: Chinatown Area Plan.” http://generalplan.sfplanning.org/Chinatown.htm.
Santa Clara Valley Transportation Authority. 2014. “Santa Clara County Priority Development Area Investment and Growth Strategy.” City/County Association of Goverments of San Mateo County. http://ccag.ca.gov/wp-content/uploads/2014/05/San-Mateo-County-PDA-Investment-Growth-Strategy-2014.pdf.
Schelling, Thomas C. 1971. “Dynamic Models of Segregation.” *The Journal of Mathematical Sociology* 1 (2): 143–86. doi:10.1080/0022250X.1971.9989794.
Schill, Michael H., Richard P. Nathan, and Harrichand Persaud. 1983. *Revitalizing America’s Cities: Neighborhood Reinvestment and Displacement*. SUNY Press.
Schuetz, Jenny. 2008. “The Effects of Inclusionary Zoning on Local Housing Markets: Lessons from the San Francisco, Washington DC and Suburban Boston Areas.” Furman Center for Real Estate & Urban Policy. http://furmancenter.org/files/publications/IZPolicyBrief_LowRes.pdf.
Schuetz, Jenny. 2014. “Do Rail Transit Stations Encourage Neighbourhood Retail Activity?” Urban Studies, September, 0042098014549128.
Schwartz, Heather L., Liisa Ecola, Kristin J. Leuschner, and Aaron Kofner. 2012. “Is Inclusionary Zoning Inclusionary? A Guide for Practitioners.” http://www.rand.org/content/dam/rand/pubs/technical_reports/2012/RAND_TR1231.pdf.
Schwartz, Matt. 2015. “Two Proposals for Increasing the Value of the California Low Income Housing Tax Credit: Presentation to the Aseembly COmmittee on Housing.” March 11. http://www.chpc.net/dnld/ImprovingTheCA_LIHTC_2Proposals2015_03_09.pdf.
Semuels, Alana. 2015. “Can Better Data Help Solve America’s Housing Problems?” *The Atlantic*, July 8. http://www.theatlantic.com/business/archive/2015/07/new-hud-rules-fair-housing/397997/.
SFO/PIA. 2014. “East Palo Alto Neighborhood Narrative.” San Francisco Organizing Project/Peninsula Interfaith Action.
Sharkey, Patrick. 2012. “Residential Mobility and the Reproduction of Unequal Neighborhoods.” *Cityscape* 14 (3): 9–31.
Sharkey, Patrick. 2013. *Stuck in Place: Urban Neighborhoods and the End of Progress toward Racial Equality*. 1 edition. Chicago: University Of Chicago Press.
Shigley, Paul. 2009. “Court Rules L.A. Inclusionary Housing Mandate Violates State Law.” *California Planning & Development Report*. August 20. http://www.cp-dr.com/node/2401.

Smith, Neil. 1979. “Toward a Theory of Gentrification A Back to the City Movement by Capital, Not People.” *Journal of the American Planning Association* 45 (4): 538–48. doi:10.1080/01944367908977002.
Smith, Neil. 1996. *The New Urban Frontier: Gentrification and the Revanchist City*. Psychology Press.
Smith, V. Kerry, Christine Poulos, and Hyun Kim. 2002. “Treating Open Space as an Urban Amenity.” *Resource and Energy Economics* 24 (1-2): 107–29.
Steinberg, Darrell. 2008. *Sustainable Communities and Climate Protection Act, California Senate Bill 375*.
Sugrue, Thomas J. 2005. *The Origins of the Urban Crisis: Race and Inequality in Postwar Detroit*. With a New preface by the author edition. Princeton: Princeton University Press.
Sullivan, Daniel Monroe, and Samuel C. Shaw. 2011. “Retail Gentrification and Race: The Case of Alberta Street in Portland, Oregon.” *Urban Affairs Review* 47 (3): 413–32. doi:10.1177/1078087410393472.
Swan, Rachel. 2015. “Rent Control Stalls in Richmond, at Least for Now.” *SFGate*, July 30. http://www.sfgate.com/bayarea/article/Rent-control-stalls-in-Richmond-at-least-for-6413720.php.
Taggart, Kendall. 2012. “Explainer: The End of Redevelopment Agencies.” *California Watch*. January 31. http://californiawatch.org/dailyreport/explainer-end-redevelopment-agencies-14624.
Talen, Emily. 2006. “Design for Diversity: Evaluating the Context of Socially Mixed Neighbourhoods.” *Journal of Urban Design* 11 (1): 1–32. doi:10.1080/13574800500490588.
Tan, Bryant. 2008. “New Housing in Old Chinatown : Barriers and Incentives to Affordable Housing Development.” Thesis, Massachusetts Institute of Technology. http://dspace.mit.edu/handle/1721.1/44346.
Taylor, Monique M. 2002. *Harlem Between Heaven And Hell*. Minneapolis: Univ Of Minnesota Press.
Thai Community Development Center. 2002. “Surveying East Hollywood: A Profile and Needs Assessment of the Businss Community.” Thai Community Development Center. http://thaicdc.org/research/swotfullreport.pdf.
The Growing Transit Communities Partnership. 2013. “The Growing Transit Communities Strategy.” Growing Transit Communities and Puget Sound Regional Council. http://www.psrc.org/assets/9539/GTCStrategy.pdf.
The Watts Neighborhood Council. 2015. “History of Watts.” The Watts Neighborhood Council. http://thewattsnc.com/history-of-watts/.
Tiebout, Charles M. 1956. “A Pure Theory of Local Expenditures.” *Journal of Political Economy* 64 (5): 416–24.
Torrens, Paul M., and Atsushi Nara. 2007. “Modeling Gentrification Dynamics: A Hybrid Approach.” *Computers, Environment and Urban Systems* 31 (3): 337–61. doi:10.1016/j.compenvurbsys.2006.07.004.
Train, Kenneth. 2003. *Discrete Choice Methods with Simulation*. Cambridge University Press.
Troy, Austin, and J. Morgan Grove. 2008. “Property Values, Parks, and Crime: A Hedonic Analysis in Baltimore, MD.” *Landscape and Urban Planning* 87 (3): 233–45. doi:10.1016/j.landurbplan.2008.06.005.
Turner, Margery Austin. 2013. “Housing Discrimination against Racial and Ethnic Minorities 2012: Executive Summary.” Text. June 11. http://www.urban.org/publications/412838.html.
UCLA Comprehensive Project. 2015. “Oriented for Whom? Impacts of TOD on Six Los Angeles Neighborhoods.” UCLA Department of Urban Planning. http://www.urbandisplacement.org/sites/default/files/images/spring_2015_tod.pdf.
U.S. Department of Housing and Urban Development (US HUD). 1979. “Displacement Report.” Washington, D.C.: U.S. Department of Housing and Urban Development.
U.S. Government Accountability Office (US GAO). 2001. “Mass Transit: Bus Rapid Transit Shows Promise.” U.S. Government Accountability Office. http://www.gao.gov/products/GAO-01-984.

Vandeveer, Roger C. 1980. “Conversion of Apartments to Condominiums: Social and Economic Regulations under the California Subdivision Map Act Comments.” *California Western Law Review* 16: 466–99.
Vigdor, Jacob L. 2001. “Does Gentrification Harm the Poor?” *Brookings-Wharton Papers on Urban Affairs*. http://www.jstor.org/stable/25067387.
Vigdor, Jacob L. 2013. “Weighing and Measuring the Decline in Residential Segregation.” *City & Community* 12 (2): 169–77. doi:10.1111/cico.12023.
Voith, Richard. 1993. “Changing Capitalization of CBD-Oriented Transportation Systems: Evidence from Philadelphia, 1970–1988.” *Journal of Urban Economics* 33 (3): 361–76. doi:10.1006/juec.1993.1021.
Vuchic, Vukan. 2002. “Bus Semirapid Transit Mode Development and Evaluation.” *Journal of Public Transportation* 5 (2). doi:http://dx.doi.org/10.5038/2375-0901.5.2.4.
Wacquant, Loic. 1997. “‘A Black City Within the White’: Revisiting America’s Dark Ghetto.” *Black Renaissance* 2 (1): 141.
Wacquant, Loïc J. D. 1997. “Three Pernicious Premises in the Study of the American Ghetto.” *International Journal of Urban and Regional Research* 21 (2): 341–53. doi:10.1111/1468-2427.00076.
Waddell, Paul. 2011. “Integrated Land Use and Transportation Planning and Modelling: Addressing Challenges in Research and Practice.” *Transport Reviews* 31 (2): 209–29. doi:10.1080/01441647.2010.525671.
Waddell, Paul, Liming Wang, and Xuan Liu. 2008. “UrbanSim: An Evolving Planning Support System for Evolving Communities.” In *Planning Support Systems for Cities and Regions*, edited by Richard K. Brail. Cambirdge, Mass: Lincoln Institute of Land Policy.
Wang, L. Ling-chi. 2007. “Chinatown in Transition.” *Amerasia Journal* 33 (1): 31–48. doi:10.17953/amer.33.1.3246116125188729.
Wang, Yang, J.E. Abraham, J.D. Hunt, and Shengyi Gao. 2011. “Hedonic Regression of Local-Level Attraction Influences on Housing Price: Evidence from California Statewide Rent Modifier Estimation.” In *Proceedings of the 12th International Conference on Computers in Urban Planning and Urban Management*. Lake Louise, AB.
Wardman, Mark. 2004. “Public Transport Values of Time.” *Transport Policy* 11 (4): 363–77. doi:10.1016/j.tranpol.2004.05.001.
Wardrip, Keith. 2011. *Public Transit’s Impact on Housing Costs: A Review of the Literature*.
Waters, William G. 1992. The Value of Time Savings for the Economic Evaluation of Highway Investments in British Columbia: Prepared for the Planning Services Branch, Ministry of Transportation and Highways, Victoria, B.C., Canada. Centre for Transportation Studies, University of British Columbia.
Watson, Tara. 2009. “Inequality and the Measurement of Residential Segregation by Income in American Neighborhoods.” *Review of Income and Wealth* 55 (3): 820–44. doi:10.1111/j.1475-4991.2009.00346.x.
Wegmann, Jake. 2012. “Affordable Housing Demand and Supply Analysis, 2010-2040.”
Wei, Fang, and Paul L. Knox. 2014. “Spatial Transformation of Metropolitan Cities.” *Environment and Planning A* 46: 000–000.
Weinberger, Rachel R. 2001. “Commercial Property Value and Proximity to Light Rail: A Hedonic Price Application.” *University of California Transportation Center*, September. http://escholarship.org/uc/item/3rb737r9.
Wilson, William J. 1987. *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. Chicago: University of Chicago Press.
Wilson, William Julius, and Richard P. Taub. 2006. *There Goes the Neighborhood: Racial, Ethnic, and Class Tensions in Four Chicago Neighborhoods and Their Meaning for America*. Reprint edition. New York: Vintage.

Winstead, Brock. 2006. “The Politics of Tenant Protections in Richmond, Califoria.” Center for Community Innovation. http://communityinnovation.berkeley.edu/publications/Winstead-Politics-Tenant-Protections.pdf.
Winston, Francisca, and Chris Walker. 2012. “Predicting Gentrification in Houston’s Low- and Moderate-Income Neighborhoods.” LISC.
Wirth, Louis. 1938. “Urbanism as a Way of Life.” *American Journal of Sociology* 44 (1): 1–24.
Wyly, Elvin, Kathe Newman, Alex Schafran, and Elizabeth Lee. 2010. “Displacing New York.” *Environment and Planning. A* 42 (11): 2602.
Xie, Yu, and Xiang Zhou. 2012. “Modeling Individual-Level Heterogeneity in Racial Residential Segregation.” *Proceedings of the National Academy of Sciences* 109 (29): 11646–51. doi:10.1073/pnas.1202218109.
Yang, Rebecca, and Paul A. Jargowsky. 2006. “SUBURBAN DEVELOPMENT AND ECONOMIC SEGREGATION IN THE 1990s.” *Journal of Urban Affairs* 28 (3): 253–73. doi:10.1111/j.1467-9906.2006.00291.x.
Yin, Li. 2009. “The Dynamics of Residential Segregation in Buffalo: An Agent-Based Simulation.” Urban Studies 46 (13): 2749–70. doi:10.1177/0042098009346326.
Yip, Christopher Lee. 1985. *San Francisco’s Chinatown: An Architectural and Urban History*. University of California, Berkeley.
Young, Allen. 2015. “Governor Signs Bill Creating Replacement for Redevelopment Agencies.” *Sacramento Business Journal*. September 22. http://www.bizjournals.com/sacramento/news/2015/09/22/governor-signs-bill-creating-replacement.html.
Zheng, Diehang, Yongheng Deng, Peter Gordon, and David Dale-Johnson. 2007. “An Examination of the Impact of Rent Control on Mobile Home Prices in California.” *Journal of Housing Economics*, Special Issue on Macroeconomics and Housing, 16 (2): 209–42. doi:10.1016/j.jhe.2006.10.006.
Zukin, Sharon. 1982. *Loft Living: Culture and Capital in Urban Change*. Johns Hopkins Studies in Urban Affairs. Baltimore: Johns Hopkins University Press.
Zukin, Sharon. 1987. “Gentrification: Culture and Capital in the Urban Core.” *Annual Review of Sociology* 13: 129–47.
Zukin, Sharon. 1995. *The Cultures of Cities*. 1 edition. Cambridge, MA: Blackwell Publishers.
Zukin, Sharon. 2009. *Naked City: The Death and Life of Authentic Urban Places*. Oxford University Press.
Zukin, Sharon, Valerie Trujillo, Peter Frase, Danielle Jackson, Tim Recuber, and Abraham Walker. 2009. “New Retail Capital and Neighborhood Change: Boutiques and Gentrification in New York City.” *City & Community* 8 (1): 47–64. doi:10.1111/j.1540-6040.2009.01269.x.

# Appendices

## Appendix A. Summary of Racial Transition and Succession Studies

| Authors | Scale | Units of Analysis | Study Methods | Conclusions |
|---|---|---|---|---|
| Bostic and Martin (2003) | Nationwide (50 largest metros) | Census tract | The authors use census data from 1970 through 1990 to identify "gentrifiable" and gentrifying tracts. They then model different levels of black homeownership in these tracts over time. | Middle class black homeowners are found to be drivers of gentrification in the 1970s, though this finding loses significance in the 1980s. |
| Card et al. (2008) | Nationwide | Census tract | The authors use census data from 1970, 1980, 1990, and 2000 to estimate the existence of "tipping points" in neighborhood racial composition, beyond which changes in composition change more rapidly. | The authors find evidence of neighborhood tipping phenomena, with tipping points generally occurring when neighborhoods reach between 5% and 20% non-white. The specific point at which tipping occurs depends significantly on a variety of metro-level variables, including rates of violent crime, past incidences of riots, and measured racial animus. |
| Charles (2000) | Los Angeles | Individual survey respondents(N = 4,025) | Charles asks respondents of different races and ethnicities (white, black, Latino, Asian) whether they would prefer neighborhoods of various racial and ethnic compositions. The results are then regressed on a number of individual and neighborhood attributes. | Charles finds strong preference for same-race neighborhoods, with this preference particularly strong for white households. Additional modeling shows this preference to decline with graduate education and with younger respondent ages, and to increase with greater levels of racial stereotyping. |
| Charles (2003) | Literature Review | Mostly census tract and individual household | Charles reviews extant literature on various aspects of residential segregation, including the prevalence of segregation among different population groups, theories and empirics of neighborhood attainment, and patterns of individual neighborhood preference. | Looking specifically at neighborhood attainment, Charles differentiates between "spatial assimilation", which holds that different population groups integrate spatially in accordance with their SES attainment, and "place stratification", which holds that structural factors maintain patterns of spatial segregation, SES notwithstanding. While Charles finds much disagreement within the literature, there appears to be greater evidence for "place stratification" holding among black households. |

| Authors | Scale | Units of Analysis | Study Methods | Conclusions |
|---|---|---|---|---|
| Chipman, Wright, Ellis, and Holloway (2012) | Chicago | Census tract | Chicago neighborhoods are classified cross-sectionally according to race/ethnicity composition and tracked in their transitions from 1990 to 2010. The authors focus specifically on integrating descriptive results into an interactive mapping tool. | As with other studies the authors noted processes of diversification outside of Chicago's urban core, though they also noted a subset of "low-density, black-dominated tracts, whose numbers and locations barely changed during the past 20 years." |
| Crowder and South (2005) | Nationwide | Family | Using Panel Study of Income Dynamics longitudinal data from 1970 through 1997, the authors model the likelihood of black and white households transitioning between poor and non-poor tracts. | Across all years of the study, black-headed households are less likely than white-headed households to move from poor to non-poor tracts and more likely to move from non-poor to poor, after controlling for a number of factors. The racial discrepancy in both of these migration rates declined over time, however. |
| Crowder et al. (2011) | Nationwide | Family | The authors use Panel Study of Income Dynamics (PSID) data to follow panels individual households from 1968 through 2005. They model the likelihood of moving in terms of the immigrant presence in a given neighborhood. | The authors find that both native-born white and native-born black families are more likely to move out of neighborhoods with greater immigrant populations, with this result holding after controlling for a number of neighborhood and individual household variables. |
| Ellen, Horn, and O'Regan (2012) | Nationwide | Census tract | Census data from 1970 through 2010 is used to classify neighborhoods by race/ethnicity composition and to track the transitions between classifications. | There has been a steady increase in integrated neighborhoods, though a majority of non-integrated neighborhoods have remained so, and a substantial number of integrated neighborhoods have reverted to non-integrated status. Correlates of greater rates of integration include location in a central city and metropolitan growth. |
| Farrell and Lee (2011) | Nationwide (100 largest metros) | Census tract | Census data are used to categorize neighborhoods by race and ethnicity composition in 1990 and 2000, with transitions between classifications tracked. | Splitting neighborhoods cross-sectionally into those that are "dominant", "shared", "two-group", and "multi-group", the authors then look across time to classify neighborhoods as bifurcating, fragmenting, integrating, or "other". The authors find general trends toward diversification across metro areas, though they did note a subset of tracts experiencing a reduction of diversity through white out-migration. |

| Authors | Scale | Units of Analysis | Study Methods | Conclusions |
|---|---|---|---|---|
| Freeman and Rohe (2005) | Nationwide | Census tract | The authors identify tracts that received assisted housing (including public housing and housing units constructed under Section 236, Section 8, or the LIHTC program) between 1980 and 1990. The authors then use propensity score matching to test whether these tracts underwent greater racial transition than did comparable tracts that did not receive assisted housing units. | The authors find little evidence that the presence of assisted housing led to a greater outflow of white residents. |
| Glaeser (2003) | New York, New Jersey, California | Tenant, city | Glaeser examines the characteristics of tenants in rent-controlled units vs. non-rent-controlled units in New York City, as well examining aggregate statistics for California and New Jersey municipalities with and without rent control. | Rent control tenants in New York City are lower income, and older than tenants overall. They are also more likely to be white, casting doubt on rent control's ability to effect racial integration in the city. Looking at cities in California and New Jersey, Glaeser finds that cities with rent control in California saw less of an increase in rents and incomes than cities without, while the opposite was true for cities in New Jersey. Glaeser takes this as evidence that rent control might marginally increase economic integration in California, while it might be exasperating the concentration of poverty in New Jersey. The paper has little concrete to say with respect to racial segregation. |
| Hipp (2011) | Multiple cities for which violent crime data is available | Housing unit | The author uses American Housing Survey data from 1976 through 1999 to estimate probabilities of neighborhood out-migration and in-migration relative to crime rates. | Hipp finds that disparate levels of in- and out-migration by race contribute to different exposures to neighborhood crime by race and ethnicity. Controlling for a variety of individual and neighborhood characteristics, white households are more likely to exit neighborhoods with high and rising crime rates, while black and Latino households are more likely to enter into such neighborhoods. |

| Authors | Scale | Units of Analysis | Study Methods | Conclusions |
|---|---|---|---|---|
| Hipp (2012) | Nationwide | Housing unit | The author uses American Housing Survey data from 1985 to 1993 to predict the race of in-movers to a longitudinally tracked housing unit, based on racial characteristics of the surrounding census tract, an 11-houshold "micro-neighborhood", and of the prior occupants of the unit. | Same-race proportions at the micro-neighborhood level are better predictors of racial occupancy than are the comparable proportions at the tract level. Accounting for these neighborhood compositions, the race of the prior householder is still strongly predictive of the race of the new occupant. One explanation put forward for this phenomenon is a signaling mechanism, where new residents gain assurance that they belong in a given setting. |
| Krysan et al. (2009) | Metro Chicago and Detroit | Individual survey respondent (N = ~1,500) | Respondents of different races are shown videos of neighborhoods that vary by class signifiers and racial composition. The respondents were then asked to rate the desirability of the neighborhood. | Controlling for class, white respondents rate neighborhoods with black population and mixed population representation and less desirable than those with white population representation. Conversely, black respondents rated white neighborhoods as less desirable than black neighborhoods, but rated black neighborhoods as less desirable (though not statistically significantly) than mixed neighborhoods. |
| Lee and Wood (1991) | Nation-wide (58 central cities) | Census tracts | The authors used census data for 58 out of 60 central cities with populations greater than 250,000 in 1970 or 1980 to assess the trajectories of racially mixed neighborhoods during this time period. | The authors find significant variation in tract trajectories based on regional, city, and neighborhood factors. Framing transitions in terms of "succession", "stability", and "displacement", the authors find, for instance, that tracts across different regions that experience either displacement or stability tend to have greater initial population percentages of Hispanic and foreign born residents. |
| Logan and Zhang (2010) | Nationwide | Census tract | The authors track neighborhood race and ethnicity compositions from 1980 through 2000, looking to examine the role that "global neighborhoods" of high Asian and Hispanic residence play in integrating previously white neighborhoods. | While finding evidence for global neighborhoods, the authors also find that broad patterns of residential settlement are largely maintained through the avoidance by whites of "all-minority" areas, as well as of the out-migration of whites from more diverse neighborhoods. |

| Authors | Scale | Units of Analysis | Study Methods | Conclusions |
|---|---|---|---|---|
| McKinnish, Walsh, and White (2010) | Nationwide | Census tract | For both 1990 and 2000, the authors use confidential Census data to model household movements into and out of gentrifying neighborhoods (defined by baseline income and income change). | The authors find that largely middle-class black families carry out the income gentrification of low-income black neighborhoods. Conversely, gentrifying neighborhoods with low black populations see an increased outflow of high school-educated black households, though also with a substantial inflow of this same population group. |
| Ottensmann (1990) | South Bend, IN | Tract | The authors specify and run a set of simulation models to test the increase in neighborhood concentration of black residents between 1980 and 1990. The authors compare the concentration of black residents with and without the presence of black in-migration to the study metro. | The authors find that the in-migration of black residents is a major driver of greater black-white segregation. |
| Quercia and Galster (2000) | Literature Review | Primarily census tracts and block groups | The authors assess literature on neighborhood threshold effects, assessing theorized mechanisms for such thresholds, the neighborhood attributes on which such thresholds are conceptualized, the analytic methods by which thresholds are identified, and the actual empirical assessment of thresholds. | The authors find the "extant empirical literature" to be "sketchy", though they do see evidence for thresholds or "tipping points" along related socioeconomic measures, whereby neighborhoods have downward trajectories reinforced. |
| Reibel and Regelson (2011) | Nationwide (50 largest metros) | Census tract | The authors use a cluster analysis applied to neighborhoods based on their patterns of racial change between 1990 and 2000. They then analyze the distribution of these clusters, including specifying a model to account for the probability of a tract falling in a given cluster. | The authors find substantial regional variation in the prevalence of different transition types. Modeling this, they find that racially stable neighborhoods are more probable in the Northeast and South, transition from white to Hispanic less probably in the South and transition from white to black more probable in the south. They also find differences in transition probabilities based on racial/ethnic composition of metros (e.g. more "moderate integration" in metros with higher Asian population percentages) as well as locational characteristics of individual tracts (e.g. less integration in central cities). |

| Authors | Scale | Units of Analysis | Study Methods | Conclusions |
|---|---|---|---|---|
| Rosenblatt and Deluca (2012) | Baltimore | Family | The authors conduct interviews with families who have participated in Moving to Opportunity in Baltimore, seeking to understand why a large proportion of such participants moved back to high-poverty neighborhoods after program enrollment. | The authors note reports of families seeking to live in larger housing units in order to accommodate larger family sizes. These units were seen to be more affordable in high-poverty neighborhoods. Moreover, the interviewed families were able to move into such neighborhoods because of copying mechanisms developed during prior stays in distressed neighborhoods. |
| Sampson (2012) | Chicago | Family | Sampson uses longitudinal family survey data, as well as detailed information on the characteristics of neighborhoods, to model the neighborhood attainment of moving families. | A number of neighborhoods and household factors beyond mere race, income, and proximity are significantly predictive of where moving families end up. Specifically, similarities in perceived neighborhood disorder and closeness of elite and non-elite social network ties between origin and destination neighborhoods are associated with neighborhood destinations. |
| Sampson and Sharkey (2008) | Chicago | Family | The authors use longitudinal survey data to tract movement of families originating in Chicago, analyzing these movements in terms of detailed survey responses given by the families and characteristics of the neighborhoods of origin and destination. | The authors find movement between neighborhoods to be heavily patterned by race and class, with aggregate flows of family movements serving to reinforce existing patterns of racial and economic segregation. |

# Appendix B. Summary of the Impact of Rail Transit Facilities on Residential and Commercial Property Values

| Authors | Rail Mode | Location (Transit Facility) | Methodology Used | Extent of Property Value Impact | Major Conclusions |
|---|---|---|---|---|---|
| Ahlfedt (2013) | Light Rail (Jubilee Line & Docklands Light Railway) | London | Pre/Post Study | The study showed that for the average household a doubling of access to employment centers results in a utility effect that is equivalent to an increase in monthly income of £383 (in 2001 prices). | The model provides a better overview of potential funding possibilities for projects, particularly regarding contributions made by landlords levied on the predicted property price impact. |
| Armstrong (1995) | Commuter Rail (MBTA Fitchburg line) | Boston | Hedonic Price Models | Homes located in census tracts with rail stations had 6.7 per cent higher selling prices. | Proximity to the line (within 400 feet) coincided with a 20 per cent decrease in value, suggesting disamenity effects caused by frequent freight trains. |
| Armstrong and Rodriguez (2006) | Commuter rail | Four municipalities with commuter rail service, and three without commuter rail service. | Hedonic Price Models | Study finds a 10 per cent premium near stations. | There is a penalty between $73 and $290 per 100 feet closer to the right-of-way. |
| Bowes and Ihlanfeldt (2001) | Rapid Rail (MARTA) | Atlanta | Hedonic Price Models | Properties within a quarter of a mile from a station are found to sell for 19% less than properties beyond three miles from a station. And houses beyond three miles from a station sell on average for 4.7% more if the nearest station has a parking lot. | The positive effect of access to stations was generally greater than the negative effects of crime or the positive effects of retail, although within a quarter-mile radius some stations appeared to have net neutral or negative impacts. |
| Cervero (1996) | Heavy Rail | San Francisco Bay Area (Bay Area Rapid Transit) | | +10-15% in rent for rental units within 1/4 mile of BART | Units within a quarter-mile of the Pleasant Hill Bart station rented for around $34 more per month than comparable unit farther away. |
| Cervero and Duncan (2002) | Light and Commuter Rail | Santa Clara County | Hedonic Price Models | Large apartments within a quarter mile of station premiums as high as 45 percent, while land near commuter rail had a premium of about 20 per cent. | Apartments near light rail stops were more valuable than comparison properties. |

| Authors | Rail Mode | Location (Transit Facility) | Methodology Used | Extent of Property Value Impact | Major Conclusions |
|---|---|---|---|---|---|
| Chatman et al. (2012) | Light, Interurban Rail (River Line) | Southern New Jersey | Hedonic Price Models | Neutral to slightly negative. | The net impact of the line on the owned housing market is neutral to slightly negative. While lower-income census tracts and smaller houses seem to appreciate near the station. |
| Chen et al. (1998) | Light Rail | Portland | Hedonic Price Models | Property premium was estimated at about 10.5 per cent. | The value of accessibility to the station generally exceeded the nuisance of the line. |
| Duncan (2008) | Light Rail | San Diego | Hedonic Price Models | 17 per cent premiums for condominiums and 6 per cent premiums for single-family homes within a quarter-mile of light rail stations. | Past research has shown that property near rail stations have a premium (between 0% and 10%) in many U.S. cities. However, most of these studies focus on single-family homes. This paper indicates that condominiums receive capitalization benefits in excess of 10%, and the benefits received by single-family properties fall within the more typical range (<10%). |
| Gatzlaff and Smith (1993) | Heavy Rail | Dade County, Florida (Miami Metrorail) | Pre/Post Study | At most a 5% higher rate of appreciation in real estate sales value compared to the rest of the City of Miami. | Residential values were only weakly impacted by the announcement of the new rail system. Higher priced neighborhoods have experienced greater increases in property values near Metrorail stations while declining ones have not |
| Gibbons and Machin (2005) | London Underground and Docklands Light Railway (late 1990s) | South East London | Hedonic Valuation Models | House prices rose by 9.3 percent more in places with transit than without. | The study suggests that households significantly value rail access and that these valuations are sizable as compared to the valuations of other local amenities and services. |
| Goetz et al. (2010) | Light Rail (Hiawatha Line) | Minneapolis | Pre/Post Study | Single-family homes within ½ - mile of a station sold for $5,229 more after 2004 than homes farther from the station. The premium for multi-family properties was $15,755 after the line opened. | This study demonstrates that completion of the Hiawatha Line has generated value and investment activity in the Minneapolis housing market. |

| Authors | Rail Mode | Location (Transit Facility) | Methodology Used | Extent of Property Value Impact | Major Conclusions |
|---|---|---|---|---|---|
| Hess and Almeida (2007) | Light Rail | Buffalo, New York | Hedonic Price Models | A premium of between 2 and 5 per cent of value was found. | There is a lower effect for properties in economically declining areas and higher effects in more prosperous areas. |
| Immergluck (2009) | Light Rail (Beltline) | Atlanta | Pre/Post Study | Single-family homes within one-quarter mile of the planned loop sold at a 15 to 30 percent premium compared to similar properties located more than two miles away. | The study found large increases in premiums for homes near the lower-income, southern parts of the Beltline TIF district between 2003 and 2005, which corresponded to initial media coverage of the planning process. The findings suggest that planning for the Beltline induced substantial speculation and gentrification. |
| Kahn (2007) | Light Rail | 14 cities | Pre/Post Study | Neighborhoods close to new “walk-and-ride” stations saw home values increase more than 5 percent over 10 years, but home values near new “park-and-ride” stations fell by about 2 percent. | This article uses a 14-city census tract–level panel data set covering 1970 to 2000 to document significant heterogeneity in the effects of rail transit expansions across the 14 cities. Communities receiving increased access to new “walk-and-ride” stations experience greater gentrification than communities that are now close to new “park-and-ride” stations. |
| Knapp et al. (2001) | Light Rail | Portland | Pre/Post Study | Vacant parcels within one-half mile of the planned line sold at a 31 percent premium in the two years after plans were announced. The premiums for parcels within one mile were 10 percent. | The study find that plans for light rail investments have positive effects on land values in proposed station areas. |
| McDonald and Osuji (1995) | Southwest Side Rapid Transit Line | Chicago | Pre/Post Study | An increase of 17 per cent in value for properties within a half-mile of stations by examining comparative parcel sales from 1980 to 1990. | Alternatively, the increase was 1.9% (or $126.75 per lot) per mile of distance to downtown Chicago for those sites within one-half mile of the stations. |

| Authors | Rail Mode | Location (Transit Facility) | Methodology Used | Extent of Property Value Impact | Major Conclusions |
|---|---|---|---|---|---|
| McMillan and McDonald (2004) | Rapid Transit Line (Downtown Chicago to Midway Airport) | Chicago | Pre/Post Study | Single-family homes near transit began selling for 4.2 percent more than homes one mile away in the 1980s. The premium increased to as much as 19.4 percent between 1991 and 1996 before correcting to just about 10 percent in later years. | House prices were being effected by proximity to the stations in the late 1980s and early 1990s—after the plans for the line were well known. The difference between the increase in the value of homes within the sample area as compared with properties farther away from the new transit stations was approximately $216 million between 1986 and 1999. |
| Nelson (1992) | Heavy Rail | Atlanta, Georgia (MARTA East Line) | Hedonic Price Models | +$1,000 on home prices for each 100 feet a house is closer to a rail station in low-income transit adjacent census tracts; a slight negative effect in high income tracts (although this may be due to proximity to industrial uses or to low income neighborhoods). | For lower income neighborhoods, the benefit effects of accessibility more than offset any nuisance effects. Higher value homes may be more sensitive to nuisance effects than by improvements in accessibility. |
| Pollack et al. (2010) | Fixed Rail | 42 stations | Pre/Post Study | In 29 of the 42 station areas, the median home value increased by at least 20% more than in the region as a whole. Station area median gross rents outpaced the region by a similar margin in about 40 percent of cases. | The study affirm that transit can be a catalyst for neighborhood renewal, and that such improvements to neighborhood accessibility could potentially 'price out' current residents because of rising property values. |
| Weinberger (2001) | Light Rail | Santa Clara County, California | Explanatory hedonic models. The study design attempts to reconcile both longitudinal and cross-sectional effects in a single model. | A commercial property within ~ ¼-mile of a transit station would lease in 1993 for 13.8% more than other properties leased in the County in that year, if it were leased in 1997 it would command a 14.6% premium but only 5.2% in 1998. | The basic results indicate that after controlling for factors such as length and type of lease, building improvements, regional and local economic cycles, and location, properties that lie within a ~ ¼ mile of a light rail station command a higher lease rate than other properties in the County. |

# Appendix C. Summary of Studies on TOD and Gentrification

| Authors | Location of Study | Time Period | Variables & Methods Used | Major Conclusions |
|---|---|---|---|---|
| Lin (2002) | Chicago | 1975-1991<br><br>Study Periods: 1975-1980, 1980-1985 and 1985-1991. | Residential zoning densities; straight-line distances to the CBD, Lake Michigan and transit stations; annual changes in land values.<br><br>Method: regression analysis | • Transit had influenced gentrification during two of the three periods studied, with large, negative and statistically significant coefficients relating changes in housing values to proximity to transit.<br><br>• Weakness: Results are limited since gentrification is usually measured with a variety of indicators, yet Lin only took into account changes in land values |
| Kahn (2007) | 14 cities | 1970-2000 | Property values; education level; proximity to walk-and-ride stations; proximity to park-and-ride stations; and proximity to any transit station interacted with the median household income.<br><br>Methods: Three model structures for statistical analysis. Regression analysis to estimate the changes in housing prices at the four study periods: 1970, 1980, 1990 and 2000. | • The regression showed mixed results across the study sample - walk-and-ride stations having a positive effect on housing prices, and park-and-ride stations effecting housing prices negatively.<br><br>• The results were inconclusive, and varied depending on the type of regression models used (OLS or IV), ultimately demonstrating that although gentrification did occur near some walk-and-ride stations, it did not appear near park-and-ride transit stations. |

| Authors | Location of Study | Time Period | Variables & Methods Used | Major Conclusions |
|---|---|---|---|---|
| Pollack et al. (2010) | 12 cities | 1990-2000 | Population; race; household income; gross rent; mobility status (whether residents have moved in the last 5 years); transit ridership; housing value; and number of cars per household.<br><br>Variables were collected and analyzed at the census block group level.<br><br>Method: Regression Analysis | • Population, housing units, income, rents and home prices all increased in new rail station areas.<br><br>• Car ownership increased.<br><br>• A significant percentage of station areas saw transit use drop faster than the region. |
| Dominie (2012) | Los Angeles | 1990-2010 | Two income variables (high- and low-income households); changes in race/ethnicity; occupation; and education.<br><br>Method: Six Regression Models | • Areas around transit in Los Angeles County, for the most part, were more likely to gentrify,<br>• Greater increases in car-owning residents than the surrounding counties, and experienced resultant losses in transit ridership. |

# Appendix D. TOD Impacts in Los Angeles

Here we provide a brief overview of recent studies conducted by UCLA students, as well as nonprofit and public agencies related to TOD development and its impacts in Los Angeles neighborhoods.

## UCLA Student Research

A UCLA study entitled *TOD Impacts on Businesses in Four Asian American Neighborhoods* focused on Chinatown, Thai Town, Little Tokyo, and Koreatown. Overall, this study was the first to examine the impact of TODs on small and ethnic businesses, thus expanding the way researchers should examine the impacts of government infrastructure investments on neighborhood change. Despite data limitations, the available information indicated that many local and Asian businesses did not proportionately benefit from development. There was considerable heterogeneity among the four communities in terms of impacts. From 2001 to 2011, businesses in Chinatown grew at a much lower rate relative to businesses in LA County, and the growth rate of Asian businesses showed a more drastic decrease in the TOD study area compared to that of LA County as well (Fang and Le, 2014). Koreatown only slightly lags behind Los Angeles County for all business and small business growth, thus this neighborhood is still very competitive and has potential for future growth (Cha et al. 2014). In Little Tokyo, the data implies that the TOD study area and LA County's overall business sectors are dynamic, though the study area saw lower rates of business growth and lower turnover (Hom, Toscano, and Yang, 2014). Finally, in Thai Town, the data suggests that while the overall business sector and small business subsector in the TOD Study Area are flourishing, Asian businesses are growing at a dismal rate (Macedo and Nem, 2014). Thus, the results are consistent with community concerns about a relative slowing of growth in small and Asian businesses. The study suggests that greater attention by government is needed to maintain the cultural characteristics of neighborhood and to support small local and ethnic businesses (Ong, Pech, and Ray 2014).

A second UCLA project focused on the analysis of transit-oriented development and fair and affordable housing, examining four LA neighborhoods: Boyle Heights, Westwood, the neighborhood around Sunset/Vermont, and the neighborhood around USC. All these TOD areas had distinctive characteristics.

- In Boyle Heights, racial/ethnic groups within the TOD Service Area earn far less than their respective racial/ethnic group in L.A. County at large. This pattern indicates that economic conditions have been a major factor driving the racial/ethnic distribution in the TOD Service Area, rather than explicit racial/ethnic discriminatory forces. Boyle Heights and the TOD Service Area both have a substantially higher proportion of affordable rental units than L.A. County at large. In addition to this, the median income in both areas is far lower than the county median. Due to these combined factors, the availability of affordable units provides residents with a relatively stable supply of housing, in turn lowering the rent burden in the area (Beltran et al., 2011).
- Around USC, there does not appear to be significant discrimination in housing on the basis of race or ethnicity, as Hispanic and Black/African American households are overrepresented in the USC neighborhood. However, an overrepresentation of African American and Hispanic households may be indicative of housing discrimination in other parts of the city or region. There is a strong supply of low-rent housing, yet a majority of households still pay more than 30 percent of income on housing costs (Lopez et al., 2011).

- In the Sunset/Vermont station area there was no significantly overrepresented or underrepresented racial ethnic group. Trends confirm that the area is actually moving towards representations more consistent with Los Angeles County. Sunset/Vermont does not appear to have a greater need for affordable housing than the County, as it has proportionately twice as many low rent units than the County. However, over 50% of renters in this neighborhood face rent burden.
- In Westwood, subtle housing discrimination practices seem to exist. The research found that Latinos/Hispanics and Blacks are underrepresented in the neighborhood. And the area has an inadequate supply of low-rent housing and a high housing burden among renters. Indeed, people who want to live and work here cannot afford to be here without paying more than 30% of their income on rent (Allen et al., 2011).

## Non-Profit Studies

***1. Planning to Stay: A Community Created Master Plan for an Improved Transit Village in Westlake.*** **February 2010. Central City Neighborhood Partners.**

This study focused on the Metro Red Line in Westlake Village in Los Angeles. This area is a low-income, immigrant community, predominantly composed of renters, near downtown Los Angeles. The proximity to downtown and good transit access has prompted significant development interest, which has caused hardship for many residents because of increasing rents. The report mentions the replacement of mom-and-pop businesses by chain and upscale establishments.

The report views resident participation as critical to prevent further displacement and maintain affordable housing:

> Residents' leadership is especially critical in resolving the conundrum of improving the neighborhood without gentrifying it. The solution is likely a combination of aggressive affordable housing policy and strategic improvements crafted to improve the neighborhood more in the eyes of current residents, than in the view of new more affluent residents (2010:11)

The report asks the important question: "Are we planning a transit village, or does it already exist?" This area is already very transit-friendly, as it is within walking distance of the Metro, Rapid Bus and bus lines. It averages 33,594 residents per square mile, more than 4 times the city average. The commercial streets are aligned with neighborhood businesses, services and offices in multi-story mixed-use buildings with active street facades. The area already has four times more transit use than the City of Los Angles and seven times more than Los Angeles County. Consequently, the goal of this study is not to plan a transit village, but rather to improve an existing one. Suggestions proposed include:

- A "Transit Investment Based Inclusionary Housing Zone" that would require 25% or greater affordable units in all new construction and major renovations within ½ mile of the Red Line station. If challenged in court, the authors of the report believe that this policy would be affirmed because the value of station-adjacent property is significantly increased by the enormous public investment in the station and line, thus creating a constitutional basis for requiring developers to provide affordable housing.
- Density bonus programs that provide an additional incentive to build more affordable units. Modeled after the City of West Hollywood's successful ordinance, the policy proposal offers progressively more density bonus as the developer provides more affordable housing, all

the way up to a 100% bonus for 100% affordable housing.

- Implementation of inclusive policies that ensure housing development rather than decrease the stock of affordable housing. It is critical to do this first, so that if later steps attract developer attention, their new projects will be certain to include ample affordable housing.
- Improvement of the neighborhood landscape starting with enhancements that serve current population such as a new DASH route (local shuttles), widened sidewalks, etc.

***2. Hollywood: A Comeback Story and Lessons Learned. Beth Steckler and Lisa Payne.*** **February 24, 2012.**

The introduction of the Metro Red Line subway and three stations along Hollywood Boulevard in the heart of the redevelopment project area has served as a catalyst for development. The Community Redevelopment Agency (CRA) adopted a "bookend strategy" that at first focused investment around the stations with the assumption that it would then be easier to attract development to the rest of the project area.

However, by 2009 the demographics of Hollywood's residents had changed: they owned more cars, composed smaller households, and had higher incomes than the previous area residents. Despite all the development, the study outlines that the number of people living in central Hollywood fell by about 10 percent, while population in the city grew by about 9 percent. Per capita income rose 34 percent in Hollywood, but only 2 percent citywide. And there was an increase in car ownership despite the easy availability of high-quality transit: The area witnessed a 32 percent decrease in car-free households, while households with one car increased by 15 percent. This information has implications for ridership on the transit system. All the numbers suggest that, despite the city's extraordinary efforts to keep housing affordable, Hollywood is gentrifying.

Focusing on the case study of the Hollywood area, the report suggests the following 11 recommendations for TODs around metro stations in Los Angeles:

- Be bold in addressing big problems
- Get city agencies working together with the community
- Engage communities of interest to help address problems
- Tackle crime and problem properties
- Deliver on the promise of good jobs for the community
- Capture some of the increased property value
- Devise strategies for making streets and sidewalks clean
- Minimize displacement
- Seize opportunities for moving mission forward
- Get the parking right
- Advocate for local, regional, statewide, and federal policies.

***3. Creating Successful Transit-Oriented Districts in Los Angeles: A Citywide Toolkit for Achieving Regional Goals.*** **February 2010. Center for Transit-Oriented Development.**

The Center for Transit-Oriented Development (CTOD) set out to determine why good TOD is or is not occurring around stations, and to strategize about ways that station area performance could be improved. CTOD examined the current success of transit-oriented districts through a data-driven analysis and a discussion with focus groups from five transit corridors in the city. They created a variety of tools measuring current performance including a station typology, station area profiles, and a set of regional screen maps that analyze demographic and economic conditions throughout the City.

The CTOD also conducted a case study analysis of five corridors that have clusters of stations, including: the Gold Line from Little Tokyo to Indiana; the Red Line from Vermont/Wilshire to Vermont/Sunset; the Orange Line from Sepulveda to Warner Center; the Expo Line from USC to Crenshaw; and a key portion of the proposed downtown streetcar alignment. CTOD invited stakeholders from these corridors to talk about the opportunities and challenges of TODs. Participants included staff from several city departments and various agencies including CRA-LA, the Planning Department, and LA Metro, as well as community members and organizations, institutional property owners and major employers, and planners, developers, and activists.

This report emphasizes that transit investment and transit-oriented districts are keys to enhancing affordable living. A 2009 study by the American Public Transportation Association found that households that used transit saved an average of $10,000 in Los Angeles (2010: 4). Additionally, there is growing support for TOD from business interests. The authors emphasize that achieving TOD success requires the involvement of many public and private organizations.

According to the report, the demand for transit-oriented living in the Los Angeles region is strong and growing; nearly two-thirds of this demand is likely to come from households earning less than the city's median income (2010: 7). Already, transit serves many of the city's existing lower-income neighborhoods, offering residents regional access but increasing their vulnerability to displacement over time. (2010: 8). Furthermore, 22.4 percent of jobs in Los Angeles County are connected to transit (2010: 8).

The report stresses that since contracts on over 20,000 units of affordable housing will expire by 2014, housing preservation will be a key component of station area planning. Another means of protecting affordability is to proactively implement development plans for small parcel sizes near some transit stations. The chart below identifies different TOD strategies that relate to several topics (for example, Housing Affordability and Economic Development) that came about as a result of this project.

***4. Preservation in Transit-Oriented Districts: A Study on the Need, Priorities, and Tools in Protecting Assisted and Unassisted Housing in the City of Los Angeles. May 2012. Prepared for the Los Angeles Housing Department. Prepared by: Reconnecting America.***

For this study, four existing transit-oriented districts were selected as areas of focus for preservation activities over five years. The areas were chosen based on several factors:

- Median Household Income
- Percent of Renter-Occupied Households

- Potential Change in Market Strength Resulting from:
    - Proximity to Major Job Centers
    - Areas with Lower Transportation Costs
    - Rising Property Values
    - Transit Access to Downtown Los Angeles and Westwood Resulting from Measure R Investments
    - Historic Neighborhood Character (age of buildings)
- Vulnerability of Housing Stock:
    - Concentration of Income-Restricted, At-Risk Units
    - Concentration of Larger Buildings Subject to the Rent Stabilization Ordinance
    - Concentration of Smaller Buildings Subject to the Rent Stabilization Ordinance

The station area clusters chosen were along the Red Line, Purple Line, Venice Blvd. Central L.A Rapid Bus corridor (North of I-10), and Expo Line. The areas chosen exhibited a high confluence of vulnerability factors.

The study suggests that if transit investments manage to reduce congestion to major transit-oriented job centers like Downtown Los Angeles or Westwood, then workers in these places must be able to reach them by transit. Thus, the report proposes a comprehensive TOD strategy that might include the following:

- Affordable housing preservation;
- Coordinated land use regulations that leverage new transit-oriented development (both market rate and affordable);
- Provision of other amenities such as parks, quality schools, fresh food, etc.;
- Making last mile connections and investing in supportive pedestrian, bicycle, parking improvements and land use planning efforts; and
- Coordinated workforce and economic development strategy that considers both business attraction and job training near transit.

# Appendix E. Summary of Simulation Models of Gentrification

| Authors | Model Structure[1] | Model Setting | Mechanisms | Findings |
|---|---|---|---|---|
| O'Sullivan (2002) | Cellular automata | London | This model is explicitly posed as a spatial instantiation of the "rent gap" theory of gentrification. Each iteration of the model consists of spatially linked properties (the "cells" of the model) passing among states of "not for sale," "for sale," "seeking tenants," and "rented." The rent gap is operationalized as the amount by which the "condition" value of a given property is less than the average condition of spatially linked properties. This gap helps determine the investment in upgrading a property, which in turn helps determine the property's state, as well as values for sale price, rent price, and "neighborhood status." | Posed as an exploratory analysis, model outcomes are shown for a sample run of 60 years, with the author tracking the proportion of properties in each of the four different states, as well as average values occupant income, physical condition of properties, and neighborhood status. The model is able to generate alternate periods of stability and instability in these measures, with neighborhood change dependent on the inclusion of a neighborhood status feedback mechanism. |
| Torrens and Nara (2007) | Cellular automata and agent-based hybrid | Salt Lake City | The interactive units in this model are of three types: spatially fixed markets and properties, and spatially mobile residents. Residents choose among markets (large aggregations of properties) and then choose among nested properties. The decision whether or not to move, and subsequently where to move, is based on the preferences and economic statuses of residents, as well as of properties of both broader markets and individual properties. Real estate prices are subsequently adjusted based on location-specific vacancy rates. | The authors track five primary market-level outcomes in their model: total household population, average property values, the average economic status of residents, residential turnover, and resident ethnic profile. These outcomes are presented for four different model runs: a status quo scenario; a demand-based gentrification scenario, in which additional high-income households are exogenously input to the model; a supply-based gentrification scenario, in which additional high-value properties are exogenously input; and a scenario combining demand and supply gentrifying pressures. The model, specified in an exploratory way, is able to produce varying gentrification dynamics under these different scenarios. |

[1] Mode structure is split into three broad types. “Cellular automata” models consist of spatially fixed units. The characteristics of these units (or automata) evolve according to the attributes of other, neighboring automata. The potential states of the automata, their updating rules, and their geometries of influence are all potentially complex. “Agent-based” models, on the other hand, consist of spatially mobile agents situated within a fixed or evolving environment. The agents move according to decision procedures that can be based on both characteristics of the environment and of other agents. Characteristics of agents themselves may be static or may change over time, and their movement may alter relevant aspects of the environment. Finally, hybrid models contain elements of both cellular automata and agent-based models. These models contain spatially mobile agents, but they also contain spatially fixed cells that evolve according to the actions of mobile agents, as well as in response to the characteristics of other spatially fixed cells.

| Authors | Model Structure[1] | Model Setting | Mechanisms | Findings |
|---|---|---|---|---|
| Jackson, Forest, and Sengupta (2008) | Agent-based | Boston | Four distinct types of mobile agents -- professionals, students, non-professionals, and elderly -- interact with a simulated urban landscape, with movement decisions governed by neighborhood preferences and abilities to pay that vary between agent types. Additionally, rents charged for simulated housing units increase according to the presence of professionals, and students transition over time to either professionals or non-professionals. | Measured outcomes of the gentrification model include the proportion of residents by type in the modeled neighborhoods, as well as the average land rents in these areas. Geographic trends are analyzed in terms of their qualitative similarity to results predicted by theory, and multiple test parameters are tweaked to validate the model's conformity to theoretical expectations. |
| Eckerd and Reames (2012) | Cellular automata and agent-based hybrid | Abstract grid | The authors posit a model that incorporates both a real estate market that governs the price of simulated plots of land, as well as a preference mechanism the governs the location decisions of residential agents. While the specifics of both of these mechanisms are left vague, the authors specify that residential agents are to be heterogeneous with respect to both income and race, and that these two dimensions of "socioeconomic status" are to drive the gentrifying dynamics. | The work presented by the authors is meant only to lay out the foundation for a gentrification simulation. Thus, the authors have no concrete results. They do, however, explicitly describe the process by which model results are to be compared with empirical observations to validate the model's structure, behavior, and policy implications. |
| Diappi and Bolchi (2013) | Cellular automata and agent-based hybrid | Milan | This model consists of investors, small owners, and tenants as "active" agents, and buildings as "passive" or spatially fixed agents. Within the model, investors decide whether to generate new developments and owners decide on their level of property upkeep based on property- and neighborhood-level characteristics (with investor decisions framed around the familiar rent gap theory). These supply decisions are additionally influenced by two exogenous factors: macroeconomic cycles, and an "Alonso curve" rent gradient falling outward from the city center. Tenants make locational decisions within the resulting real estate market based on their individual preferences and abilities to pay. | The model is first validated by reproducing the observed spatial patterns of rent in Milan as they evolved from 1993 to 2003. The authors next use the model to predict future rent levels with and without a series of planned large-scale development projects. Finally, the authors use model results to posit rent gap dynamics as a potential explanation for cyclicality observed in aggregate rent levels. |

# Appendix F: Census Tract Datasets

Two census tract-based time series were developed with data on housing and demographic characteristics of non-transit and transit neighborhoods (areas within a half-mile radius of a fixed-rail transit station). As discussed below, we intended to use the Neighborhood Change Database (2010) to reconcile tract boundaries from 1980 to 2010; however, significant errors were found, and we instead went with the Brown Longitudinal Tract Database. Below we discuss some of the methods used and challenges faced when processing the datasets for the two regions.

While the team's original plan was to use Geolytics Neighborhood Change Database (2010) (NCDB) for this task, a major problem was encountered with the reported population counts in the NCDB. The problem that the team noticed from the onset is that Geolytics data revealed dramatic population changes for a number of census tracts in Los Angeles County and in the Bay Area that appeared to be anomalous. Populations were allocated to census tracts that generally do not have population or very few people. Table F.1 lists the tracts where the team spotted errors in the misallocation for Los Angeles. These were mainly the 9800 and 9990 tracts. The Bureau of Census provides the following definition for the tracts with code range in 9800s and 9900s:

> The code range in the 9800s is new for 2010 and is used to specifically identify special land-use census tracts; that is, census tracts defined to encompass a large area with little or no residential population with special characteristics, such as large parks or employment areas. The range of census tracts in the 9900s represents census tracts delineated specifically to cover large bodies of water. This is different from Census 2000 when water-only census tracts were assigned codes of all zeroes (000000); 000000 is no longer used as a census tract code for the 2010 Census (https://www.census.gov/geo/reference/gtc/gtc_ct.html).

Because of some of the inaccuracies in the NTDB, the team decided to use Brown University's Longitudinal Tract Data Base (LTDB) and its crosswalks to reconcile the changes in tract boundaries from earlier time period. The Longitudinal Tract Data Base provides a crosswalk that allows one to normalize census tract data from previous years (1970-2000) to 2010 census tract boundaries to maximize comparability across the study period. In addition, the LTDB also includes both a selection of short- (Full Count) and long-form (Sample Count) variables from the 1970-2000 Censuses that are already normalized to 2010 boundaries. For any additional variables not provided by the LTDB, we downloaded the original raw data (through FactFinder2 or Social Explorer) and used LTDB's crosswalk normalize to 2010 boundaries. The census tract data in the database were obtained from five sources: the Longitudinal Tract Data Base, the 1990 U.S. Decennial Census, the 2000 U.S. Decennial Census, the 2010 U.S. Decennial Census, and the 2009-2013 American Community Survey (ACS).

**Table F.1: Total Population Counts**

| | *Geolytics* | | | *Decennial Census* |
|---|---|---|---|---|
| **Census Tract** | **1980** | **1990** | **2000** | **2010** |
| 6037980001 | 1,308 | 1,702 | 1,879 | 0 |
| 6037980002 | 2,695 | 3,251 | 3,195 | 0 |
| 6037980003 | 619 | 805 | 668 | 2 |
| 6037980004 | 365 | 637 | 616 | 169 |
| 6037980005 | 3,327 | 3,434 | 3,490 | 0 |
| 6037980006 | 277 | 343 | 112 | 0 |
| 6037980007 | 904 | 1,221 | 794 | 0 |
| 6037980008 | 1,746 | 2,489 | 2,723 | 145 |
| 6037980009 | 8,659 | 9,035 | 8,875 | 14 |
| 6037980010 | 4,453 | 4,831 | 4,634 | 164 |
| 6037980013 | 12 | 13 | 16 | 59 |
| 6037980014 | 3,494 | 4,097 | 3,957 | 239 |
| 6037980015 | 4,858 | 5,956 | 5,191 | 554 |
| 6037980018 | 70 | 89 | 91 | 1 |
| 6037980019 | 7,801 | 7,667 | 8,128 | 173 |
| 6037980020 | 2,072 | 2,393 | 2,372 | 0 |
| 6037980021 | 3,366 | 5,273 | 6,025 | 33 |
| 6037980022 | 3,815 | 3,642 | 3,622 | 4 |
| 6037980023 | 1,753 | 2,315 | 2,592 | 8 |
| 6037980024 | 5,167 | 5,151 | 5,253 | 186 |
| 6037980025 | 2,614 | 2,639 | 2,837 | 0 |
| 6037980026 | 3,957 | 4,019 | 5,214 | 20 |
| 6037980028 | 2,029 | 2,380 | 2,198 | 4 |
| 6037980030 | 2 | 2 | 2 | 0 |
| 6037980031 | 7,719 | 9,220 | 8,894 | 1,262 |
| 6037980033 | 138 | 4,704 | 24 | 61 |
| 6037990100 | 7,141 | 7,850 | 8,698 | 0 |
| 6037990200 | 81,334 | 81,046 | 78,104 | 0 |
| 6037990300 | 28,450 | 33,523 | 30,442 | 0 |

While we did our best to include variables that are consistent across all three time periods, we did encounter some inconsistencies in some key variables. One example is the data on mobility. For our analysis on neighborhood mobility, we relied on the 2009-13 ACS data on "Geographical Mobility by Selected Characteristics in the United States" to examine the demographic characteristics and socioeconomic status of those moving into TOD areas. The information is available for persons who moved within one year. Unfortunately, there are no comparable datasets in the 1990 and 2000 Decennial Censuses. What is available from the two Censuses is a table on "Year Householder Moved into Unit". The universe, which is the householder, is different from the ACS mobility table, which reports estimates for persons. Another difference between the two tables is the reported mobility period. The ACS table provides estimates for those who moved within the last year, while the 1990 and 2000 dataset on "Year Householder Moved into Unit" reports estimates for those who moved within a year and three months. Additionally, the "Year Householder Moved into Unit" variable does not provide in details key characteristics of the mover that are important to this research. This includes information on the mover's income, race, and education attainment level. The ACS 1-year mobility data provides this information.

Another major problem that we encountered was the household income brackets that were not inflation adjusted across data sets, thus creating "artificial" shifts in distribution by income. We were able to partially address this by using Social Explorer, which allowed us to adjust the income brackets for inflation, but we do not know the reasonableness of their estimated reallocation.

The team observed inaccuracies with the Geolytics NCDB data in the Bay Area similar to those in Los Angeles County. For certain tracts, especially those near water bodies, significant discrepancies

existed for population counts in the NCDB. For instance, in a census tract in the northern county of Marin that underwent changing tract boundaries between 2000 and 2010, the Geolytics database indicated a population spike from 281 in 2000 to 7809 in 2010 (Figure F.1). Through our interviews and contact with our partner CBO, we learned that few if any new units were added to the area during that decade, and barring the building of an entirely new community, a population growth of 2679% in an existing community seemed unbelievable.

After contacting Geolytics in search of an explanation or data fix and receiving little of either, we sought an alternative source of data in Brown University's Longitudinal Tract Database (LTDB). Despite using seemingly similar methods, LTDB showed a gradual population growth from 1980. We therefore contacted Brown University to better understand the source of this difference, and they suggested that Geolytics used a less robust methodology, involving analysis of the street grid among other, less transparent methods. Although the LTDB appeared more robust for this single tract, we began to question the reliability of either dataset. Following UCLA's methodology (Ong et al. 2014), we prepared a third dataset using block data from 1990 and 2000 and assigning it to 2010 tract boundaries – a methodology similar to those used by both Brown University and Geolytics.

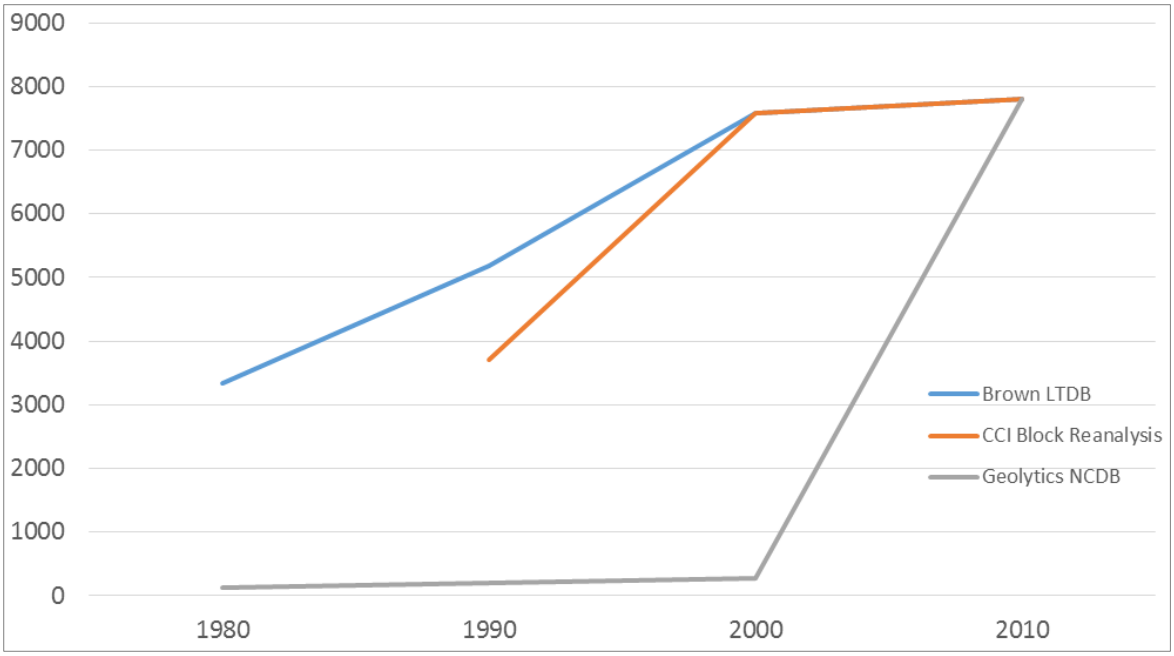



**Figure F.1: Differences between Geolytics NCDB, Brown LTDB, and census block analysis for census Tract 1122.01, Marin County**

When we compare the results from our analysis of block level population data, we find that Brown University's LTDB aligns well with our results for 2000, but not for 1990. In contrast, Geolytic's NCDB aligns better than Brown in 1990, but significantly worse in 2000 (Table F.2). As much of our analysis focuses on change since 2000, we chose to utilize the Brown LTDB dataset for the purposes of this research.

**Table F.2: Correlation coefficients between Geolytics NCDB, Brown LTDB, and census block analysis for Bay Area tracts**

| | **1990 Census Block Analysis** | **2000 Census Block Analysis** |
|---|---|---|
| 1990 Brown LTDB | 0.696 | - |
| 1990 Geolytics NCDB | 0.826 | - |
| 2000 Brown LTDB | - | 0.993 |
| 2000 Geolytics NCDB | - | 0.599 |

# Appendix G: Parcel-Level Datasets

In an attempt to build a finer grain understanding of neighborhood change in the Bay Area and Los Angeles County, we set out to acquire datasets available at the parcel, rather than census tract, level. This involved purchasing Assessor and transaction data from Dataquick as well as acquiring data on subsidized housing from the U.S. Department of Housing and Urban Development (HUD) and the California Department of Housing and Community Development (HCD), and other data where available. One of the biggest limitations of this task was the uneven collection of data at the municipality level. Thus, while some cities have an abundance of fine-grain data (e.g., San Francisco), others collect very little or data is only available at the citywide level. Although this task originally envisioned acquiring housing discrimination complaints from the California Department of Fair Employment and Housing and with HUD, such data available to the public are only reported at the aggregated level (county or state), and the frequency is very low, limiting usefulness for this study. In addition to the assessor and subsidized housing data, we sought to acquire permits data, code violation data, and condo-conversion data to develop proxies for different types of displacement, as summarized in Table G.1, included in our original scope of work. Unfortunately, much of this data (especially permit and evictions data) was not actually available at the parcel level for our areas of analysis. The below sections detail the kind of data we were able to acquire, specifically paying attention to the assessor and transaction data.

**Table G.3: Types of Displacement**

| Displacement Type | Sales | Permits-New | Permits-Rehab | Permits-Demo | Condo conversions | Code violations | Rent-Own conversions | Evictions | Subsidized housing |
|---|---|---|---|---|---|---|---|---|---|
| Economic | X | NA | NA | | | | | | x |
| Physical | X | | | NA | x | NA | NA | x | x |
| Exclusionary | X | NA | | NA | x | | NA | | x |

*NA = Indicates what is not available*

## G.1 Parcel Database for Los Angeles

The UCLA research team made several adjustments to Task 2H due to the unavailability of datasets in Los Angeles County. Numerous requests were made to obtain city data on building permits, demolitions, and code violations but the team was unsuccessful in acquiring these datasets. The fragmentation of Los Angeles County, which consists of a total of 89 different jurisdictions, made it difficult for the research team to track down all of the datasets.

Instead, the UCLA team had to rely on existing parcel datasets, which the team already has access to from other research projects. The UCLA team had access to a rich set of parcel data which goes as far back as 1999 and up to 2013. The parcel data was purchased from the Los Angeles County Assessor's office, which records data on parcel and structure characteristics as well as transaction information, including sale price and date of sale. Only the 2000, 2007 and 2013 parcel data were used for this project. Although not perfect, the Los Angeles County Assessor's parcel data was sufficiently complete to enable the team to leverage it in order to estimate the number of new construction projects, condo conversions, and properties that have gone through major renovations. Property sales data were derived from DataQuick (see description in Bay Area section below).

**List of Substitutions**
Permits-New ➔ Newly constructed building imputed from LA County Assessor dataset
Permits-Rehab ➔ Major renovations for single-family homes imputed from LA County Assessor dataset

***Major Renovation/Improved Units***

Our analysis of major renovations only looks at single-owner properties that were renovated between 2007 and 2012. The recording year was used as a proxy for the year the property was sold. We limit our sample to include properties that were sold in 2007 but remained with the same owner during the six-year period (2007-2012). To determine if the property was renovated, we looked at the changes in the property's improvement value between these two years. California's Prop 13 caps property taxes at 1% of the assessed value of a home at the time of purchase and prevents taxes from increasing more than 2% a year or more than the rate of inflation, whichever is less, unless there is a sale or major renovation. Anything beyond this would indicate some real improvement or renovation to the property.

For this study, a home is said to have been improved or experienced major renovation if it met the following criteria:

1. The percentage change in improvement value is greater than 10.7% (this is the rate of inflation between 2007 and 2012)
2. The amount in real dollar improvement is greater than or equal to $5,000 (improved value in 2012 less improved value in 2007 times 1.107)

We aggregated all properties that were identified as being improved or that experienced major renovation, up to the census tract level.

***New Construction of Residential Units***

The 2013 County Assessor Parcel data was used to estimate the number of new residential units. Parcels with the first character of the use code either zero or with use code ranging from 01 to 09 are classified as residential properties. Table G.2 provides a breakdown of the types of residential property and their use codes.

**Table G.4: County Assessor Use Codes and Corresponding Residential Property Types**

| Use Code | Description |
|---|---|
| 01 | single-family residence (one unit) |
| 02 | two units |
| 03 | three units |
| 04 | four units |
| 05 | five or more units |
| 06 | modular home |
| 07 | mobile home |
| 08 | rooming house |
| 09 | mobile home park |

Using the "Year Built" variable, we define units that were constructed between 2005 and 2013 as "new". Since the parcel data does not include a "number of total units" variable for multi-family properties, we had to estimate the number of units for each parcel classified as "Five or More Units". We did this by dividing the property's square footage by 900. The 900 square feet is the

average size for a multi-family unit in Los Angeles County. Table G.3 gives an example of our calculation. We aggregated all "new residential units" up to the tract level.

**Table G.5: Estimating the Number of Units for Parcels Classified as 5 Units or More**

| AIN | Use Code | Yr. Built | Tract10 | BG10 | SQ.FT | Est. Units |
|---|---|---|---|---|---|---|
| **XXXXXXXXXX** | 0501 | 2005 | 265510 | 1 | 77,329 | 85 |

**Estimated # of Units = Building sq. ft. / 900**
**77,329/900 = 85 units**

***Condo Conversion***

Our analysis of condo conversions identified apartment units that were converted to condos between 2003 and 2013. Since the parcel data does not contain a variable denoting when the property was converted, we had to estimate this by merging together the 2003 and 2013 parcel datasets using the property's Assessor Identification Number (AIN). Only parcels with the use code 10E (condo conversion) were kept in the dataset. If a parcel existed in 2013 but not in 2003 then we can assume that the conversion occurred between 2000 and 2013. If the parcel existed in both the 2000 and 2013 datasets then it is most likely that the conversion took place before the 2003 period. When a unit is converted from apartment to condo, it is given a new AIN. Prior to the conversion, the unit would not have had its own AIN, but instead the whole apartment structure itself would have had one unique AIN for the property.
Table G.4 provides a simple cross-tab between the 2007 and 2013 parcels. There were 47,919 parcels that were identified as condo conversion in 2007 and 52,890 in 2013. A total of 47,115 existed in both 2007 and 2013 parcel datasets which would indicate that the conversion took place prior to 2007. It is estimated that 4,971 units were converted between 2007 and 2013 (AIN contained in 2013 but not in 2007). The number of condo-converted units were aggregated up to the tract level.

**Table G.6: Simple Cross-Tab of 2007 and 2013 Condo Conversion Data**

| | In_2013 | | Total |
|---|---|---|---|
| In_2007 | **0 (No)** | **1 (Yes)** | |
| **0 (No)** | 0 | 4,971 | 4,971 |
| **1 (Yes)** | 804 | 47,115 | 47,919 |

## G.2 Parcel Database for the Bay Area

No consistent parcel level data was available for all Bay Area counties; therefore, the UC Berkeley team relied on the parcel data purchased from Dataquick for the construction of the database. A significant amount of data processing and cleaning was necessary to extract relevant indicators from this dataset. Data was purchased for current assessor data (equivalent to 2013), historical assessor data, which dates back to 2004, as well as transaction data, which dates back to 1988. From these datasets we intended to extract data on the frequency of sales and sales price of residential properties, land use changes including condominium conversions, new construction, and major renovations. Of this list, we were only able to extract the first two datasets, as the remaining indicators proved to be unreliable.

### *Transaction Data*

After following the data cleaning procedures described in the Appendix to remove duplicates, outliers, non-monetary transactions, public agency sales (which could distort the calculation of sales values) among other cleaning procedures, we calculated residential sales price per square foot and then estimated the median sales price (and number of sales) per census tract. This data allows us to better understand the turnover and value appreciation by neighborhood.

### *Land Use Changes*

For land use changes, we looked at the change in land use codes for each property between 2004 and 2013. The major limitation of this was that we were only able to match properties that did not change parcel numbers; this is a limitation because it is very common for parcel numbers to change, especially if any subdivision or parcel assembly has happened. In addition, Dataquick could not provide us with an algorithm for the changes in assessor numbers to match between years, as they argued that each County uses its own numbering system, which can change over time. Thus the land use change (including condominium conversions) was determined to be significantly underestimated from this technique. As an example, Table G.5 displays the counts of the total conversions between 2006 and 2011 (the last year for which we had reliable land use data). As a point of reference, there are approximately 2,206,509 parcels in the nine-county Bay Area. If this method of comparison were correct, land use changes would have only occurred on less than 2.5% of all parcels over a five-year period, which seems a bit low. Furthermore, when aggregating at the tract level for the purposes of modeling, these land use changes become virtually insignificant.

**Table G.7: Land Use Changes between 2004 and 2013**

| From \ To | Agricultural | Commercial | Industrial | Residential | Miscellaneous | Vacant |
|---|---|---|---|---|---|---|
| Agricultural | X | 71 | 37 | 689 | 125 | 383 |
| Commercial | 2 | X | 568 | 12,504 | 408 | 601 |
| Industrial | 36 | 567 | X | 1,117 | 154 | 310 |
| Residential | 335 | 1,175 | 78 | X | 641 | 2,851 |
| Miscellaneous | 282 | 6,279 | 214 | 1,839 | X | 1,248 |
| Vacant | 105 | 734 | 237 | 21,298 | 565 | X |

Similar results were found for condo conversions: according to this method only 6,143 parcels converted from other types of residential uses to condominiums. Based on the layouts of the current assessor data, we know that each condominium has a unique Assessor Parcel Number (APN), thus it is highly unlikely that this method of matching parcel numbers will give us an accurate portrayal of the total number of condominium conversions in the Bay Area.

### *New Construction*

One method for calculating new construction from the parcel data is to use the field for "Year Built" by building and the number of residential units on site. However, the units in many cases are counted many times, especially in buildings of condominiums where each condominium has a unique parcel number. Thus when summed, for instance in a condo building of 20 units, the total would equal 400 units because total number of units is replicated each time. Number of units appears to be inaccurate even for non-condo buildings. For instance, in San Francisco, according to the Dataquick Assessor tables, there were 2,298 units developed over the period 2007-2013;

however, the City claims to have permitted 3,697 units, 1,606 were reported as having been built during that same time period in their Housing Element Annual Reports to HCD. When comparing data for San Francisco, where we have access to additional assessor data and land use data, the Dataquick assessor data claims that only 2,156 units were built during the 2007-2013-time period, whereas it appears that they permitted 16,826 units, and when we looked at assessor data that San Francisco Planning department cleaned, it appears that 7,545 residential units were developed during that time period. Because of these large discrepancies, we decided to abandon Dataquick as a source of data for new construction and instead rely on census data to estimate new units.

***Major Renovations***

Similar to the analysis described for the Los Angeles Region, the UC Berkeley team set out to analyze land-to-improvement values as a proxy for major renovations. Upon calculating and mapping these ratios for the Bay Area, however, it appeared that several counties applied a constant ratio for calculating improvement values. As illustrated in **Error! Reference source not found.**, virtually all of Alameda, Solano, and Sonoma counties have the same median improvement-to-land value for 2013 when estimated at the tract level. This led us to assume that the improvement value was not worth including in the analysis at the regional level.

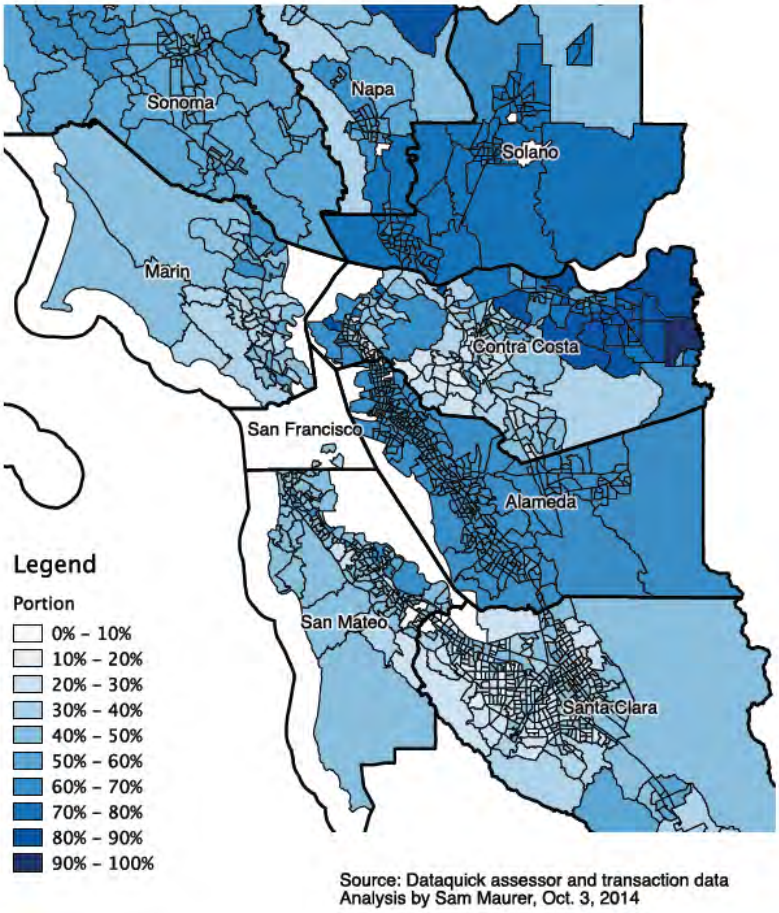



**Figure G.1: Improvement to Land Value Ratio for 2013 in the Bay Area**

### *Affordable Housing*

We were able to obtain a detailed dataset on subsidized housing from the non-profit California Housing Partnership Corporation. This data was primarily derived from the U.S. Department of Housing and Urban Development Low-Income Housing Tax Credits (HUD LIHTC) datasets, but also contains buildings developed with other federal funding sources as well. This dataset allows us to calculate the number of subsidized housing units constructed by year and location, although it does exclude any units developed exclusively with funding (e.g., local redevelopment agency projects).

### *Parcel Data for San Francisco*

Given the limited availability of parcel-level data at the regional scale, we sought to obtain more detailed data for the one county in the Bay Area that collects and makes public very detailed datasets: San Francisco County. For this county we were able to obtain the following datasets at the parcel/address level:

1. Fault and no-fault evictions since 1997
2. Below Market Rate units built under the City's Inclusionary Housing program since 1992
3. Housing permits for condominium conversions and for renovations since 1990
4. New housing construction from the local assessor/land use tables since 1990
5. Housing code violations since 2008

# Appendix H. Data cleaning Protocol for DataQuick Assessor and Transaction Data

| **PART 1 – GENERAL FILTERS** | | |
|---|---|---|
| **Issue** | **Analysis** | **Final criteria (SQL syntax)** |
| Remove transactions from outside the 9-county San Francisco Bay Area | | 1. mm_fips_muni_code IN (1,13,41,55,75,81,85,95,97) |
| Remove transactions from prior to 1988 since the dataset is supposed to only go back to 1988 sales | | 2. (s.sr_date_transfer/10000) >= 1988 |
| Remove non-residential transactions | • These represent less than 10% of state-wide transactions provided by Dataquick, and only 2.2% after applying the other data filters | 3. SUBSTRING(a.use_code_std FROM 1 FOR 1) = 'R' |
| **PART 2 – LINKING TRANSACTIONS TO ASSESSOR DATA** | | |
| **Issue** | **Analysis** | **Final criteria (SQL syntax)** |
| Basic identifiers have to be present in order for us to link transactions to census tracts | • Census tracts are listed in the assessor table but not in the transactions table, so we match transactions to assessor records using the property id<br>• 8% of transactions have a missing or 0 property id, and 0.3% of current assessor records are missing a census tract<br>• These transactions will disappear automatically from the final statistics, but it's probably best to explicitly remove them so they don't affect how we're judging the other data cleaning filters<br>• There don't seem to be any zero values for the census tract | 1. sr_property_id IS NOT null<br>2. sr_property_id > 0<br>3. sa_census_tract != ''<br><br>(varying syntax due to integer vs. character data fields) |
| Historical assessor data is sporadically incomplete, so it's probably best to pull square footage and use codes from the current assessor table, even though they could have changed or the property may no longer exist | • Historical assessor data is missing for several entire counties in 2011 and 2012<br>• In general, the historical tables are also less complete than the current assessor table<br>• When we match transactions to the next-year assessor tables, 1%–10% are missing, but when we match them to the current table, only < 1% are missing | 1. sales.sr_property_id = assessor.sa_property_id<br><br>for matching the square footage and use codes |
| Square footage and use codes have to be present in order to calculate final statistics | • After implementing the primary filters (arms-length, positive transfer value, property match in the assessor table), 3.5% of the Bay Area transactions have missing or zero square footage and < 1% are missing a use code<br>• We'll proactively remove these from the "clean" data tables | 1. sa_sqft IS NOT null<br>2. sa_sqft > 0<br>3. use_code_std != '' |

| **PART 3 – PROPERTIES OF INDIVIDUAL TRANSACTIONS** | | |
|---|---|---|
| **Issue** | **Analysis** | **Final criteria (SQL syntax)** |
| Dataquick's arms-length flag may not be accurate, because it includes transactions with a transfer value of 0 and excludes some with a transfer value > 0 | • Cross-tabulation of transfer value and arms-length flag:<br>**(A)** 38% - value > 0 and arms-length<br>**(B)** 48% - value = 0 and non-arms-length<br>**(C)** 12% - value > 0 and non-arms-length<br>**(D)** 2% - value = 0 and arms-length<br>• Group D in particular calls Dataquick's methodology into question, but examples from Group C look ok (sales to trusts and other things we should be filtering out)<br>• All in all, it seems best to remove transactions Dataquick classifies as non-arms-length rather than trying to catch all of them using other filters<br>• We have to remove transactions with missing or 0 transfer values anyway, in order to calculate meaningful price statistics | 1. sr_arms_length_flag = '1'<br>2. sr_val_transfer IS NOT null<br>3. sr_val_transfer > 0 |
| Only include resale and subdivision transaction types | • For transactions with value > 0:<br>89% = R (resale)<br>10% = S (subdivision)<br>0.5% = C (construction)<br>0.5% = T (timeshare)<br>none refinance, none missing | 1. sr_tran_type = 'R'<br>OR sr_tran_type = 'S' |
| Possibly should filter by transaction document type | • For transactions with value > 0:<br>46% = G (grant deed)<br>6% = U (trustees deed)<br>1% = Q (quitclaim)<br>negligible H, W, T<br>47% missing<br>• Too many missing values to use this field | 1. NONE |
| Only include transactions representing full sale amount | • For transactions with value > 0:<br>79% = F (full)<br>3% = P (partial, excluding liens etc.)<br>4% other (C, U)<br>14% missing (data dictionary indicates missing = assumed full)<br>• Overall, the data in this field doesn't seem reliable enough to use | 1. NONE |
| Remove trust transactions that Dataquick misclassified as arms-length | • Pulled a sample of matching records and the filter works as expected | 1. sr_buyer NOT ILIKE '% trust%'<br>2. sr_seller NOT ILIKE '% trust%'<br><br>(case-insensitive pattern matching where % matches any string of zero or more characters) |
| Remove public agency transactions because they're often not at market prices | • Filter works as expected, with > 90% of the matches being public agencies<br>• The false positives are entities with names like "First National Bank Daly City," but there doesn't seem be to any easy way to improve the pattern matching | 1. As above, with "county," "city," "agency," "redevelopment" |

| PART 4 – SETS OF RELATED TRANSACTIONS | | |
|---|---|---|
| **Issue** | **Analysis** | **Final criteria (SQL syntax)** |
| Sets of transactions involving the **same property id** on the same day often represent different parts of a single sale (refinance, multiple loans, trust transactions, one to many owners or vice versa, etc.) | • After applying all the prior filters, these duplicates represent about 1.0% of the remaining transactions (0.6% same price, 0.4% differing prices)<br>• The same-price duplicates are *mostly* transactions involving intermediaries, and the differing-price duplicates are *mostly* multi-part transactions, but the patterns aren't consistent enough for us to get reliable prices from these records | 1. After applying all the prior filters, group remaining transactions by sr_property_id and sr_date_transfer<br>2. Remove all these transactions |
| Sets of residential transactions on a single day with the **same document number but differing property id's** represent subdivision or condo building sales, which often have incorrect price or square footage data | • After applying all the prior filters, these duplicates represent about 1.2% of the remaining transactions<br>• (We have to group transactions by county here because document numbers can repeat across jurisdictions)<br>• Dataquick reps informed us that for residential condo and subdivision transactions involving multiple property id's, they record the total transaction price separately for each unit<br>• This looks correct based on the data, but it's hard to be certain | 1. After applying all the prior filters, group remaining residential transactions by mm_fips_muni_code, sr_doc_nbr_fmt, and sr_date_transfer<br>2. If the dollar amounts match, only keep one of the transactions, and calculate price per square foot as transaction price / total square footage<br>3. If the dollar amounts differ, calculate the price per square foot normally |
| **PART 5 – PRICE OUTLIERS** | | |
| **Issue** | **Analysis** | **Final criteria (SQL syntax)** |
| Identify and filter out significant outliers in price per square foot, because these are likely to be errors that would bias aggregate calculations | • We adjust prices to 2010 dollars using national headline CPI for the calendar year of the transaction[2]<br>• The residential price cutoffs work out to $1054 for Alameda, $794 for Contra Costa, $1788 for Marin, $1577 for Napa, $2014 for San Francisco, $1773 for San Mateo, $1354 for Santa Clara, $729 for Solano, and $1260 for Sonoma, in 2010 dollars | • After applying all prior filters, adjust the remaining prices for CPI inflation<br>• Remove the top 0.1% of transactions by price per square foot, separately for each county |

[2] http://www.bls.gov/data/inflation_calculator.htm

# Appendix I. Sources and Definitions of Affordable Housing Data for Section 2E.2

In Los Angeles, we define affordable rental units as units with median gross rent of less than 80% of the county median; data comes from the 2000 Decennial census and the 2009-13 five-year ACS. For the Bay Area, we define these units as those where low-income households are paying less than 30% of their income on rent. Condo conversions include apartment units that have been converted to condos between 2003 and 2013. Data for Los Angeles comes from the Los Angeles County Assessor's office. Data on Section 8 units is derived from the U.S. Department of Housing and Urban Development's (HUD) Picture of Subsidized Households for years 2000 and 2013. Section 8 data from 2000 was adjusted to 2010 boundaries using Brown University's Longitudinal Tract Data Base's (LTDB) crosswalk. For Los Angeles, the LIHTC data comes from the California Tax Credit Allocation Committee (CTCAC). In the Bay Area, this data is derived from the California Housing Partnership Corporation that verified HUD and state Housing and Community Development (HCD) data and includes some non-LIHTC federally and state subsidized housing units (e.g., project-based Section 8). The placed-in-service variable was used to identify units constructed up to 2000 and 2014. Ellis Act evictions data, which primarily includes tenants evicted due to the conversion of rental units to condos, comes from the Los Angeles Housing Department and is only available for the City of Los Angeles. All units are normalized as fraction of the housing stock (divided by total housing units). The change represents the proportion after minus the proportion before.

# Appendix J. Ground-Truthing Methodology for the SF Bay Area

Demographic and housing indicators associated with processes of residential displacement, and/or thought to influence susceptibility to such processes (Chapple 2009) were collected to each case study area. In addition to the secondary datasets, we used qualitative data that included archival research of newspaper articles, planning documents, and academic literature and interviews with community stakeholders based on questions regarding demographic, housing, and commercial change.

Blocks for the "groundtruthing" visual survey were selected by analyzing census Block data from 2000 and 2010 for demographic change, as well as data on sales, price increases, and new developments from 2010-2015 to determine property turnover and change. Eligible blocks were vetted with local stakeholders to narrow the candidates down to three to five that had experienced significant change over the past five to 10 years. The data gathered through this groundtruthing observation tool was subsequently compared to census figures and sales data from the county Assessor's Office to verify, at a high level, the stories the secondary data and stakeholder interviews are telling about change in these areas.

We next present the observation tool developed for this groundtruthing exercise followed by detailed descriptions of each case study groundtruthing neighborhood and the results from comparing field observations with secondary data and interviews.

# **WORKSHEET:** Visual Demonstration of Neighborhood Change

*Instructions: Physically walk predetermined neighborhood blocks and note evidence of deterioration or improvement using Section One. Parcel or building specific information should be collected in Section Two. Each block should named according to its main corridor (indicated on your map as the street with parcels on both sides). Bring a camera to take a photograph of each building.*

**One whole worksheet should be completed for each block section*

**Block Name:** _____ **Observer:** _____

**Physical Observation date and time :** ____/____/_____ **Start** ___:___ **AM/PM** **End** ___:___ **AM/PM**

## **SECTION ONE:** Block Overview and initial impressions

1. The primary land use for the block face is:
   - □ Residential
   - □ Commercial
   - □ Institutional (school, hospital, churches):
   - □ Industrial
   - □ Other: _____

2. Public investment + existing public infrastructure:
   - □ transit stops
   - □ municipal street lighting
   - □ on street residential permit parking
   - □ street furniture (including parklets)
   - □ bike racks
   - □ public trash cans
   - □ parking pay machines
   - □ newly paved streets
   - □ Other: _____

3. Describe any visible people, noting race or ethnicity, age, number, and activities they might be engaged in:_____

4. The # of signs discouraging disorder such as neighborhood watch, anti-littering/loitering/drug use/vandalism/graffiti: _____

5. Physical disorder such as garbage, litter, graffiti, or vandalism by degree of observations:

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| no disorder | very few signs of disorder | noticeable vandalism | mostly vandalized or littered | completely vandalized or littered |

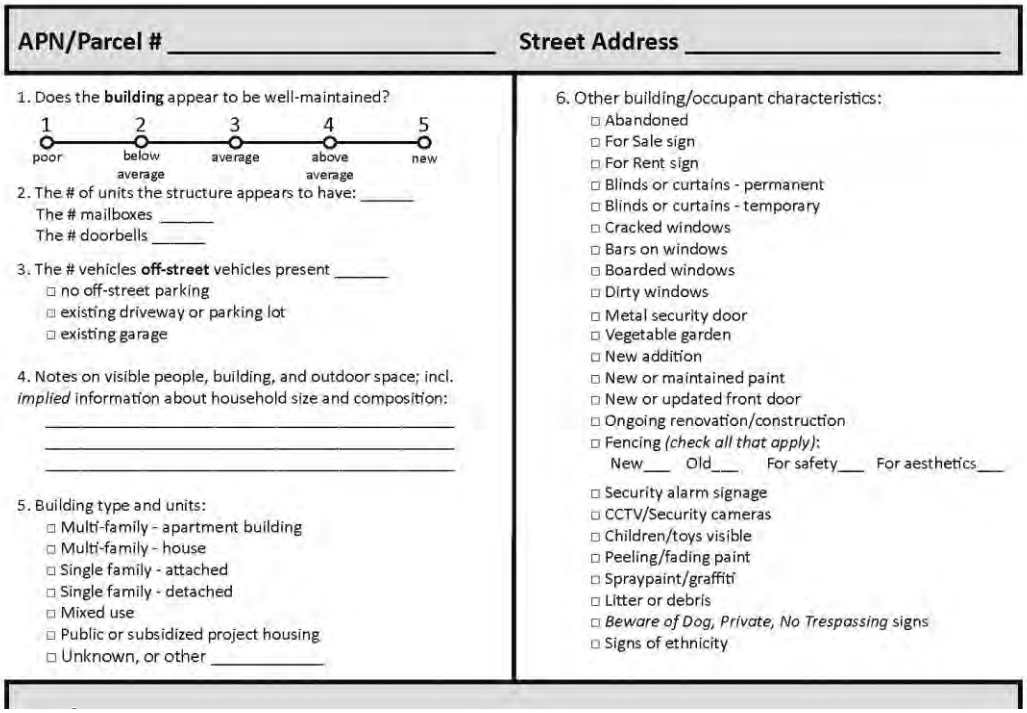
6. Please describe indicators of international or immigrant presence (note ethnicity, signs in a foreign language, or locally-owned foreign/ethnic business).

7. Additional notes on block overview: _____

## **SECTION TWO:** Block/Parcel Data

**located on the following pages*

*Using your pre-printed parcel map, carefully walk the block and record your observations for each building. Allow for ~1.5 hours of field time. Be sure to take a photograph of each building for comparison with past year data later.*



APN/Parcel # _____ Street Address _____

1. Does the **building** appear to be well-maintained?

1 poor — 2 below average — 3 average — 4 above average — 5 new

2. The # of units the structure appears to have: _____
   The # mailboxes _____
   The # doorbells _____

3. The # vehicles **off-street** vehicles present _____
   - □ no off-street parking
   - □ existing driveway or parking lot
   - □ existing garage

4. Notes on visible people, building, and outdoor space; incl. *implied* information about household size and composition:
   _____
   _____
   _____

5. Building type and units:
   - □ Multi-family - apartment building
   - □ Multi-family - house
   - □ Single family - attached
   - □ Single family - detached
   - □ Mixed use
   - □ Public or subsidized project housing
   - □ Unknown, or other _____

6. Other building/occupant characteristics:
   - □ Abandoned
   - □ For Sale sign
   - □ For Rent sign
   - □ Blinds or curtains - permanent
   - □ Blinds or curtains - temporary
   - □ Cracked windows
   - □ Bars on windows
   - □ Boarded windows
   - □ Dirty windows
   - □ Metal security door
   - □ Vegetable garden
   - □ New addition
   - □ New or maintained paint
   - □ New or updated front door
   - □ Ongoing renovation/construction
   - □ Fencing *(check all that apply)*:
     New___ Old___ For safety___ For aesthetics___
   - □ Security alarm signage
   - □ CCTV/Security cameras
   - □ Children/toys visible
   - □ Peeling/fading paint
   - □ Spraypaint/graffiti
   - □ Litter or debris
   - □ *Beware of Dog, Private, No Trespassing* signs
   - □ Signs of ethnicity

## East Palo Alto

East Palo Alto is a small city in San Mateo County located about halfway between San Jose and San Francisco. With a population of about 29,000, East Palo Alto is bordered by the affluent cities of Palo Alto and Menlo Park. A young city, it was incorporated in 1983.

From 1980-2010, the case study area[3] experienced several demographic changes:

- Population increased by 22%.
- Latinos increased from 14% to 63% of residents, while African-Americans decreased from 55% to 16% of residents.
- Housing cost burdens increased, from 25% of renters and 17% of owners being cost-burdened, to 51% and 49%, respectively.
- Overcrowding is a problem: 29% of housing units have more than one person per room.

### *East Palo Alto Ground-Truthing Results*

On November, 14, 2014, two researchers from the UC Berkeley surveyed three blocks in the area: 2018, 4002, and 4003. On January 10, 2015, one of the same researchers, along with three community members, surveyed blocks 2002 and 5010.

At the parcel level, land use and number of units were very well-matched between assessor data and visual observation. The datasets also aligned in terms of level of investment and stability. One

[3] Defined as census tracts 6118, 6119, 6120, and 6121, which cover the city in its entirety and encompass a small area outside it, as well.

thing not captured by secondary data but clear from visual inspection was a perceived lack of safety on most of the blocks.

There is not much variance among the blocks. Most have some sign of change—either high percent have sold, high percent have changed tenure, or property values appear to be rising—and also have signs of potential stability such as permanent curtains in the windows or children's toys in the yard in addition to some signs of safety concerns.

Tables J.1-J.6 summarize secondary and ground-truthing data for the blocks; this data is analyzed below in the block-by-block comparisons.

**Table J.1: Total Ground-Truthed Parcels for East Palo Alto**

| Block and Tract | # Parcels Ground-truthed |
|---|---|
| Block 2002, Tract 6119 | 38 |
| Block 2018, Tract 6120 | 23 |
| Block 4002, Tract 6121 | 8 |
| Block 4003, Tract 6121 | 9 |
| Block 5010, Tract 6121 | 21 |

**Table J.2: Sales History and Assessed Value of Residential Parcels for East Palo Alto**

| Block | Median Year of Construction | Median Year of Last Sale | Percent Sold 2010-2014 | Median Sale Price | Median Sale Price Per Square Foot | Assessed Value Per Square Foot (2013) |
|---|---|---|---|---|---|---|
| 2002 | 1954 | 2006 | 28% | 243,000 | $162.00 | $185.00 |
| 2018 | 1950 | 1999 | 33% | 155,000 | $179.00 | $176.00 |
| 4002 | 1949 | 2010 | 88% | 1,130,541 | $318.00 | $276.00 |
| 4003 | 1952 | 2010 | 82% | 777,041 | $375.00 | $241.00 |
| 5010 | 1961 | 2010 | 68% | 1,890,367 | $360.00 | $363.00 |
| San Mateo County | 1958 | 2001 | 16%[4] | $449,000 | $168 | $220 |

*Source: Dataquick, 2014. These figures refer to all parcels in the area, including non-residential uses.*

**Table J.3: Assessor Data for East Palo Alto**

| Block | # Matched Parcels (2004-2014) | Average Change in Improvement to Land Ratio (2004-2014) | % Change Owner Occupancy (Rent to Own or Own to Rent, 2004-2014) | Average Change in Sq. ft. (2004-2014) |
|---|---|---|---|---|
| Block 2002 | 39 | -11.7% | 17.9% | 1.8% |
| Block 2018 | 23 | 4.2% | 21.7% | -2.2% |
| Block 4002 | 8 | -30.3% | 0.0% | 1.7% |
| Block 4003 | 9 | -49.1% | 22.2% | 2.4% |
| Block 5010 | 21 | -36.7% | 9.5% | 2.4% |

*Source: Dataquick, 2014. These figures refer to all parcels in the area, including non-residential uses.*

[4] Percent Sold 2010-2013.

**Table J.4: Census Data 2000 – 2010, East Palo Alto**

| Block | Population Growth (% change) | Average Household Size (% change) | Percent Change in Percent White | Percent Change in Percent Black | Percent Change in Percent Hispanic | Percent Change in Percent Family Households | Percent Change in Percent Rental Units |
|---|---|---|---|---|---|---|---|
| East Palo Alto | 39.% | -8.5% | 1.8% | -9.0% | 7.6% | -0.3% | 8.6% |
| Block 2002 | 26.1% | 0% | 5% | -12% | 14% | -5% | -20% |

*Source: Census, 2000-2010. Note: the missing blocks did not have consistent borders.*

**Table J.5: Census 2010 Demographics, East Palo Alto**

| Block | Population | Average Household Size | Percent White | Percent Black | Percent Hispanic | Percent Family Households | Percent Rental Units |
|---|---|---|---|---|---|---|---|
| 2002 | 147 | 4.58 | 36% | 18% | 61% | 82% | 26% |
| 2018 | 142 | 4.73 | 19% | 6% | 82% | 90% | 67% |
| 4002 | 277 | 4.29 | 59% | 8% | 88% | 73% | 100% |
| 4003 | 273 | 3.07 | 49% | 5% | 85% | 62% | 100% |
| 5010 | 1434 | 2.92 | 36% | 12% | 68% | 55% | 100% |

*Source: Census, 2010.*

**Table J. 7: Summary of Parcel Matches and Primary Land Use, East Palo Alto**

| Block | Primary Land Use, based on Ground-truthing data | Percent Land Use Matched | Total Number of Units on Block | | Percent of Parcels whose Number of Units match between Assessor Data and Visual Observation |
|---|---|---|---|---|---|
| | | | *Assessor Data – Dataquick* | *Visual Observation Ground-truthing* | |
| 2002 | Single-family residential | 100% | 39 | 44 | 100% |
| 2018 | Single-family residential | 87% | 28 | 34 | 96% |
| 4002 & 4003 | Multi-family residential | 88% | 200 | 155 | 94% |
| 5010 | Multi-family residential | 90% | 457 | 517 | 95% |

*Note: Percent Land Use Matched and Percent Units Matched take as their denominator only those parcels for which a land use or number of units was indicated by both assessor data and ground-truth data.*

### *Comparison of East Palo Alto Data Analysis with Stakeholder Interviews*

Aall of the case study tracts in East Palo Alto were lower-income; two were not losing low-income households, while two were had characteristic that were associated with gentrification and displacement outcomes identified in sections 2D and 2E, leading us to classify them as being at risk of gentrification and displacement.

Stakeholder interviews paint a slightly different picture. Of the three tracts east of Highway 101 (6118, 6119, 6120), stakeholder feedback indicates a greater risk than the secondary data presents of gentrification and displacement. There is concern, even with East Palo Alto's strong renter protections, that the foreclosure crisis—which affected the many single-family owner-occupied

homes—and pressures in the surrounding areas could lead to gentrification or displacement in these areas. Plus, these renter protections are weakened in these areas since much of the housing is single-family homes, to which rent control does not apply.

In terms of the tract west of Highway 101 (6121), stakeholders described many issues that make them view this area as undergoing displacement, in contrast to what the secondary data may lead us to believe. This neighborhood is known as the Westside. Figure J.1 shows that the area contains the majority of the city's multi-family rental housing stock. Over half of the city's rent-controlled units are located on the Westside, the majority of which are owned by a single landlord, Equity Residential (EQR). In recent years, conflicts between tenant protections and landlord interests on the Westside have been the focus of major attention from the city, and led to significant instability for Westside residents. In 2008, Page Mill Properties, the former owner of the multi-family housing stock now owned by EQR, was involved in approximately 11 lawsuits with the city.

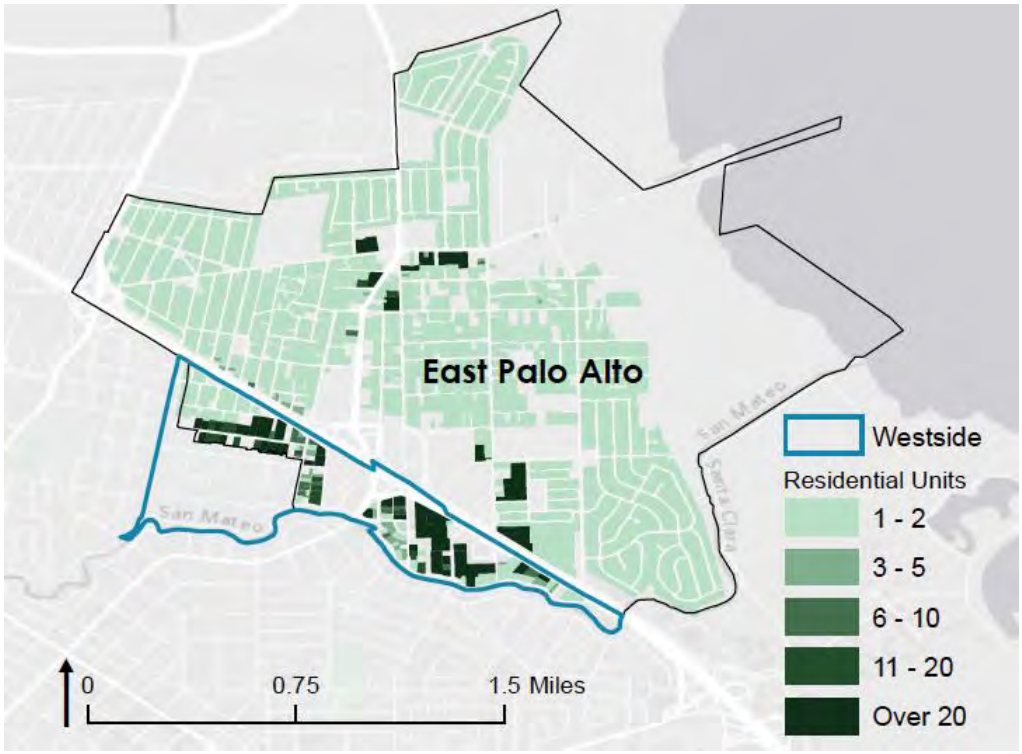



**Figure J.1: Densities in East Palo Alto: Note the Westside Outlined in Blue**

Just a year after Page Mill Properties began purchasing buildings in the Westside in 2006, tenants began complaining of harassment and steep rent hikes (Berstein-Wax 2010). In 2007 the company evicted 71 people. In 2008 another 99 people were evicted, an eviction rate 7.5 times greater than that of the rest of San Mateo County (Berstein-Wax 2009). When Page Mill defaulted on its loans and went into foreclosure in 2009, Wells Fargo took over the properties. The bank then sold the foreclosed portfolio to EQR, the largest publicly traded landlord in the United States, in December of 2011. After this acquisition, EQR now owns about half of the city's apartments, and two-thirds of its rent-controlled apartments and 15% of the total low-rent apartments in the County. The company issued 706 three-day eviction notices in the first six months of managing the apartments (LeVine 2014). Tenant organizers saw the excessive use of three-day notices as a form of harassment. It is

unclear however, how many of the eviction notices issued actually led to households leaving their apartments, and available sources of data are limited in this regard.

Direct evictions are also not the only pressure that residents of EQR apartments experience. The City of East Palo Alto was notified in 2013 that EQR was illegally painting curbs red in an effort to reduce parking around their buildings (Green 2013a). Advocates see this manipulation of parking supply, a precious commodity in East Palo Alto, as another form of harassment.

These issues in the Westside are not well-captured by secondary data. In this way, the ground-truthing exercise helps to illuminate other issues—either more recent than available data or just not captured in secondary data—that could be leading to displacement.

### *Conclusion*

East Palo Alto is distinctive for its government's commitment to ensuring the city remains affordable to low-income households, and for a strong legacy of community organizing that holds the city accountable to that commitment. While demographic data on its own shows few signs of gentrification and displacement, the experience of residents, activists, and city staff on the ground, show that housing pressure is very real here. The city is home to many low-income households already burdened by their housing costs, a vulnerability that is compounded for the large number of undocumented immigrants believe to have established households here. With much of the city's rental housing owned by a single landlord, there are few alternatives for tenants facing evictions.

## Marin City

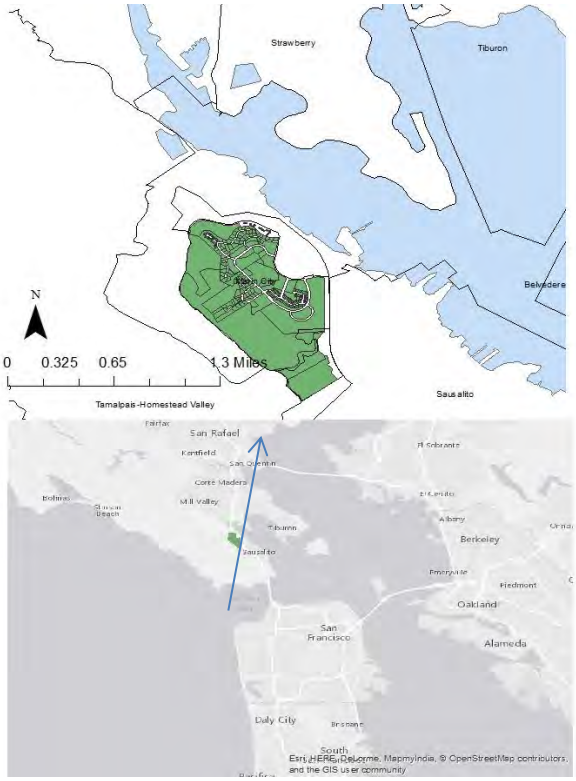



**Figure J.2: Marin City Case Study Area (Census Tract 1290) in Green, with Vicinity Map**

Marin City, located north of San Francisco in Marin County, is a small, historically African-American suburban community. It is a bounded by the affluent cities of Sausalito to the south and Mill Valley to the north, Highway 101 to the east and the hills of Marin County to the west (Figure J.2). The entire area is quite small—it is only 1.2 miles across. It hosts high-rise public housing, townhouses, single-family homes, and a shopping center, all with a suburban feel and views of the Bay. The area is also host to older homes occupied by a diverse population in the hills and a significant stock of subsidized housing—604 units. Nearly half of these are in a collection of high-rise buildings called Golden Gate Village, which feature great views out on to Richardson Bay, a small inlet of the San Francisco Bay.

Over the last 30 years, Marin City has experienced gradual change: population has grown, the proportion of African-Americans has decreased, and median income and educational attainment have increased. Yet even with these changes, other aspects of the community—like homeownership—have remained stable. While the area has been stable in its housing stock overall, it has experienced significant commercial displacement: for instance, a popular weekly flea market was discontinued in 1996 when a large shopping center was developed.

***Marin City Ground-Truthing Results***

On November 11, a researcher from UC Berkely performed the ground-truthing analysis in Marin City (see selected blocks, Figures J.3). The researcher walked the blocks there with a lifelong resident, and a former resident who directs a community organization.

The secondary data sets and ground-truthing data tell the same basic stories for each block. Parcels generally matched in terms of land uses and number of units, and the total number of units was fairly consistent across three data sources (Table J.7).

Finally, the quality and age of buildings were comparable between secondary sources and ground-truthing methods; however, safety perception and public investment cannot be ascertained from the secondary data sources; only from ground-truthing. Tables J.7-J.10 summarize the secondary and ground-truthing data that are used below in block-by-block comparisons.




**Figure J.3: Map of Marin City with Three Ground-Truthing Blocks in Green**

*Note: All of the blocks fall in Marin County Census Tract 1290.*

**Table J.7: Parcel Mismatch among Datasets for Marin City**

| Block | # assessor parcels matched to ground-truth parcels, of total assessor parcels | # ground-truth parcels matched to assessor parcels, of total ground-truth parcels |
|---|---|---|
| 1000 | 31 / 54 | 32 / 33 |
| 1004 | 38 / 50 | 38 / 49 |
| 1005 | 33 / 34 | 34 / 34 |

**Table J.8: Sales History and Assessed Value of Residential Parcels in Marin City**

| **Block** | **Median Year of Construction** | **Median Year of Last Sale** | **Percent Sold 2010-2013** | **Median Sale Price** | **Median Sale Price Per Square Foot** | **Assessed Value Per Square Foot (2013)** |
|---|---|---|---|---|---|---|
| 1000 | 1965 | 2005.5 | 30% | $396,000 | $286 | $219 |
| 1004 | 1997 | 2001.5 | 20% | $245,750 | $163 | $195 |
| 1005 | 1996 | 2000.5 | 26% | $229,000 | $154 | $197 |
| Marin City | 1979 | 2002.5 | 21% | $287,500 | $207 | $193 |
| Marin County | 1973 | 2003 | 22% | $552,000 | $307 | $258 |

*Source: Dataquick, 2014*

**Table J.9: Indicators of Marin City Neighborhood Change: Census Data/Demographics, 2000-2010**

| Block | Population Change (Percentage Change) | Average Household Size (Percentage Change) | Change in Percent White[5] | Change in Percent Hispanic | Change in Percent Black | Change in Percent Family Households | Change in Percent Rental Units |
|---|---|---|---|---|---|---|---|
| 1000 | -24% | 1% | 55% | 1085% | -33% | -11% | -5% |
| 1004 | 62.6% | 33% | 407% | 1715% | -71% | 21% | -15% |
| 1005 | -85.7% | -15% | 16% | -55% | -11% | 3% | -74% |
| Marin City | -6% | Not Available | -25% | 88% | 0% | 11% | 17% |
| Marin County | 2% | 1% | -7% | 40% | -7% | 1% | 3% |

*Note: Marin City is defined as Marin County Census Tract 1290. Source: US Decennial Census 2000, 2010*

**Table J.10 Summary of Parcel Matches and Primary Land Use in Marin City**

| Block | Primary Land Use, based on Ground-truthing data | Percent Land Use Matched | Total Number of Units on Block | | | Percent of Parcels whose Number of Units match between Assessor Data and Visual Observation |
|---|---|---|---|---|---|---|
| | | | Assessor Data – Dataquick | Visual Observation Ground-truthing | Census Data: Total Housing Units – 2010 | |
| 1000 | Single-family residential | 74% | 81 | 71 | 87 | 65% |
| 1004 | Single-family residential | 97% | 105 | 104 | 133 | 95% |
| 1005 | Single-family residential | 88% | 32 | 34 | 33 | 100% |

*Note: Percent Land Use Matched and Percent Units Matched take as their denominator only those parcels for which a land use or number of units was indicated by both assessor data and ground-truth data.*

### *Comparison of Marin City Data Analysis with Stakeholder Interviews*

Marin City is a low-income tract that is not losing low-income households, nor does it have many risk factors for gentrification or displacement. The area's ability to preserve its low-income population is likely related to the significant public housing stock in the city, host to nearly a third of the city's residents, plus several other subsidized housing projects that bring the total number of subsidized units to 604—over half of the rental stock *(Department of Housing and Urban Development, 2014a).*

[5] Note: For the blocks, this figure refers to all whites of one race, including those that are Hispanic. For the Marin City and Marin County figures, it refers to Non-Hispanic whites. The "Percent Change" figures all compare percentages over time; for example, in Marin City, the percent Non-Hispanic white in 2000 was 34%, which decreased to 25% in 2010—a -25% change.

However, stakeholder interviews paint a different picture of the neighborhood. Residents are very concerned that the public housing, situated on a hill with views of Richardson Bay, will be demolished in favor of private development, according to a long-time community organizer in the neighborhood. Other residents, interviewed on the street in front of their homes, commented that the population has been remarkably stable in the last 10-15 years.

### *Conclusion*

While there is some variation among the secondary datasets, ground-truthing, and stakeholder interviews, these data sources tell very similar stories about the neighborhood overall. Even where they diverge the most the two can be reconciled by saying that the neighborhood, though stable in recent years is vulnerable to displacement (captured in residents' concerns about losing public housing units).

## The Mission District

The Mission District is located in the southeastern region of San Francisco and is home to almost 52,000 of San Francisco's approximately 818,000 residents. Since the 1950s, the neighborhood has been San Francisco's Latino enclave. From 1980 to 2013, a period that has included two tech booms, the cost of living and of housing has risen dramatically in the Mission, which led to the displacement of long-time residents. During this time, the Mission District lost much of its industrial sector (Casique 2013).

Since 1980, the area has seen significant shifts in racial composition (a decrease in Latinos and increase in whites), proportion of family households (decreased), educational attainment (toward more highly educated people), median income (increasing), and rents (increasing)—all indicative of gentrification.

New residents were—and are still—attracted to the amenities provided by higher density, the cultural richness of the neighborhood, and transit access. Multiple bus lines as well as two BART stations (16th Street and 24th Street Mission Station) service the neighborhood for an easy commute to the financial district. The neighborhood is also close to the freeway and Caltrain, which provide accessibility to the greater region, including Silicon Valley.

### *Mission District Ground-Truthing Results*

On November 14, 2014, a researcher from UC Berkeley Center, a community organizer, and a consultant with deep knowledge of the area walked four blocks in the Mission District (Figure 2H.8). Tables J.11 and J.12 describe the blocks using census data: Blocks 3003 and 1004 stand out in terms of real estate transactions and sales prices, while Block 1007 has seen rapid gains in the white population, and all of the blocks have experienced declines in average block size.

Of the sample blocks' 193 parcels recorded in the assessor dataset, field researchers were able to match 73% of these parcels on the ground. Of parcels for which the land use was indicated in assessor data and verifiable through ground-truthing, 87% matched. The total number of units on the four blocks ranged from 319 according to assessor data, to 421 according to ground-truthing, to 431 according to the Census.

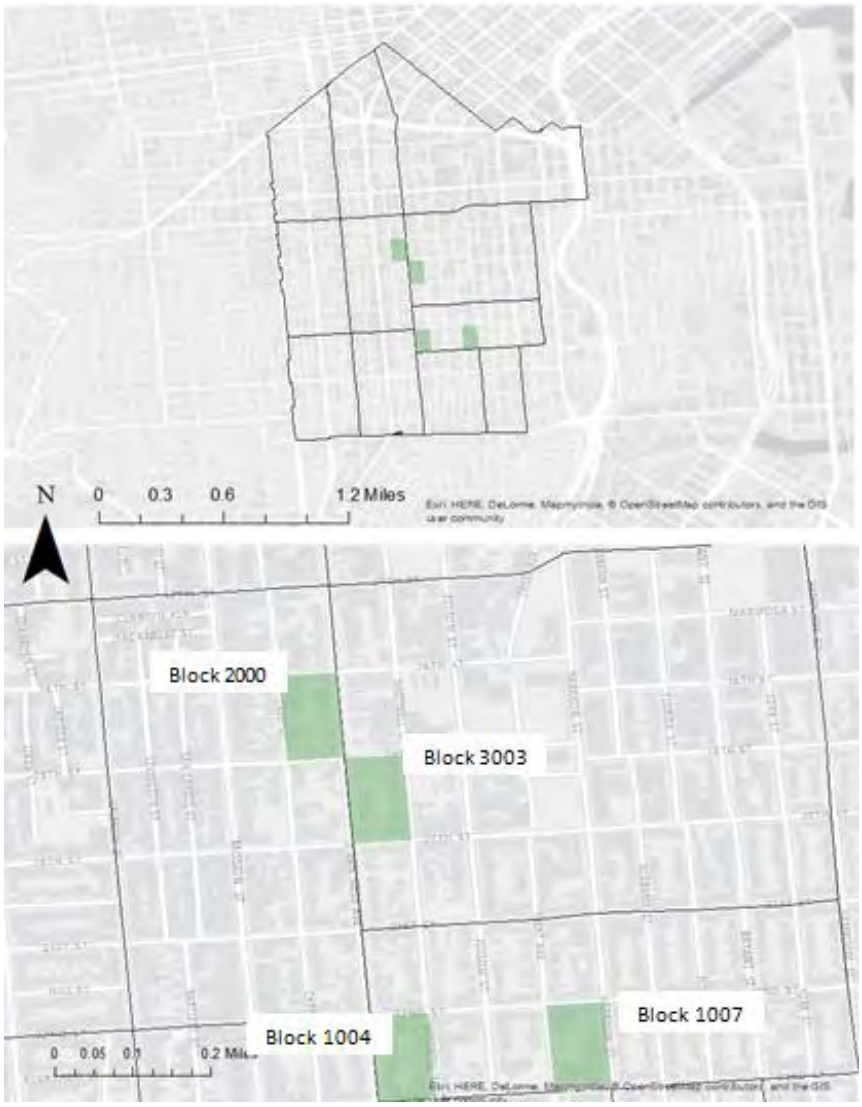



**Figure J.4: Map of Mission District, with census tracts,and Four Ground-Truthing Blocks in Green**

**Table J.11 Sales History and Assessed Value of Residential Parcels in the Mission District**

| Block | Median Year of Construction | Median Year of Last Sale | Percent Sold 2010-2014 | Median Sale Price | Median Sale Price Per Square Foot | Assessed Value Per Square Foot (2013) |
|---|---|---|---|---|---|---|
| 3003 | 1985 | 2005 | 29% | $578,500 | $491 | $465 |
| 2000 | 1903 | 1999 | 19% | $697,500 | $256 | $205 |
| 1007 | 1933 | 2004 | 23% | $925,000 | $216 | $161 |
| 1004[6] | 1904.5 | 2007.5 | 42% | $785,000 | $366 | $221 |
| Mission | 1912 | 2004 | 20% | $585,000 | $314 | $235 |
| SF | 1932 | 2003 | 21% | $520,000 | $337 | $277 |

*Source: Dataquick, 2014. These figures refer to all parcels in the area, including non-residential uses.*

[6] Assessed value would likely be higher if the assessor data included new condominium buildings on the block.

**Table J.12 Indicators of Neighborhood Change: Census Data/Demographics in the Mission District *(Percentage Change From 2000–2010)***

| Block | Population | White Population | Asian Population | Hispanic Population | Average Household Size | Family Households |
|---|---|---|---|---|---|---|
| 3003 | -5% | 14% | -22% | -11% | -13% | -12% |
| 2000 | -7% | -9% | -12% | -25% | -19% | -12% |
| 1007 | 81% | 111% | 1 to 8 residents | -28% | -46% | 7% |
| 1004 | -11% | 19% | 21% | -30% | -15% | -26% |
| Mission | -5% | 16% | 7% | -21% | Not available | 40% |
| SF | 4% | -2% | 12% | 11% | -2% | 4% |

*Source: Decennial Census 2000 and 2010, accessed through NHGIS.*

For each block, the total number of units based on three different datasets vary widely, as do the listed number of units for each parcel. Land uses, on the other hand, match fairly well on each block. These results suggest that some error may exist in either the census or assessor's reported count of housing units and unit type, likely due to rapid or un-permitted changes to parcels. However, even with these discrepancies, the ground-truthing exercise confirmed the overall story of this neighborhood as one that has experienced and is still undergoing major gentrification and displacement.

Broadly, the secondary datasets and ground-truthing data paint similar pictures of change on these four blocks. Where the assessor data is ambiguous or reveals a mix of forces, as with Block 1004, so does the ground-truthing data. On one block (3003), the data sets align in terms of the broad story, but the ground-truthing takes the narrative deeper and reveals significant public investment and continued concerns about safety.

Block 1007 provides a cautionary example. On this block, the assessor dataset was missing a large number of parcels, most of them in two new condominium buildings. Without ground-truthing the block, we would have missed the major impact these buildings have on the feel of the street, and their implications for gentrification in the area. The block is a good example of a place in transition: running through its center is a relic of the area's former industrial character, in the form of a warehouse and some older, poorly-maintained buildings; yet, at the same time, there are several better-maintained homes, two new high-priced condominium buildings, and a new, well-used and well-maintained park.

In terms of comparing datasets, unmatched parcels were a concern for three of four blocks; the number of units recorded per parcel usually did not match (Table J.13). This could be related to the high incidence of condominiums, and the rapid change in the area. On the other hand, when it came to land uses, there were consistent matches between ground-truthing and assessor data.

**Table J.13: Parcel Mismatch among Datasets in the Mission District**

| Block and Census Tract | # assessor parcels matched to ground-truth parcels, of total assessor parcels | # ground-truth parcels matched to assessor parcels, of total ground-truth parcels |
|---|---|---|
| Block 3003, Tract 228.01 | 65 / 81 | 66 / 70 |
| Block 2000, Tract 208 | 26 / 55 | 28 / 31 |
| Block 1007, Tract 228.03 | 12 / 16 | 12 / 87 |
| Block 1004, Tract 228.03 | 37 / 41 | 39 / 39 |

Most of the mismatch is not significant enough to skew results; however, three areas of discrepancy are significant. On Block 3003, 15 of the parcels in the assessor data did not appear in the ground-truthing geographic dataset. On Block 2000, 29 of the 55 parcels in the assessor data did not appear in the geographic data set. Finally, on Block 1007, almost all of the parcels from the geographic dataset did not appear in the assessor data. This is primarily the result of the Dataquick data missing over 40 parcels for one building (3000 23rd St.). Although it has many parcels, Dataquick lists it as having only one, with the use listed as an apartment building. Likewise for another building (2652 Harrison St.), while it has 20 parcels/units (condominiums, in this case), according to the geographic ground-truthing data, Dataquick lists it as a single parcel. This is almost definitely a glitch in the data or possibly a condo-conversion process that happened after 2013.

For two variables—land use and number of units—comparisons are made on a parcel-by-parcel basis; only parcels that appear in both datasets are used for this comparison (Table J.14).

**Table J.14: Summary of Parcel Matches and Primary Land Use in the Mission District**

| Block | Primary Land Use, based on Observations | Percent Land Use Matched between observation & Assessor | Total Number of Units on Block | | | Percent of Parcels whose Number of Units match between Assessor Data and Visual Observation* |
|---|---|---|---|---|---|---|
| | | | Assessor Data – Dataquick | Visual Observation Ground-truthing | Census Data: Total Housing Units-2010 | |
| 3003 | Residential: 50% condo, 21% multi-family | 87% | 81 | 134 | 121 | 44% |
| 2000 | Residential: 42% multi-family, rest condo and single-family | 96% | 100 | 85 | 121 | 38% |
| 1007 | Residential: condo, multi-family | 71% (denominator is 7) | 32 | 96 | 78 | 38% (denominator is 12) |
| 1004 | Residential: 45% multi-family, 38% condo | 86% | 106 | 106 | 111 | 32% |

**Note: Percent Land Use Matched and Percent Units Matched take as their denominator only those parcels for which a land use or number of units was indicated by both assessor data and ground-truth data.*

The uses on the blocks vary: former industrial sites share the block with new condominium developments; unmaintained townhouses sit next to recently-renovated townhouses with expensive improvements; expensive cafes and grocery stores have opened next to long-time, low-cost diners.

All four blocks are mostly residential, with a mix of single-family homes, multi-family rental buildings, and condominium buildings, which are usually newer. There are a few non-residential uses on each block, including some light industry, stores, offices, and one church. Most structures are older, though there are some very new buildings. The neighborhood is diverse in terms of socioeconomic status (judging by the range of businesses) and race (judging by the signs in Spanish posted in a laundromat and observations of pedestrians).

### *Conclusion*

Stakeholder interviews, secondary data sources, and visual observations of the Mission are all aligned in telling the same story of a neighborhood experiencing ongoing change of gentrification that began nearly two decades ago. Advocates in the community discussed the historical and ongoing influx of new residents and displacement of low-income people, as well as extensive community organizing and resistance in the face of such changes. Where the datasets diverge is in the number of units in each parcel and on each block (though land uses match well between visual observation and assessor data); even this divergence is consistent with what we know about the Mission: it has experienced rapid change that secondary data has not picked up yet.

# Appendix K. Los Angeles Ground-Truthing Neighborhoods

Table K.1 provides a profile of the three case study areas, and how they compare with the TOD and County averages.

**Table K.1: Profiles of Case Study Areas in Los Angeles Ground-Truthing**

| | Chinatown | Hollywood/Western | 103rd/Watts Towers | All TOD average | County average |
|---|---|---|---|---|---|
| Income (2013) | 34,088 | 45,600 | 40,376 | 51,471 | 81,416 |
| Change in income 90-2013 | -14% | -10% | 13% | 9% | -5% |
| Change in income 00-2013 | -13% | -1% | -9% | 7% | -6% |
| Change in income 90-00 | -1% | -9% | 24% | 2% | 1% |
| Largest race/ethnic group | Asian | White | Hispanic | Hispanic | Hispanic |
| Not Hispanic White (NHW) | 9% | 48% | 1% | 15% | 28% |
| % point change in NHW | 1% | -1% | 0% | -3% | -13% |
| # HH | 2,700 | 9,937 | 2,894 | 4,329 | N/A |
| % HH with Child | 29% | 19% | 56% | 30% | 37% |
| % Renter | 93% | 94% | 63% | 81% | 53% |
| % Moderately Burdened (30%-50%) | 26% | 22% | 25% | 27% | 26% |
| % Severely Burdened (50%+) | 27% | 37% | 42% | 31% | 30% |
| Ellis Act Evictions 2007-2014 | 4 | 6 | 0 | 11 | |
| Condo Conversions | 0 | 11 | 0 | 44 | |
| Jobs/Housing Balance | 3.45 | 0.78 | 0.53 | 3.76 | |
| # Businesses | 1,101 | 1,338 | 266 | 1,536 | |
| # Churches | 18 | 19 | 28 | 20 | |
| # HS Nonprofits | 13 | 13 | 11 | 13 | |
| Yearly Station Traffic Volume (All Boardings and Alightings) | 1,119,344 | 3,327,704 | 1,178,918 | 2,723,794 | |
| SNAP | Yes | Yes | Draft | | |

*Source: Tabulated by authors from the 1990 and 2000 Decennial Censuses and the 2009-2013 American Community Survey; NCCS database on non-profits; Longitudinal Employment-Household Dynamics (LEHD) datasets; and data on ridership from Metro.*

### *Chinatown (Gold Line)*

The Chinatown Metro rail station is an elevated light-rail stop located at North Spring Street and College Street in the Chinatown neighborhood of downtown Los Angeles. The station opened in 2003 as an eastern extension of the Gold Line, connecting Pasadena, Downtown Los Angeles, and East Los Angeles. The Chinatown neighborhood is the result of the construction of the nearby Union Station in the 1930s, which forced residents to migrate north from what was originally considered Old Chinatown to the current location of New Chinatown. Confined in an ethnic enclave by legislation and racial backlash, many Chinese merchants developed family-owned, self-sustaining

"mom and pap" stores to survive within their community. Today, many small businesses and local merchant shops in Los Angeles Chinatown continue to thrive catering to the shopping needs of local residents but also as tourist destinations for many visitors.

Although Chinatown today is characterized as a multiethnic neighborhood, it is still majority Asian. Other ethnic groups whose members live there include Latinos, blacks, and whites. Nearly all the households (93%) are renters, with about 53% experiencing rent burden. The median household income in 2013 was a little more than $34,000.

Our model identifies this area as having a high potential for gentrification. In addition, community groups believe that the area is at "high risk" of gentrification as they see the neighborhood experiencing a wider transformation, including the loss of traditional businesses[7], and the offering of new housing options, public services, and activities that are inconsistent with the historical identity of this neighborhood. While the area is changing, it is not clear if the TOD is driving the changes. So far, there are few formal venues for CBOs to directly influence TOD planning and efforts in Chinatown.

***Hollywood Blvd./Western Blvd. (Red Line)***

The Hollywood Blvd./Western Blvd. Metro rail station is a heavy-rail subway station located in East Hollywood situated below grade. It opened in 1999. It is the only heavy-rail line in the case study areas and the one with the highest ridership. Hollywood/Western has one ground level entrance/exit with two subterranean levels. The station does not offer parking. The Hollywood/Western neighborhood is one of the most densely populated areas in the city and is located in the central region of Los Angeles. Beginning in the 1960s, many immigrants from around the world —East Asia, Latin America, the former Soviet Union, and the Middle East—settled there and formed communities. Each community continues to leave its mark on this neighborhood. Whites still make the largest racial group in the study neighborhood. East Hollywood was affected by the 1992 Los Angeles Riots and also sustained significant damage in the 1994 Northridge earthquake.[8].

Ninety-four percent of the residents here are renters in multi-family buildings. A high percentage of renters (about 59%) are burdened by the cost of housing, with renters spending at least 30% of their income on rent. The median household income in 2013 was $45,600, about 55% of the county's average.

The area is also known for the Barnsdall Art Park and Los Angeles Community College, and is considered one of Los Angeles' largest hospital districts. Model results indicate that this area has a high potential for gentrification. The Hollywood/Western TOD is also part of the Vermont/Western Transit Oriented District Specific Plan (SNAP), implemented two years after the station opened. The SNAP offers a formal mechanism for community engagement and a means for CBOs to influence development.

***103rd St./Watts Tower (Blue Line)***

[7] The 2013 State of Los Angeles Chinatown report provides insight into job concerns and is available at http://www.aasc.ucla.edu/research/pdfs/statect.pdf. Numerous news articles also document changes in the area; for instance, see: http://www.ladowntownnews.com/news/with-jia-chinatown-gets-a-million-apartment-complex/article_9fc95a96-a0d4-11e3-b308-0019bb2963f4.html

[8] East Hollywood Neighborhood Council. (2015). The history of East Hollywood. Retrieved May 3, 2015, from http://www.easthollywood.net/history.

The 103rd St./Watts Tower Metro rail station is a light-rail station located at grade level at the intersection of 103rd St and Grandee Ave. in Watts in South Los Angeles. The station opened in 1990 and is the oldest of the case studies. The Watts area is a largely-residential commuter district, about 13 miles south of the downtown central business district and away from other large employment areas. Annexed by the City of Los Angeles in 1926, the area gained an African-American majority in the 1940s as a result of the Great Migration. The neighborhood suffered through the Watts uprisings in 1965, and a wave of gang-related violence arose in the following decade that lasted until the early 2000s, but has since subsided (Empower LA 2015). Presently, the area has a Latino majority (74%), with African-Americans retaining a significant minority at 25%.

Though the area has the lowest percentage of renters relative to the other case studies (at about 63%), it also has the greatest share of burdened renters (at 67%). The median income was $40,376 in 2013, less than half of the county average (at $81,416). Additionally, 103rd St./Watts has a low job-to-housing balance at only 0.53 jobs per resident employees. This means that residents in Watts commute outside of Watts to work, and that the area is more residential than commercial.

For years a disinvested and poor African-American neighborhood, Watts has experienced significant demographic transition in the last decades and is now predominately Latino. The gentrification model shows this area as undergoing little change. There has been an ongoing desire to promote local economic development by the public and private sector in the wider South Los Angeles area.[9]

[9] The 2014 Watts Community Studio report provides insight into priorities of residents and public officials. See http://wattscommunitystudio.files.wordpress.com/2014/01/wcs-final-report.pdf. Talks of private investment include the opening of local eateries, among other activities. For instance, see: http://la.eater.com/2015/1/20/7861851/roy-choi-locol-opening-watts-south-la-twitter

# Appendix L. Detailed Ground-Truthing Methodology for Los Angeles

## Street and Census Blocks

Census blocks were selected by their proximity to the rail station regardless of land use or transaction activity. The boundaries for most census blocks coincided with street block segments. The groundtruthing exercise involved walking through the case study neighborhoods and documenting visual observations on each block. Researchers photographed each block and parcel of interest to supplement the findings.

Block-level evaluations aimed to capture indicators of gentrification on the street blocks surrounding the Metro rail stations. Surveyors assessed each block for:
Observable land use (e.g., single-family residential, commercial retail, institutional)
Visible public infrastructure (e.g., pedestrian lighting, bus shelters, bike infrastructure)
Characteristics of individuals and the observed level of diversity present on the block (e.g., age, race, gender)

- Physical disorder (e.g., graffiti, litter, neighborhood watch signs)
- Indicators of ethnic commercial presence (e.g., signs, goods, businesses)
- Signs of commercial gentrification (e.g., upscale coffee shops, yoga studios and other upscale recreational facilities, recent renovations)
- Signs of residential gentrification (e.g., new construction, recent renovations, upscale landscaping)

Indicators of commercial gentrification surveyed included specialty, high-end, or boutique stores and restaurants. Signs of residential gentrification included new construction, conspicuous or recent renovation of buildings (such as new paint, doors, windows, or patios), upscale landscaping or xeriscaping, and the presence of luxury or "green" vehicles parked in the driveway or on the street. The team selected these indicators after consulting with the UCLA research team and UC Berkeley research team that completed prior groundtruthing at San Francisco Bay Area transit stations.

## Parcels

We identified parcels located on blocks with high rates of property activity compared to the nearby blocks. Using County Assessor data from DataQuick, we mapped parcels with new construction, renovation, or sales to single-family homes, multifamily buildings, and commercial properties between 2008 and 2013. We then identified the average number of parcels per block that experienced transactions during the five-year period. Any block within a half-mile radius of the station that exhibited a higher-than-average rate of property activity was included in the sample. For example, if the average number of parcels experiencing change in a station area was 15%, then any block in which more than 15% of parcels experienced change and which are fully within the half-mile boundary were included in the groundtruthing sample. Within each selected block, we visited parcels which met the described criteria to perform parcel-level inventory of building characteristics. This visual analysis included descriptions of:

- Building type (e.g., single-family, multi-family, strip mall)

- Building signs and markings (e.g., for sale, for rent, eviction notices)
- Occupancy status (e.g., occupied, not occupied, unable to judge)
- Building characteristics (e.g., newly constructed, older building and renovated, older building and not renovated)
- Overall building appearance (e.g. below average, average, above average)
- Physical appearance relative to its surroundings (e.g., roughly consistent, out of place and higher-end, out of place and lower-end)
- Physical signs of residential/commercial gentrification (e.g., new construction, recent renovations, upscale landscaping)

The instrument also accounted for signs of commercial gentrification, which include new construction, notable renovation, upscale landscaping, and upscale store frontage. Photographs supplemented these written observations. The instruments are included in Appendix II. The following survey documents are found in the appendices:

- Groundtruthing instruction sheet
- Block groundtruthing form
- Residential parcel groundtruthing form
- Commercial parcel groundtruthing form
- UCLA consent letter

## Challenges

The research team experienced a number of challenges, including surveyor subjectivity, inconsistent numbers of cases between study areas, and sampling limitations. While in the field, it was difficult to consistently evaluate whether or not a building or parcel condition could be objectively considered as average, slightly below average, or slightly above average. Furthermore, working with a team of researchers increases the chance of discrepancy. To overcome this challenge, we beta-tested the instrument and at least two researchers groundtruthed each neighborhood to ensure consistency and to identify inconsistencies. In designing the survey, the research team expected observations of residents to be useful in observing changes to the neighborhood; however, the researchers observed very few residents, particularly in residential neighborhoods. For this reason, this study is complemented by Census data and surveys of transit and business users.

In conducting parcel-level analysis, researchers visited parcels that had been sold or substantially rehabilitated in the past five years, as determined by sales records, permits, and visual observations during fieldwork. The number of property sales varied dramatically between case study neighborhoods. In areas with relatively few transactions the research team selected any parcel that met the parcel selection criteria. Nonetheless, at least fifteen parcels are included for each station area, providing a sufficient sample to evaluate trends.

## Estimated Units

Another challenge is that the Assessor's parcel data has incomplete information on the number of units in a given parcel. We complemented the Assessor information by using the land-use code to estimate the number of units. A single family residence was counted as one unit. We then identified condo units and constructed the number units for these using the second character of the property use code. We followed a similar process for multi-family units as we did for condos. We also estimated the number of estimate the number of units for parcels with use code 05 (five or more units) by dividing the building's square foot by 900 (900 is the average square feet per unit in LA). We compared the estimated numbers to those reported by DataQuick, which also has missing information on unit counts. The results are similar. See Figure L.1 below.

As the number of housing units in a TOD area increase, so does the discrepancy between census housing units and parcel estimates. One reason may be temporal, that is inconsistencies in year for the various datasets. We also use an average size of a unit across all areas to estimate the number of units for a given parcel; however, certain neighborhoods may have homes with significantly greater or smaller area footprint.

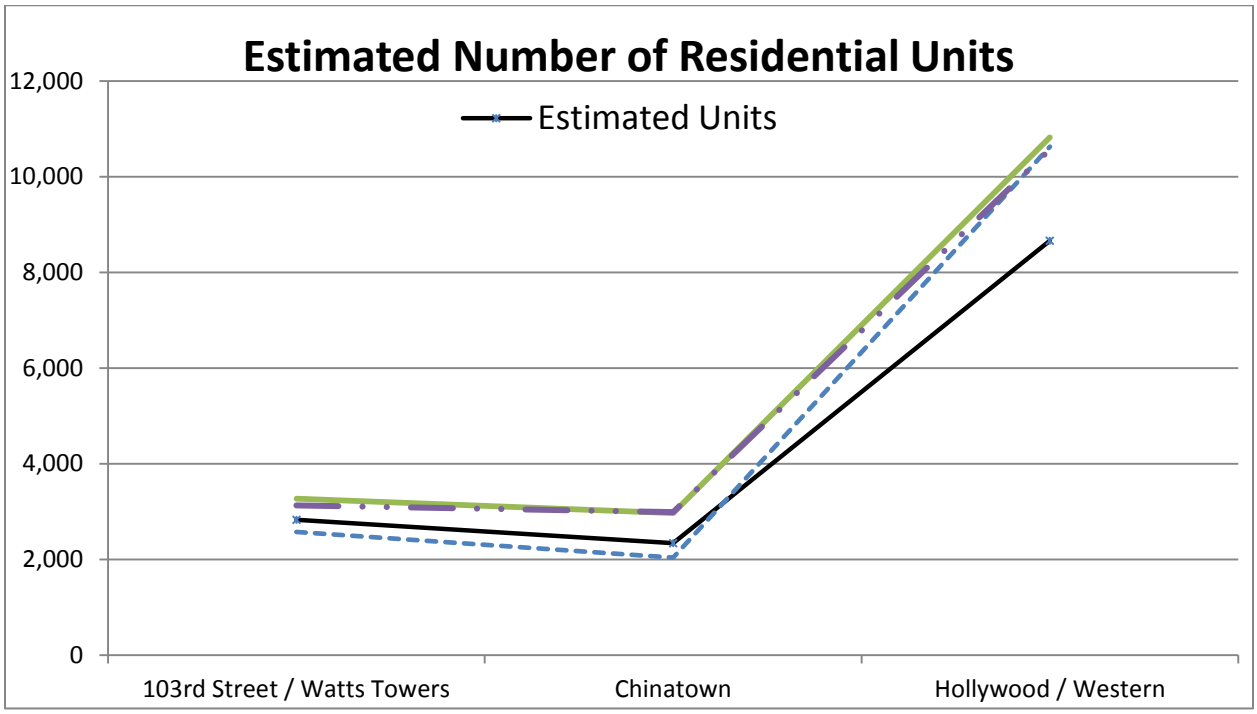



**Figure L.1: Comparison of Estimated Units with Different Data Sources**

# Appendix M. Survey Instruments in Los Angeles

## Groundtruthing Instruction Sheet

**UCLA TOD Project***

**Visual Observations of Neighborhood Change and Gentrification**

**MATERIALS:**
Camera
Smartphone with a compass
UCLA informational letter
Clipboard and pen(s)
Name badge with UCLA logo
Parcel map with directions on where to survey

**DRESS CODE:** Please dress appropriately for conducting fieldwork as you are representing UCLA.

UCLA gear (no headgear including beanies, hats, visors, etc.) is optional
No shorts or short skirts
No offensive graphics or words
Comfortable shoes for long periods of walking and standing

**INTRODUCTION**: The purpose of this "groundtruthing" instrument is to gauge whether there are visual signs of neighborhood change that indicate gentrification. Some of the observations are subjective; therefore, it is important to go through training prior to conducting fieldwork.

Provide the following information to any person who asks about your observation activity:

"I am a graduate student in UCLA's Urban Planning program. I am conducting a visual inventory of this neighborhood as a part of a project to study changes and development around transit stations. The information will be used to inform public agencies, community groups and other interested parties about these changes with the goal of enhancing neighborhood quality and ensuring that all stakeholders benefit."

Please note that there are **three distinct forms** to note your observations (street segments, and residential parcels and commercial parcels).

**INSTRUCTIONS**:

Physically walk predetermined neighborhood blocks and note evidence of gentrification and improvement relative to other uses using **Section One**. Parcel or building specific information should be collected in **Section Two**. Each block should be named according to its main corridor (indicated on your map as the street with parcels on both sides).

Bring a **camera** (could use your smart phone camera if it produces decent images). **Code each block** and each parcel on the map with its own unique number, and include these numbers on the worksheets that you fill out. **Using compass** on smartphone, stand perpendicular to street segment and note the direction of the street (north, south, east or west).

One whole worksheet should be completed for each block section

Allow for ~1.5 hours of field time.

**SECTION ONE: STREET SEGMENT OBSERVATIONS**
The purpose of the street segment observations is to assess the characteristics and appearances of street segments. If possible, take photographs relevant to gentrification (e.g., images of older and more established buildings, businesses, and residents; images of newer buildings, businesses, and residents); list addresses for possible later comparison with historical images from Google Street View.

**SECTION TWO: PARCEL OBSERVATIONS**
The purpose of the parcel observations is to assess the characteristics and appearances of parcels. Using your pre-printed parcel map, carefully walk the block and record your observations for each assigned parcel and building. Use the appropriate from (residential and commercial). Be sure to take a photograph of the assigned buildings.

* Developed by Paul Ong with Silvia Jimenez, Anastasia Loukaitou-Sideris, Karolina Gorska and students from the 2015 Urban Planning Comprehensive Project for the study *"Developing a New Methodology for Analyzing Potential Displacement."*

# Block Groundtruthing Form

Block Name/Number: _____ Direction:_____ Parcel Number: _____Location: _____

Observer:_____ Physical Observation Date:_____Start Time ____:____ AM/PM End Time ____:____ AM/PM

## SECTION ONE: STREET SEGMENT OBSERVATIONS

**1. Rough proportion of block face is (10% increments):**

□ Single Family Residential ___%
□ Multifamily Residential ___%
□ Retail ___%
□ Commercial (Office Building) ___# ___%
□ Institutional (school, hospital, religious): ___# ___%
□ Industrial ___%
□ Mixed use ___%
□ Vacancies:_____ ___%
Other: _____

**2. Existing public infrastructure:**

□ Bus stop shelter
□ Pedestrian street lights
□ On-street residential permit parking
□ Street furniture (e.g. benches, parklets)
□ Bike infrastructure (racks, lanes, etc)
□ Public trash cans
□ Parking meters
□ Newly paved streets and sidewalks, traffic calming
□ Other: _____

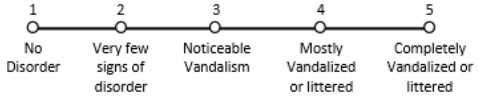
**3. Describe any visible people**

□ How busy_____
□ Dominant activity _____
□ Dominant ethnicity_____
□ Dominant age group_____
□ Dominant gender _____
□ Dominant life style _____
□ Other: _____

**4. Extent of visual social diversity (low, medium, high)**

□ Race/ethnicity_____
□ Socioeconomic class _____
□ Age _____
□ Gender _____
□ Social grouping (family, couples, friends, alone)
_____
□ Other: _____

**5. Physical disorder such as garbage, litter, graffiti, or** vandalism by degree of observations (circle 1-5):




**6. Signage discouraging/controlling disorder**

□ Neighborhood watch
□ Anti-littering/graffiti
□ Anti-loitering/drug use/vandalism
□ Anti-trespassing
□ Other:_____

Prevalence: □ Rare □ Few □ Noticeable

**7. Describe indicators of ethnic commercial presence:**

□ Non-English language signs
□ Signs of ethnic business
□ Signs of ethnic goods
□ Signs of ethnic institutions (school, hospital, churches):
□ Other: _____

Prevalence: □ Rare □ Few □ Noticeable

**8. Signs of commercial gentrification (trendy, high-end or upscale, boutique)**

□ Specialty coffee shops, bars, restaurants
□ Boutique stores
□ Yoga studios and similar recreational facilities
□ High-end grocery stores (e.g., Whole Foods, TJ)
□ Artsy spaces:
□ Other:_____

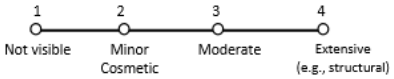
Prevalence: □ Rare □ Few □ Noticeable

**9. Diversity of commercial activities**

□ Predominantly older, well-established stores
□ Small majority of older, well-established stores
□ about an equal number of older and newer stores
□ Small majority of newer stores catering to gentrifiers
□ Predominantly newer stores catering to gentrifiers
Comments: _____

**10. Physical signs of residential gentrification**

□ New construction
□ Recent renovation to unit(s)

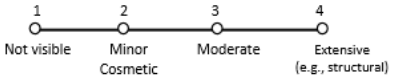



□ Upscale landscaping (e.g., fencing)
□ Upscale /luxury and "green" vehicles
□ Other: _____

Prevalence: □ Rare □ Few □ Noticeable

**11. Physical signs of commercial gentrification**

□ New construction
□ Recent renovation to unit(s)




□ Upscale/trendy landscaping (e.g., patio furniture, plant type)
□ Upscale/trendy store front
□ Upscale/trendy signage, ads, displays
□ Other:_____

Prevalence: □ Rare □ Few □ Noticeable

**12. Describe public art and aesthetics:**_____
_____

**14. Additional notes on block overview** (e.g., small dogs, dog waster bags): _____
_____

# Residential Parcel Groundtruthing Form

Observer:_____ Physical Observation Date: _____ Start Time ____:____ AM/PM Station:_____

**SECTION TWO: RESIDENTIAL PARCEL OBSERVATIONS**

APN/Parcel #_____Street Address_____

1. Building type and units:
   - ☐ Single family ☐ 2-4 multifamily
   - ☐ Non-residential ☐ 5 or more multifamily
   - ☐ Unable to judge: _____
2. Occupancy status
   - ☐ Occupied
   - ☐ Partially occupied: _____
   - ☐ Not occupied:
     Signs of abandoned: ☐ Yes ☐ No
   - ☐ Unable to judge: _____
3. Building signs and markings
   - ☐ For sale signs:_____
   - ☐ For rent signs:_____
   - ☐ Eviction notices:_____
   - ☐ Other (explain): _____
4. Building characteristics
   - ☐ Newly constructed
   - ☐ Older building:
     - ☐ Renovated ☐ Not renovated
     - ☐ Ongoing renovation
5. Overall building appearance

   1 poor — 2 below average — 3 average — 4 above average — 5 new
6. Physical Signs of Residential Gentrification
   - ☐ New construction
   - ☐ Recent renovation to unit(s)

     1 Not visible — 2 Minor Cosmetic — 3 Moderate — 4 Extensive (e.g., structural)
   - ☐ Upscale/trendy landscaping (e.g., fencing, plant types)
   - ☐ Upscale/luxury and "green" vehicles
   - ☐ Other: _____

   Prevalence: ☐ Rare ☐ Few ☐ Noticeable
7. Building appearance relative to surroundings
   - ☐ Roughly consistent
   - ☐ Out of place, higher-end
   - ☐ Out of place, lower-end
   - ☐ Unable to judge:_____
8. Notes on building and outdoor space:_____
   _____
   _____
9. Photo number(s) or range:_____
   _____

APN/Parcel #_____Street Address_____

1. Building type and units:
   - ☐ Single family ☐ 2-4 multifamily
   - ☐ Non-residential ☐ 5 or more multifamily
   - ☐ Unable to judge: _____
2. Occupancy status
   - ☐ Occupied
   - ☐ Partially occupied: _____
   - ☐ Not occupied:
     Signs of abandoned: ☐ Yes ☐ No
   - ☐ Unable to judge: _____
3. Building signs and markings
   - ☐ For sale signs:_____
   - ☐ For rent signs:_____
   - ☐ Eviction notices:_____
   - ☐ Other (explain): _____
4. Building characteristics
   - ☐ Newly constructed
   - ☐ Older building:
     - ☐ Renovated ☐ Not renovated
     - ☐ Ongoing renovation
5. Overall building appearance

   1 poor — 2 below average — 3 average — 4 above average — 5 new
6. Physical Signs of Residential Gentrification
   - ☐ New construction
   - ☐ Recent renovation to unit(s)

     1 Not visible — 2 Minor Cosmetic — 3 Moderate — 4 Extensive (e.g., structural)
   - ☐ Upscale/ trendy landscaping (e.g., fencing, plant type)
   - ☐ Upscale/luxury and "green" vehicles
   - ☐ Other:_____

   Prevalence: ☐ Rare ☐ Few ☐ Noticeable
7. Building appearance relative to surroundings
   - ☐ Roughly consistent
   - ☐ Out of place, higher-end
   - ☐ Out of place, lower-end
   - ☐ Unable to judge:_____
8. Notes on building and outdoor space:_____
   _____
   _____
9. Photo number(s) or range:_____
   _____

# Commercial Parcel Groundtruthing Form

Observer:_____ Physical Observation Date: _____ Start Time ____:____ AM/PM Station:_____

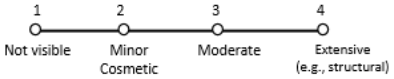
**SECTION TWO: COMMERCIAL PARCEL OBSERVATIONS**

APN/Parcel #_____Street Address_____

1. Building type and units:
   - ☐ Multi-story ___# stories
   - ☐ Stand-alone
   - ☐ Strip mall
   - ☐ Unable to judge: _____
2. Building Use (e.g., office, retail, minimart):_____
   _____
3. Occupancy status
   - ☐ Occupied
   - ☐ Partially occupied: _____
   - ☐ Not occupied:
     Signs of abandoned: ☐ Yes ☐ No
   - ☐ Unable to judge: _____
4. Building signs and markings
   - ☐ Property "For sale" signs:_____
   - ☐ Property "For rent" signs:_____
   - ☐ Eviction notices:_____
   - ☐ Upscale/trendy signage, ads, displays
   - ☐ Other (explain): _____
5. Building characteristics
   - ☐ Newly constructed
   - ☐ Older building:
     - ☐ Renovated ☐ Not renovated
     - ☐ Ongoing renovation
6. Overall building appearance




7. Physical Signs of Commercial Gentrification
   - ☐ New construction
   - ☐ Recent renovation to unit(s)




   - ☐ Upscale/trendy landscaping (e.g., patio furniture, plant types)
   - ☐ Upscale/trendy store front
   - ☐ Other:_____

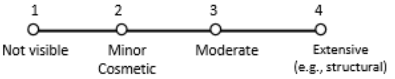
   Prevalence: ☐ Rare ☐ Few ☐ Noticeable
8. Building appearance relative to surroundings
   - ☐ Roughly consistent
   - ☐ Out of place, higher-end
   - ☐ Out of place, lower-end
   - ☐ Unable to judge:_____
9. Notes on building and outdoor space:_____
   _____
10. Photo number(s) or range:_____

APN/Parcel #_____Street Address_____

1. Building type and units:
   - ☐ Multi-story ___# stories
   - ☐ Stand-alone
   - ☐ Strip mall
   - ☐ Unable to judge: _____
2. Building Use (e.g., office, retail, minimart):_____
   _____
3. Occupancy status
   - ☐ Occupied
   - ☐ Partially occupied: _____
   - ☐ Not occupied:
     Signs of abandoned: ☐ Yes ☐ No
   - ☐ Unable to judge: _____
4. Building signs and markings
   - ☐ Property "For sale" signs:_____
   - ☐ Property "For rent" signs:_____
   - ☐ Eviction notices:_____
   - ☐ Upscale/trendy signage, ads, displays
   - ☐ Other (explain): _____
5. Building characteristics
   - ☐ Newly constructed
   - ☐ Older building:
     - ☐ Renovated ☐ Not renovated
     - ☐ Ongoing renovation
6. Overall building appearance




7. Physical Signs of Commercial Gentrification
   - ☐ New construction
   - ☐ Recent renovation to unit(s)




   - ☐ Upscale/trendy landscaping (e.g., patio furniture, plant types)
   - ☐ Upscale/trendy store front
   - ☐ Other:_____

   Prevalence: ☐ Rare ☐ Few ☐ Noticeable
8. Building appearance relative to surroundings
   - ☐ Roughly consistent
   - ☐ Out of place, higher-end
   - ☐ Out of place, lower-end
   - ☐ Unable to judge:_____
9. Notes on building and outdoor space:_____
   _____
10. Photo number(s) or range:_____

# UCLA Consent Letter

UNIVERSITY OF CALIFORNIA, LOS ANGELES

UCLA

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO

SANTA BARBARA • SANTA CRUZ

CENTER FOR THE STUDY OF INEQUALITY
LUSKIN SCHOOL OF PUBLIC AFFAIRS
6368 PUBLIC AFFAIRS BUILDING
BOX 951656
LOS ANGELES, CALIFORNIA 90095-1656

15 March 2015

To Whom It May Concern,

Students at the UCLA Center for the Study of Inequality are conducting a visual inventory of this neighborhood as part of their Urban Planning Master's Program comprehensive research project. This project examines changes and developments around transit stations in the Los Angeles area. The information will be used to inform public agencies, community groups and other interested parties about these changes and developments. The goal of the study is to enhance neighborhood quality and ensure that all stakeholders benefit from transit development.

If you have questions about the credentials of the student, please contact the UCLA Department of Urban Planning at the Luskin School of Public Affairs at: 3250 Public Affairs Building, Box 951656, Los Angeles, CA 90095. Or alternatively, questions can be answered over the phone at (310) 825-4025.

If you have questions about the project, please contact me at 818-270-0497.

Thank you.

Sincerely yours,



Silvia Jiménez
Assistant Director,
Center for the Study of Inequality

Department of Urban Planning
Luskin School of Public Affairs
University of California Los Angeles
3250 Public Affairs Building
Box 951656
Los Angeles, CA 90095-1656
Phone: (310) 825-4025

**Table M.1: Block Segment Observations for Case Study Areas**

| | Chinatown | Hollywood/ Western | 103rd Street / Watts Towers |
|---|---|---|---|
| **Total Block Segments** | 21 | 20 | 31 |
| **Land Uses** | | | |
| Single Family | 1% | 4% | 40% |
| Multifamily | 6% | 51% | 31% |
| Retail | 30% | 12% | 8% |
| Commercial | 4% | 2% | 1% |
| Institutional | 13% | 2% | 13% |
| Industrial | 3% | 0% | 0% |
| Mixed-Use | 21% | 9% | 0% |
| Vacant | 21% | 12% | 6% |
| Other (e.g., park) | 0% | 9% | 0% |
| Total | 100% | 101% | 100% |
| **Public infrastructure** | | | |
| Bus Stop Shelter | 5% | 5% | 16% |
| Ped. Street Lights | 48% | 20% | 23% |
| Residential permit parking | 10% | 0% | 0% |
| Street Furniture | 43% | 10% | 16% |
| Bike Infra | 5% | 25% | 19% |
| Public Trash Cans | 43% | 15% | 10% |
| Parking Meters | 38% | 50% | 0% |
| Street Improvements | 14% | 15% | 42% |
| **Visible People** | | | |
| Busy | 0% | 10% | 6% |
| Moderately busy | 38% | 35% | 16% |
| Not busy | 62% | 50% | 61% |
| Ethnicity | Asian, Latino, White | White, Latino, Black, Asian | Black, Latino |
| **Physical Disorder** | | | |
| Overall Rating | 2.28 | 2.05 | 2.25 |
| Neighborhood watch | 0% | 5% | 6% |
| Anti-littering/graffiti | 0% | 5% | 16% |
| Anti-loitering/drug use | 0% | 10% | 3% |
| Anti-trespassing | 10% | 30% | 39% |
| Other Signage | 19% | 30% | 42% |
| Other Notes | | | |
| **Ethnic Commercial Presence** | | | |
| Non-English signs | 67% | 25% | 10% |
| Ethnic businesses | 52% | 25% | 10% |
| Ethnic goods | 48% | 15% | 0% |
| Ethnic Institutions | 14% | 5% | 0% |

| | Chinatown | Hollywood/ Western | 103rd Street / Watts Towers |
|---|---|---|---|
| **Commercial Gentrification** | | | |
| Specialty food shops | 5% | 5% | 0% |
| Boutique stores | 0% | 0% | 0% |
| Yoga studios | 0% | 5% | 0% |
| High end grocery stores | 0% | 0% | 0% |
| Artsy spaces | 0% | 0% | 0% |
| Other Notes | N/A | | |
| Diversity of Commercial Activity | 1.4 | 2.4 | 1.7 |
| **Physical Signs of Commercial Gentrification** | | | |
| New Construction | 5% | 15% | 6% |
| Recent Renovation to Units | 81% | 15% | 6% |
| Scale 1-4 | 1.3 | 2.3 | 1.8 |
| Upscale Landscaping | 5% | 5% | 32% |
| Upscale/Green Vehicles | 10% | 0% | 13% |
| **Physical Signs of Residential Gentrification** | | | |
| New Construction | 5% | 20% | 9% |
| Recent Renovation to Units | 57% | 40% | 84% |
| Scale 1-4 | 1.3 | 2.5 | 1.8 |
| Upscale Landscaping | 5% | 50% | 43% |
| Upscale/Green Vehicles | 10% | 35% | 17% |
| **Public Art/Aesthetics** | Chinese themed decor, plazas and pedestrian street (blocked off to cars) | Poster billboards, mural on warehouse, Armenian genocide mural | Nice mural on corner or Wilmington& 103rd, public murals, trees |

**Table M.2: Commercial Parcels Observations for Case Study Areas**

| | Chinatown | Hollywood/ Western | 103rd Street / Watts Towers |
|---|---|---|---|
| **Commercial Parcels** | 7 | 2 | 3 |
| **Building Density** | | | |
| Multistory Buildings | 42.86% | 100.00% | 0.00% |
| Number of Stories | 2 | N/A | N/A |
| Standalone Building | 14.29% | 0.00% | 100.00% |
| Strip mall | 0.00% | 0.00% | 0.00% |
| Unable to Judge | 14.29% | 0.00% | 0.00% |
| **Building Use** | N/A | N/A | N/A |
| **Occupancy Status** | | | |
| Occupied | 85.71% | 100.00% | 33.33% |
| Partially Occupied | 0.00% | 0.00% | 0.00% |
| Not Occupied | 14.29% | 0.00% | 33.33% |
| Unable to Judge | 0.00% | 0.00% | 33.33% |
| **Signage Presence** | | | |
| For sale signs | 0.00% | 0.00% | 0.00% |
| For rent signs | 0.00% | 0.00% | 0.00% |
| Eviction Notices | 0.00% | 0.00% | 0.00% |
| Upscale signage | 0.00% | 50.00% | 0.00% |
| Other | N/A | N/A | N/A |
| **Building Improvements** | | | |
| Newly Constructed | 28.57% | 100.00% | 0.00% |
| Older Building | 0.714285714 | 0.00% | 100.00% |
| Renovated | 0 | 0.00% | 0.00% |
| Not Renovated | 0.714285714 | 0.00% | 100.00% |
| Ongoing Renovations | N/A | N/A | N/A |
| **Exterior Appearance** | | | |
| Overall Appearance | 3.17 | 3.26 | 2.00 |
| Recent Renovations (1-4) | 7 | 2 | 1 |
| Upscale Landscaping | 0.00% | 100.00% | 0% |
| Upscale Vehicles | 0.00% | 50.00% | 0% |
| **Appearance in Neighborhood Context** | | | |
| Out of place, higher | 14.29% | 100.00% | 0.00% |
| Out of place, lower | 0.00% | 0.00% | 33.33% |
| Roughly the same | 71.43% | 0.00% | 66.67% |
| Unable to Judge | 14.29% | 0.00% | 0.00% |

**Table M.3: Residential Parcels Observations for Case Study Areas**

| | Chinatown | Hollywood/ Western | 103rd Street / Watts Towers |
|---|---|---|---|
| **Residential Parcels** | 17 | 23 | 46 |
| **Land Use** | | | |
| Single Family | 47% | 9% | 72% |
| 2-4 MF | 29% | 0% | 28% |
| 5+ MF | 24% | 87% | 0% |
| Vacant Lot | 0% | 4% | 0% |
| | 100% | 100% | 100% |
| **Occupancy Status** | | | |
| Occupied | 94% | 87% | 96% |
| Partially Occupied | 0% | 9% | 2% |
| Not Occupied | 0% | 4% | 2% |
| Unable to Judge | 6% | 0% | 0% |
| | 100% | 100% | 100% |
| **Signage Presence** | | | |
| For sale | 0% | 0% | 2% |
| For rent | 0% | 4% | 7% |
| Eviction Notices | 0% | 0% | 0% |
| Newly constructed | 0% | 0% | 0% |
| Other Signs | 0% | 0% | 0% |
| **Building Improvements** | | | |
| Newly Constructed | 65% | 9% | 24% |
| Older Building | 35% | 87% | 76% |
| Renovated | 24% | 57% | 30% |
| Not Renovated | 12% | 26% | 46% |
| Ongoing Renovations | 0% | 4% | 0% |
| | 100% | 100% | 100% |
| **Exterior Appearance** | | | |
| Overall Appearance | 3.647058824 | 3.260869565 | 3.413043478 |
| Recent Renovations (1-4) | 1.235294118 | 1.913043478 | 1.5 |
| Upscale Landscaping | 24% | 43% | 11% |
| Upscale Vehicles | 0% | 4% | 0% |
| **Appearance in Neighborhood Context** | | | |
| Out of place, higher | 6% | 26% | 22% |
| Out of place, lower | 0% | 9% | 4% |
| Roughly the same | 88% | 61% | 74% |
| Unable to Judge | 0% | 0% | 0% |

# Appendix N. Interview Protocol for Los Angeles

The following section outlines the key questions used for this study, an outline to the interview approach, and information about the interviewed organizations and agencies. The research team also identified best practices for collaboration between CBOs and government agencies to minimize negative externalities. Results are presented as part of the 2015 UCLA Master's in Urban and Regional Planning Comprehensive Project.[10]

Our intended interviewee for each CBO was the executive director or a CBO employee with specific experience or insight in the TOD process. The interviewees had to have worked for the CBO for a significant length of time or participated in multiple organizing campaigns. Table N.1 includes more information about the organizations that were interviewed.

Public agencies were the second group of organizations selected for this research study. For the purposes of our study, we limited the selection to public agencies that are involved in local or regional land use and transportation planning in Los Angeles. Additionally, the public agencies must have worked on projects related to TOD, from development planning to construction of the actual transit infrastructure. We excluded the Los Angeles Department of Transportation (LADOT) because our secondary research found that it has not been active in TOD, despite providing other transit services for much of the study area. Table N.2 identifies the 4 public agencies that were identified for interviews specifically in the study areas. Since these agencies are large organizations that have various missions across the LA region, we selected interviewees from multiple departments to collect insight from different perspectives.

**Table N.1: Interviewed CBOs**

| Organization | Area Served | Year Est. | Approx. Annual Expenditures |
|---|---|---|---|
| Strategic Action for a Just Economy (SAJE) | South Los Angeles | 1996 | $900,000 (2013) |
| Southeast Asian Community Alliance (SEACA) | Chinatown/Lincoln Heights | 2002 | N/A |
| Chinatown Community for Equitable Development (CCED) | Chinatown | 2012 | N/A |
| Thai Community Dev. Center | Thai Town / East Hollywood | 1994 | $635,000 (2012) |
| Watts Community Studio | Watts / South Los Angeles | 2011 | N/A |
| Trust for Public Land | Greater Los Angeles Area/ National | 1972 | $141 Million (2013) |
| LA Voice | Greater Los Angeles Area | 2000 | N/A |

[10] The 2015 Comprehensive Project, "Oriented for Whom? The Impacts of TOD on Six Los Angeles Neighborhoods," is available online at: http://luskin.ucla.edu/content/comprehensive-project

**Table N.2: Public Agency Interviews**

| Agency | Division Interviewed | No. of Interviewees | Area Served |
|---|---|---|---|
| Los Angeles County Metropolitan Transit Authority (LA Metro) | Joint Development Program | 1 | County of Los Angeles |
| City of Los Angeles | Department of planning | 5 | City of Los Angeles |
| City of Los Angeles | City Council District 13 | 1 | City of Los Angeles |
| City of Los Angeles | Neighborhood Councils | 2 | City of Los Angeles |

***Strategic Actions for a Just Economy (SAJE)***

SAJE is a community organizing and advocacy organization working on behalf of the current residents of South LA, particularly in the Figueroa Corridor. SAJE provides legal support to distressed renters, helps establish land trusts, and works to find positive solutions to conflicts between institutions and low-income city residents. SAJE works in partnership with other organizations to ensure that the fate of city neighborhoods is decided by those who live there, and accomplishes this in ways that are replicable and sustainable (Strategic Actions For a Just Economy 2015).

***South East Asian Community Alliance (SEACA)***

Launched in 2002, SEACA was founded on the principle of inclusion, and from the beginning, has been guided by a belief that individuals can improve and build power in their own communities. The organization was started due to a lack of resources targeting the needs of Southeast Asians. SEACA began as a youth leadership program and over the years have expanded programs to include youth organizing, creative arts and self-expression, and most recently, health and community building through food and gardening (SEACA 2015).

***Thai Community Development Center (Thai CDC)***

Thai CDC was established to begin addressing the health and human service needs of the Thai population living in Los Angeles. Thai CDC offers a broad range of services, including health and human services, legal services, senior services, and youth services. Since its establishment in 1994, Thai CDC has addressed the multifaceted needs of Thai immigrants in the Southern California region, who, at an estimated population of 100,000 are considered the largest number of Thais living abroad (Thai CDC, 2015).

***Watts Community Studio***

The Watts Community Studio is a research project supported by the City of Los Angeles' Council District 15 Office of Joe Buscaino. The project goal is to inform local planning and economic development policy by surveying the business owners and residents of Watts in order to find out what problems most concern the community and determine how the Council District can support positive change. In addition to surveys, WCS also aims to increase collaboration and organization between small businesses, community-based organizations and faith-based organizations by conducting focus groups (WCS 2015).

***Chinatown Community for Equitable Development (CCED)***

Chinatown Community for Equitable Development (CCED) is a multiethnic coalition that was founded in May 2012 (Nguyen 2014). CCED was founded to advocate for Chinatown's small businesses whose tenure and survival was threatened by the development of the Chinatown Wal-Mart. The organization's larger goals include preserving the cultural integrity and character of the neighborhood and advocating for the rights of long term residents to live and work in the area. While Chinatown has changed due to light rail expansion and the increased development interest it prompted, residents can be assured that CCED will provide them a voice in the development process.

***Trust for Public Land***

Trust for Public Land works to create greenspace in cities across the nation. The organization's Los Angeles office recently worked with the City and Watts community residents to transform an abandoned lot near the Metro Blue Line into community serving park space (Trust for Public Land, personal communication April 6, 2015). Development interest spurred by TOD can provide increased community amenities like greenspace in urban neighborhoods. The Trust for Public Land's efforts show that community driven advocacy can create these improvements in underinvested neighborhoods that need them most.

***LA Voice***

LA Voice was founded in the year 2000 and organizes to increase leadership capacity in Los Angeles working class communities (LA Voice). The organization is involved in a number of issues including housing and workers rights in rapidly changing Los Angeles neighborhoods (LA Voice, personal communication, April 10, 2015). The organization has also conducted community visioning exercises around Metro owned properties near the Metro Red Line. The organization's advocacy work has amplified the voices of low income residents so development and neighborhood improvements benefit all residents.

*Key Interview Questions*
<u>How has Transit Oriented Development (TOD) impacted the study areas?</u>

We asked questions about how TOD had impacted the study areas in question. Before proceeding to other interview questions, it was important to understand what changes due to TOD that the interviewees identified. This line of question provides an opportunity to better understand community experience through the eyes of those who live and work in the area. Assessing the perceived impacts on each study area enabled the team to compare the effects of TOD across geographic areas.
<u>How effective have local communities been in controlling the outcomes of TOD?</u>

The next set of questions pertains to how CBOs and agencies have influenced the outcomes of TOD in a geographic area. Our interview team was looking for both concrete examples of successful and unsuccessful campaigns or strategies to influence the results of TOD, as well as general issues that had arisen in specific areas that were experiencing TOD growth. In the end, the responses to this line of questioning form the basis for a set of recommendations to address ongoing concerns in the TOD process.
<u>What is the relationship between CBOs and governmental agencies in the TOD process?</u>

A key focus of study for the project is the amount of community input in the development of Metro's rail system. Ideally, there would be a high level of collaboration and coordination between the governmental agencies overseeing the construction of transit lines (and the subsequent urban growth patterns) and the local communities that experience these impacts. The research team was interested in understanding the degree of coordination (if any) between government agencies charged with the development of transit and the communities that they are ostensibly there to serve.

What more can be done to allow station area residents and community groups to influence the TOD process from conception, design, and realization?

Finally, our team was interested in what were the internal and external factors, such as staff availability or professional relationships that limited the effectiveness of CBOs and governmental agencies in impacting the TOD process. Governmental agencies are primarily responsible for the design and implementation of a transit system; CBOs can work through the public process or informal channels to minimize undesirable outcomes in the development.

# Appendix O. Detailed Assessments for LA Ground-Truthing Case Studies

***Chinatown Detailed Assessment***

For the Chinatown case study, we surveyed 21 street block segments along the streets of Hill, Broadway, Spring, Alameda, Alpine, College, Llewellyn, Gin Ling, Mei Ling, and Sun Mun within the quarter-mile buffer from the station, and Grand and Cesar Chavez within the half-mile buffer (See Figure O.1). Additionally, we sampled 19 residential parcels and seven commercial parcels. Parcels observed included parcels on Stadium, Coronel, Bernard, Hill, Broadway, Yale, and Alpine (See Figure O.2). As mentioned above, our observed parcels had a 95% match with the assessor data in residential land use.

Our observations captured relatively little commercial change and only very early signs of residential gentrification. Most of the blocks surveyed were predominantly commercial, many (about 30%) with retail or mixed-use (about 21%). There was no new commercial construction visible in the surveyed blocks. About 80% of the commercial blocks had recent renovations; however, most of the renovations were minor. Only two blocks had signs of upscale landscaping, while we noticed "green" or upscale vehicles only in one block. We only observed one commercial "For Lease" sign. Similarly, in the seven commercial parcels surveyed, the buildings appeared as "average" while five parcels did not show any renovation, although two had newly constructed properties.

Chinatown, additionally, had the highest concentration of ethnic commercial presence of all the case study areas. About 50% of the blocks had indicators showing ethnic business and goods, and over 65% of commercial blocks (or 14 blocks) had non-English signs. Chinatown's commercial presence was comprised of primarily older, established businesses with very few indications of commercial gentrification (no new boutique stores, yoga studios, high-end grocery stores, artsy spaces, or the like). Over 70% of the commercial parcels surveyed appeared roughly the same in appearance to the surrounding neighborhood context, and none had upscale signage that looked out of place (e.g., appeals to a certain lifestyle or type of shopper). However, the area had the highest presence of specialty food shops of the case study areas, possibly targeting visitors and tourists.

Our observations differ from those of representatives from CBOs, who expressed concerns that a growing number of new neighborhood businesses are not catering to the needs of long-term Chinatown residents, such as culturally appropriate retail that meets the needs of the elderly, affordable food and retail, and in some cases, jobs. Representatives from CBOs indicated that new development and incoming retailers like Starbucks and Walmart are instead catering to new residents or more affluent commuters (Southeast Asian Community Alliance, SEACA, personal communication, February 4, 2015).

According to CBO representatives interviewed, business turnover and displacement has also led some long-term residents to leave their homes because they no longer feel a cultural and economic connection to Chinatown (SEACA, personal communication, February 4, 2015). With the increase in new development, the businesses that provide goods, services, and even jobs are getting displaced (SEACA, personal communication, February 4, 2015).

Our observations did capture some signs of residential gentrification, which coincided with CBO concerns and the findings of our gentrification model. We observed one block with new residential construction, one block that had properties with upscale landscaping, and two blocks that had upscale or green vehicles parked on the street (See Table AI.2 in Appendix I). About 57% of the surveyed blocks had residential renovations, which were mostly minor. These low numbers and percentages, however, are due to the fact that most blocks surveyed were commercial rather than residential – with the residential blocks surveyed being mostly along Grand and Cesar Chavez – since residential land uses were uncommon in the areas immediately adjacent to the Metro rail station.

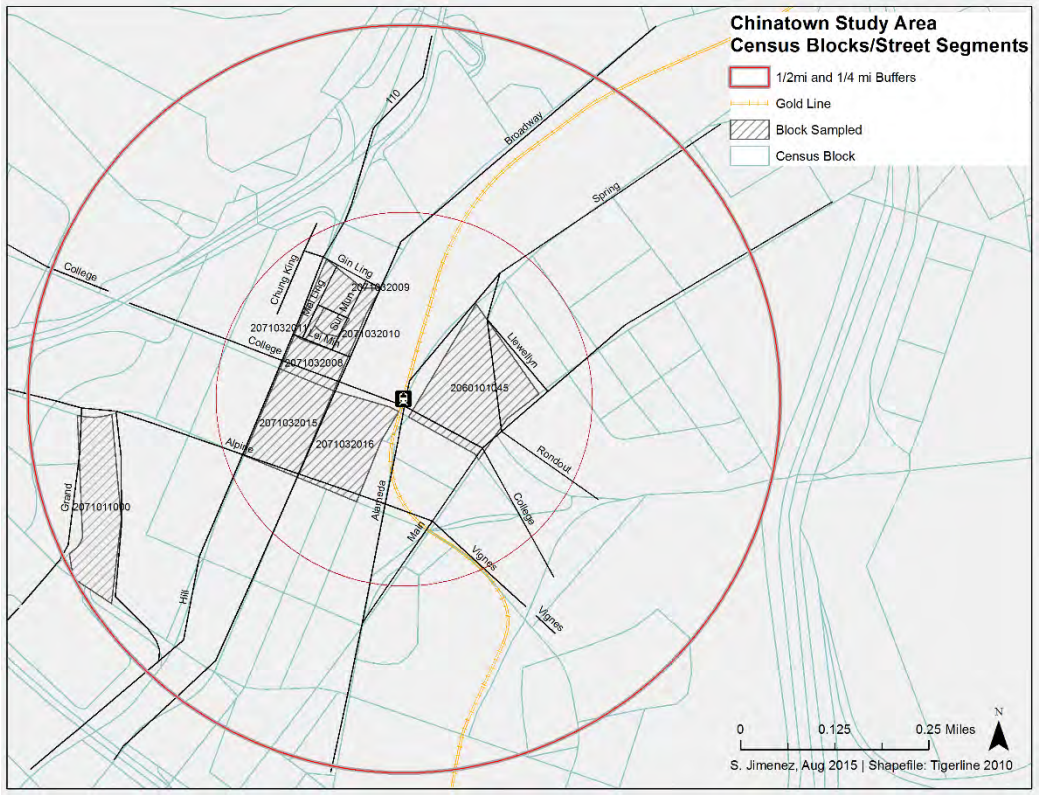



**Figure O.1: Blocks Surveyed for Chinatown Study Area**

Of the residential parcels surveyed, eight were single-family, five were multi-family with less than five units, and four were multi-family with five or more units. Chinatown also had the highest prevalence of new construction on residential parcels. About 65% of the surveyed residential parcels appeared to have new construction, over twice the percentage for Watts and seven times the percentage for Hollywood, which may be attributed to Chinatown's proximity to Downtown. This may indicate a quickly growing residential segment of the Chinatown area. Additionally, about one-fourth of residential parcels surveyed had upscale landscaping and one-fourth were newly renovated.




**Figure O.2: Parcels Surveyed for Chinatown Study Area**

A total of eight blocks had parking meters, two had residential permit parking, while three blocks had street or sidewalk improvements. Bus stop shelters and bike infrastructure were present on one bock. Additionally, way finding signage and Chinatown banners were common. Chinese architecture, arches, and street art were also present. Although over 60% of the blocks observed did not have much pedestrian traffic, our observations captured a diverse population in the area, which included not only Asians but also Latinos and non-Hispanic whites.

In the recent decades, Chinatown has experienced change along the outskirts of the half-mile radius around the station, but not close to the station where most of the commercial parcels exist. Our observations captured some of the residential changes that have occurred along the outskirts. However, due to limited parcel sampling and the fact that some new developments are only forthcoming, we failed to pick up some of the changes that many community groups see and fear – such as the Grand Plaza development on Cesar Chavez Avenue or the newly proposed College Station development. Given the high number of renters in the area, CBOs worry that real estate speculation may force long-term, low-income renters out of the neighborhood.

Some affordable housing units are also threatened; Chinatown has had affordable senior housing since the 1980s but many of the affordable units have expired or are set to expire (Chinatown Community for Equitable Development, personal communication, April 15, 2015). As a result, according to CBO representatives, some affordable senior units are converting into market-rate units. This conversion is often initiated by landlords, who turn over the building and ask for higher rents when the affordability requirements expire. CBOs are concerned with how the conversion of affordable units into market-rate units may displace Chinatown's long-term residents. They believe that real estate developers see an opportunity to attract higher returns on their developments,

which may have negative effects for a neighborhood like Chinatown that has many low-income residents.

Strong relationships between CBOs and public agencies in TOD areas are necessary to develop plans and polices to encourage development that provides community benefits through equity provisions. In the Chinatown area, this discussion is mostly happening through the city planning department's Cornfield Arroyo Seco Specific Plan (CASP), which includes density bonuses to encourage the development of affordable housing units.

***Hollywood/Western Detailed Assessment***

For the Hollywood/Western area, we surveyed 20 block segments, which included blocks along Hollywood, Western, Saint Andrews, Serrano, Carlton, Russell, and Harvard within the quarter-mile buffer from the station, and streets such as Sunset, Kingsley, and Winona within the half-mile buffer (See Figure O.3). Additionally, we sampled 46 residential parcels and two commercial parcels. Parcels observed were on Hobart, Sunset, Loma Linda, Serrano, Carlton, Harold, Harvard, Garfield, Oxford, Gramercy, and Western (See Figure O.4). Our observed parcels in this neighborhood had a 93% match with assessor data in residential land use.

Our gentrification model shows that only the area southwest of the Metro station appears to have gentrified in the last decade, while the area to the southeast has undergone little development or change. Further, no tracts north of the Metro station appear to be eligible for gentrification. Our ground-truthing observations, however, capture more signs of gentrification than those shown in the model.

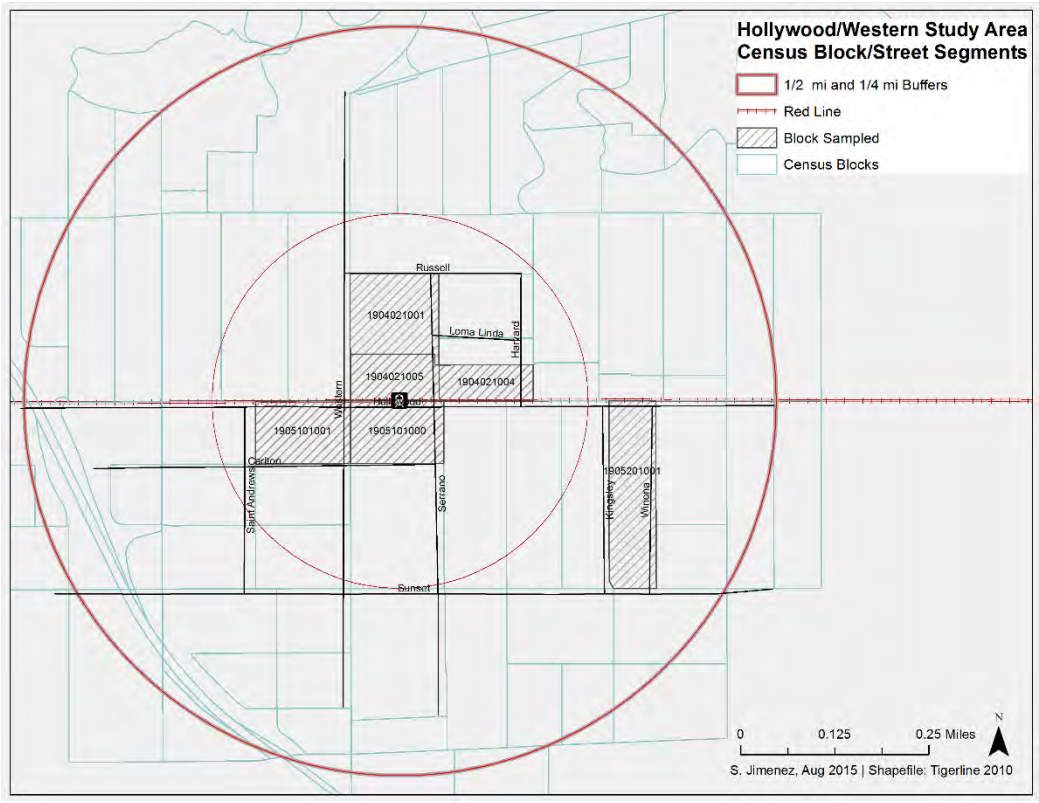



**Figure O.3: Blocks Surveyed for Hollywood/Western Study Area**

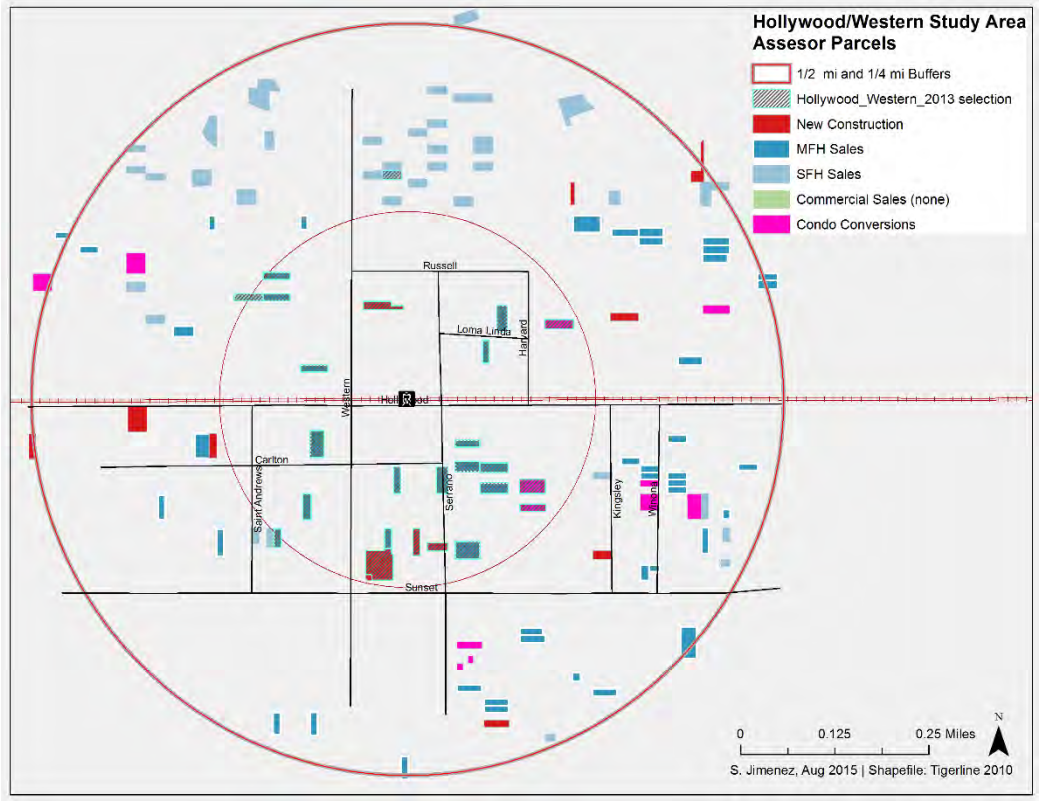



**Figure O.4: Parcels Surveyed for Hollywood/Western Study Area**

Hollywood/Western showed clear signs of late-stage commercial and residential gentrification. Surrounding the station itself are primarily commercial businesses, mostly retail or mixed-use. Although Hollywood/Western is still dominated by small, older, well-established stores, it also has indications of commercial gentrification. This area had the highest percentage of new construction in the commercial block surveyed – about 15%. About 15% of the surveyed blocks had minor or moderate renovations, while only one block had properties with some upscale landscaping (patio furniture, plants, and decorative fencing).

The two commercial parcels observed had both multi-story new constructions, making them out of context from the surrounding parcels. Additionally, one block had a yoga studio and one a specialty food shop, and one multi-story use building housed a Starbucks, a Crossfit specialty gym, and many brand-named retail stores, indicating some stereotypical signs of gentrification. One-fourth of the blocks surveyed having some non-English signs and ethnic businesses. These included mostly signs in Thai, which is expected, given the presence of Thai Town. Yet, upon one visit, the Thai restaurants seemed to cater towards a diverse and younger crowd. One block also housed an ethnic institution (a Korean church). Block segment observations also indicated signs of ethnic presence such as posters, a painted utility box, and a mural commemorating the Armenian genocide.

Additionally, Hollywood/Western showed multiple signs of residential gentrification. About 20% of the blocks surveyed had new construction, which is the highest amongst the case study areas, and about 40% showed signs of moderate renovation. Half of the blocks observed had upscale landscaping, the most amongst the case studies, and 35% had upscale or green vehicles. Moreover, many blocks had signs indicating territoriality – six blocks had anti-trespassing signs, while six

other blocks had other signage such as “Property closed to the public”, “Security camera”, or “Reserved parking.”

Of the residential buildings, 9% were new, 27% renovated, and 36% with ongoing renovations. The vast majority were ranked as average (61%), or above average (22%). Only two (9%) buildings were lower end and out of place relative to the neighborhood scale and character. Many of the residential blocks also had “for rent” signs, including one that “Welcomed Section 8.”

Hollywood/Western has less public infrastructure than Chinatown, but the highest percentage for bike infrastructure (25% or 4 blocks). Hollywood/Western had more pedestrian activity than the other case-study neighborhoods. About 10% of blocks were perceived as busy in terms of pedestrian traffic, while 35% were moderately busy. Whites, Latinos, blacks, and Asians were all observed walking or biking in the area.

Representatives of community-based groups interviewed noted the residential gentrification that the area is experiencing. One organizer estimated that 30 percent of a Hollywood church congregation has moved to San Fernando Valley because of rising rents in Hollywood (LA Voice, personal communication, April 10, 2015).

The Hollywood/Western TOD area has a high potential for gentrification. However, the gentrification impact may be moderated by community and CBO intervention and the implementation of the Vermont/Western Transit Oriented District SNAP adopted in 2001. The plan mandates equitable development through its community benefit elements. For example, SNAP’s child care facility component requires mixed-use or commercial projects with 100,000 square feet or more of nonresidential floor area to include childcare facilities to accommodate the needs of employees.

Thai Community Development Center (Thai CDC) and East Hollywood Neighborhood Council, along with Metro are trying to form a partnership to create a small business incubator near the Hollywood/Western Station (personal communication, March 9, 2015). However, where CBOs are not actively involved in neighborhood councils, there is potential that they may be left out of the planning process.

### *103rd St./ Watts Towers Detailed Assessment*

For 103rd St./Watts Towers, we surveyed about 31 block segments, which included blocks on Century, 103rd St,104th, 105th, Compton, Grandee, Graham, Beach, Holmes, Kimberly, Bandera, Wilmington, Anzac, Grape, and Hickory (Figure O.5). Additionally, we sampled 46 residential parcels and three commercial parcels (Figure O.6). The observed parcels had 89% match with assessor data in residential land use.

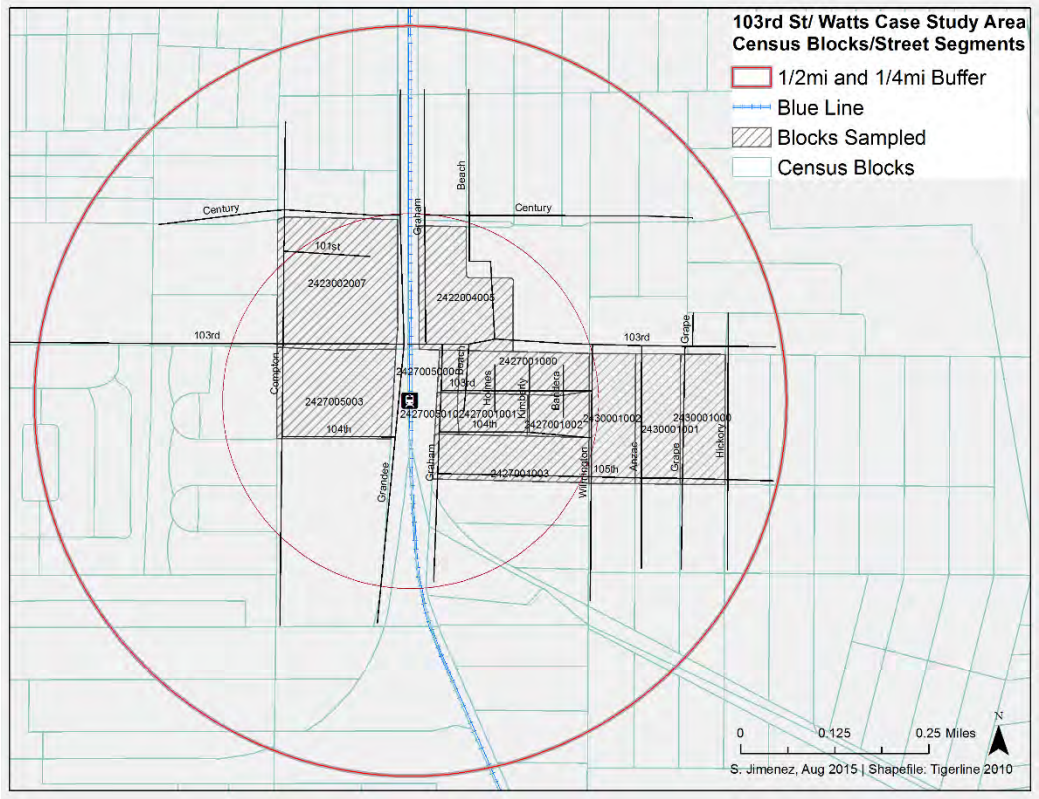



**Figure O.5: Blocks Surveyed for 103rd St./Watts Towers Study Area**

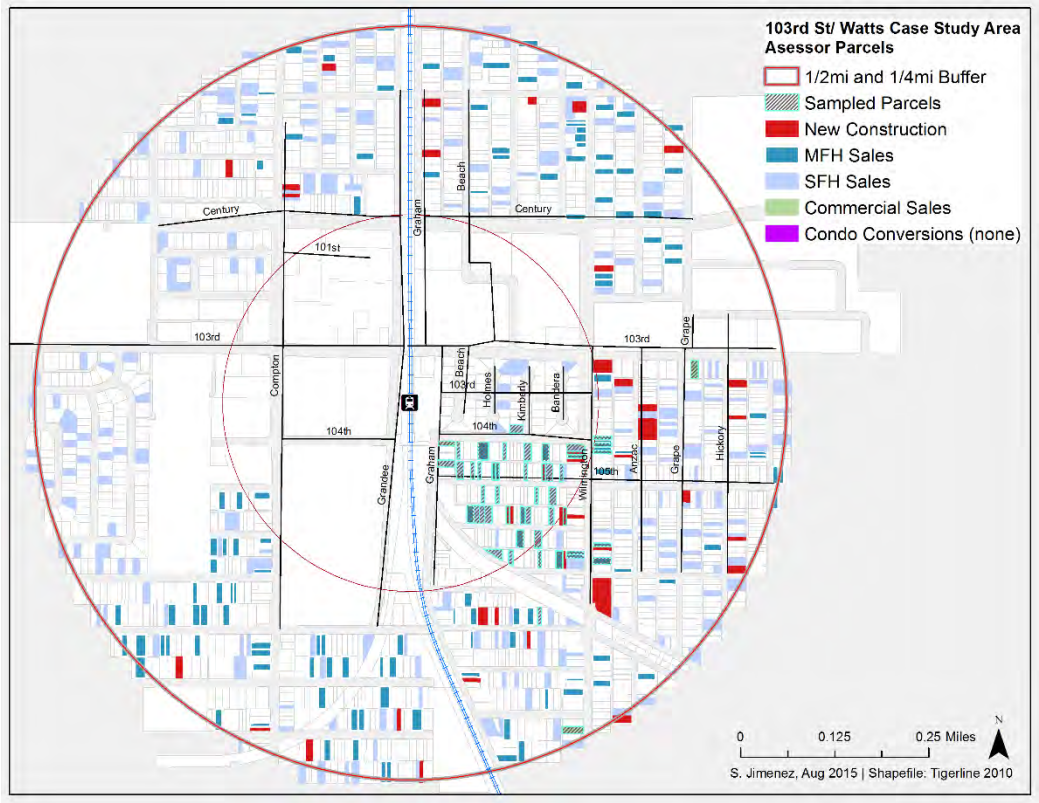



**Figure O.6: Parcels Surveyed for 103rd St/Watts Towers Study Area**

Our model of gentrification shows that although 103rd St./Watts is eligible for gentrification in that it is a disadvantaged disinvested neighborhood, the area has little signs of development in the last decades. Our ground-truthing observations are consistent with this finding.

Although the oldest of the Metro rail stations in our study, it showed very few signs of commercial gentrification. Only about 6% of the surveyed block segments showed signs of new commercial construction with mostly minor, cosmetic renovations. The few newly constructed commercial properties housed mostly small mom-and-pop stores. There was only one block dominated by commercial and retail uses, the Martin Luther King Shopping Center; most of the businesses there appeared to cater to a lower-income demographic. Examples of retail establishments include Food 4 Less, Popeye's, Burger King, and small hair salons. Only one block had upscale landscaping or green vehicles (See Table AI.1 in Appendix I).

While commercial land uses were infrequently observed in Watts; we noticed a significant institutional presence, making up about 13% of the total observed land uses in the surveyed blocks. The largest institution is the Watts Health Center. Additionally, the surveyed area included the St. Lawrence of Brindisi Elementary School and St. Lawrence of Brindisi Church.

Residential development, on the other hand, did show some moderate signs of gentrification. A large proportion of the blocks surveyed were residential, about 40% single-family and 31% multi-family. About 9% of the blocks appeared to have new residential construction, mostly along Wilmington. Renovated homes were present on about 84% of the surveyed blocks. However, many renovations seemed to be minor and solely cosmetic. While there appears to have recently been a high amount of transactional activity in residential parcels, a change in ownership has only occasionally resulted in the improvement of a parcel's appearance.

Of the residential parcels, about 71% were single-family and the rest were multi-family containing between two and four units. In total, approximately a quarter of the residential units appeared to be newly constructed, and more than a third were either in the process of renovation or appeared to have been recently renovated. Additionally, roughly a fifth of the units appeared to be significantly more upscale than their surrounding units, while only two units were significantly downscale compared to their neighbors.

The 103rdSt./Watts Station had the most security signage compared to the other case study areas. Of the 31 blocks, two had neighborhood watch signs, five had anti-littering or graffiti signage, 12 had anti-trespassing signage, and 13 had other types of signs, such as "no parking," "security surveillance," and "beware of dog." Several houses also had bars on the windows, while the majority of houses had high fences or gates. The prominence of these characteristics indicated the need or desire for more safety in the area.

In regards to public infrastructure, seven blocks had pedestrian streetlights, six blocks had bike infrastructures, five blocks had bus stop shelters and street infrastructure, and three blocks had public trashcans. Thirteen of the blocks surveyed (42%) had sidewalk improvements. Trees and public murals were also present. However, the neighborhood also had signs of disorder such as alleyways and vacant lands serving as dumping grounds.

Our observations and model results echo the experience of community groups in the Watts neighborhood – confirming the lack of noticeable changes near the 103rd St./Watts Towers metro station. Not captured by the physical observations of the community or by the gentrification model,

however, is the day-to-day experience of some Watts residents. South Los Angeles CBOs have discussed many instances of illegal evictions and slum conditions in South Los Angeles (personal communication, April 16, 2015).

Since the area is gentrification-eligible but does not yet show major evidence of gentrification, proactive community-public partnerships, if formed early, may help prevent future displacement and achieve a more equitable development model. As TOD plans are developed for the area, community benefits should also be put in place through equity provisions. For example, one tool for potential collaboration is the Jordan Downs Urban Village Specific Plan, which has the goal to create high-quality transit areas, protect community resources, and provide equitable economic opportunities.[11] The Jordan Downs Urban Village Specific Plan aims to improve connectivity for the aging Jordan Downs public housing project, which is located a half-mile west of the rail station. This plan has the potential to transform Jordan Downs into a mixed-income development (City of Los Angeles, 2012).

[11] The specific plan is available online at: http://cityplanning.lacity.org/staffrpt/initialrpts/CPC-2010-31.pdf

# Appendix P. Bay Area UrbanSim Models as Used in Plan Bay Area

This Appendix describes each of the models used in the Bay Area application of UrbanSim for the PlanBayArea project, and is intended as a more detailed reference for the base implementation for the current project. The changes in the preceding sections were applied to an updated version of the models as described below.

The sequence of the presentation of the models is organized approximately in the order of their execution within each simulated year, but in some cases they are grouped for clarity of exposition. All of the models operate as microsimulation models that update the state of individual agents and objects: households, businesses, parcels and buildings. The state of the simulation is updated by each model, and results are stored in annual steps from the base year of 2010 that the model uses as its initial conditions, to the end year of 2040 for each scenario that is simulated.

***Business Transition Model***

Objective

The Business Transition Model predicts new establishments being created within or moved to the region by businesses, or the loss of establishments in the region - either through closure of a business or relocation out of the region.

Employment is classified by the user into employment sectors based on aggregations of Standard Industrial Classification (SIC) codes, or more recently, North American Industry Classification (NAICS) codes. Typically sectors are defined based on the local economic structure. Aggregate forecasts of economic activity and sectoral employment are exogenous to UrbanSim, and are used as inputs to the model. The base year UrbanSim employment data for the MTC application were obtained from ABAG. The employment sectors adopted for this application are shown in Table AL.1. The Business Transition Model integrates exogenous forecasts of aggregate employment by sector with the UrbanSim database by computing the sectoral growth or decline from the preceding year, and either removing establishments from the database in sectors that are declining, or queuing establishments to be placed in the Business Location Choice Model for sectors that experience growth. If the user supplies only total employment control totals, rather than totals by sector, the sectoral distribution is assumed consistent with the current sectoral distribution. In cases of employment loss, the probability that an establishment will be removed is assumed proportional to the spatial distribution of establishments in the sector. The establishments that are removed vacate the space they were occupying, and this space becomes available to the pool of vacant space for other establishments to occupy in the location component of the model. This procedure keeps the accounting of land, structures, and occupants up to date. New establishments are not immediately assigned a location. Instead, new establishments are added to the database and assigned a null location, to be resolved by the Business Location Choice Model.

Algorithm

The model compares the total number of jobs by sector in the establishments table at the beginning of a simulation year, to the total number of jobs by sector specified by the user in the annual employment control totals for that year. If the control total value is higher, the model adds the

necessary number of establishments to the establishments table by sampling existing establishments of the same sector and duplicating them until enough jobs have been added. If the control totals indicate a declining job count for a sector then the appropriate number of establishments in the data are selected at random and removed. The role of this model is to keep the number of jobs in the establishments data in the simulation synchronized with aggregate expectations of employment in the region. In most current applications, control totals are separately specified for each sector and split by a proportion that is assumed to be home-based employment vs non-home-based employment. These two are handled by different model groups in the establishment location choice model.

**Table P.1: Employment Sectors**

| Sector ID | Sector Description |
|---|---|
| 1 | Professional services |
| 2 | Finance, insurance, and real estate |
| 3 | Business services |
| 4 | Agriculture |
| 5 | Natural resources |
| 6 | Arts and recreation |
| 7 | Government |
| 8 | Other education |
| 9 | Logistics |
| 10 | Eating and drinking |
| 11 | Regional retail |
| 12 | Social services |
| 13 | Leasing |
| 14 | Heavy manufacturing |
| 15 | Health |
| 16 | Local retail |
| 17 | Transportation |
| 18 | Higher education |
| 19 | Utilities |
| 20 | Construction |
| 21 | Biotechnology |
| 22 | Light manufacturing |
| 23 | Information |
| 24 | Hotel |
| 25 | Tech manufacturing |
| 26 | Personal services |
| 27 | K-12 education |
| 28 | Unclassified |

Configuration

The configuration of the Business Transition Model in the parcel model system is summarized in the following table:

**Table P.2: Configuration of Business Transition Model**

| Element | Setting |
|---|---|
| Agent | Establishments |
| Dataset | Establishments |
| Model Structure | Rule Based |

Data

The following tables are used in the Business Transition Model in the parcel version of UrbanSim.

**Table P.3: Data Used by Business Transition Model**

| Table Name | Brief Description |
|---|---|
| annual_business_control_totals | Annual aggregate control totals for employment by sector |
| jobs | jobs (synthesized from ABAG zonal employment by sector) |

***Household Transition Model***

Objective

The Household Transition Model (HTM) predicts new households migrating into the region, or the loss of households emigrating from the region.

The Household Transition Model accounts for changes in the distribution of households by type over time, using an algorithm analogous to that used in the Business Transition Model. In reality, these changes result from a complex set of social and demographic changes that include aging, household formation, divorce and household dissolution, mortality, birth of children, migration into and from the region, changes in household size, and changes in income, among others. The data (and theory) required to represent all of these components and their interactions adequately are complex, and although these behaviors have been recently implemented in UrbanSim they were not available for use within the time constraints of this project. In this application, the Household Transition Model, like the Business Transition Model described above, uses external control totals of population and households by type (the latter only if available) to provide a mechanism for the user to approximate the net results of these changes. Analysis by the user of local demographic trends may inform the construction of control totals with distributions of household size, age of head, and income. If only total population is provided in the control totals, the model assumes that the distribution of households by type remains static.

As in the business transition case, newly created households are added to a list of movers that will be located to submarkets by the Household Location Choice Model. Household removals, on the other hand, are accounted for by this model by removing those households from the housing stock,

and by properly accounting for the vacancies created by their departure. The household transition model is analogous in form to the business transition model described above. The primary household attributes stored on the household table in the database are shown in Table P.4. Income and persons are the most commonly used attributes to include in the control totals in order to be able to set household targets for income and household size distribution in future years.

**Table P.4: Household Attributes**

| Characteristic | Description |
|---|---|
| Tenure | Rent or Own |
| Building Type | Single Family Detached, Single Family Duplex, Apartment, Townhouse, Group Quarters |
| Income | Annual Household Income |
| Persons | Total Persons in Household |
| Children | Number of Children (under 18) in Household |
| Race | Race of Head of Household |
| Workers | Number or Workers in Household |
| Vehicles | Number of Vehicles |

Algorithm

The model compares the total number of households (by type) in the households table at the beginning of a simulation year, to the total number of households (by type) specified by the user in the annual household control totals for that year. If the control total value is higher, the model adds the necessary number of households to the household table by sampling existing households (of the same type) and duplicating them. If the control totals indicate a declining household count (by type) then the appropriate number of households in the data are selected at random and removed. The role of this model is to keep the household data in the simulation synchronized with aggregate expectations of population and households. Note that the model can be configured by the user's choice of specification of the annual control totals. If no household characteristics are included in the control totals, then the synchronization is done for the total number of households. Otherwise it is done by the categories present in the control totals.

Configuration

The configuration of the HTM in the parcel model system is summarized in the following table:

**Table P.5: Configuration of Household Transition Model**

| Element | Setting |
|---|---|
| Agent | Household |
| Dataset | Household |
| Model Structure | Rule Based |

Data

The following tables are used by the Household Transition Model in the parcel version of UrbanSim.

**Table P.6: Data Used by Household Transition Model**

| Table Name | Brief Description |
|---|---|
| annual_household_control_totals | Annual aggregate control totals for households, optionally by type |
| households | Synthesized households |
| persons | Synthesized persons |

***Business Relocation Model***

Objective

The Business Relocation Model predicts the relocation of establishments within the region each simulation year.

Employment relocation and location choices are made by firms. In the current version of UrbanSim, we use establishments as the units of analysis (specific sites/branches of a firm). The Business Relocation Model predicts the probability that establishments of each type will move from their current location or stay during a particular year. Similar to the economic transition model when handling job losses in declining sectors, the model assumes that the probability of moving varies by sector but not spatial characteristics. All placement of establishments is managed through the business location choice model.

As in the case of job losses predicted in the economic transition component, the application of this model requires subtracting jobs by sector from the buildings they currently occupy, and the updating of the accounting to make this space available as vacant space. These counts will be added to the unallocated new jobs by sector calculated in the economic transition model. The combination of new and moving jobs serve as a pool to be located in the employment location choice model. Vacancy of nonresidential space will be updated, making space available for allocation in the employment location choice model.

Since it is possible that the relative attractiveness of commercial space in other locations when compared with an establishment's current location may influence its decision to move, an alternative structure for the mobility model could use the marginal choice in a nested logit model with a conditional choice of location. In this way, the model would use information about the relative utility of alternative locations compared to the utility of the current location in predicting whether jobs will move. While this might be more theoretically appealing than the specification given, it is generally not supported by the data available for calibration. Instead, the mobility decision is treated as an independent choice, and the probabilities estimated by annual mobility rates directly observed over a recent period for each sector.

Algorithm

The Business Relocation Model is implemented as a cross-classification rate-based model, with a probability of moving by employment sector applied to each establishment, each simulation year. For example, if an establishment is in the retail sector, their probability of moving would be looked up by finding the retail sector entry in the annual_business_relocation_rates table. Let's assume the rate in the table is .25. This means there is a 25% chance the job will move in any given year, and 75% chance they will not move in that year. The model uses Monte Carlo Sampling to determine the outcome. It works by drawing a random number (from the uniform distribution, between 0 and 1), and comparing that random draw to the probability of moving for each household. So with our example establishment's probability of 0.75 that they will stay, if we draw a random number with a value higher than 0.75, we will predict that the job will move in that year.

The outcome of the model is implemented as follows. If an establishment is determined to be a mover because the random draw is greater than (1 - their move probability), then they are moved out of their current location. In practical terms, their building_id, which identifies where they are located, is simply reset to a null value. They remain in the jobs table but temporarily have no assignment to a location.

In the current application of the model in the Bay Area, the relocation rates for establishments was assumed to be zero, due to a combination of data limitations and time constraints to calibrate the model with non-zero relocation rates. This makes the location choices of businesses fixed once the establishment is assigned to a location.

Configuration

The configuration of the BRM is summarized in the following table:

**Table P.7: Configuration of Business Relocation Model**

| Element | Setting |
|---|---|
| Agent | Establishment |
| Dataset | Establishment |
| Model Structure | Cross-classification rate-based Model |

Data

The following tables are used in the Business Relocation Choice model:

**Table P.8: Data Used by Employment Relocation Model**

| Table Name | Brief Description |
|---|---|
| annual_business_relocation_rates | Annual relocation rates for establishments by sector |
| establishments | establishments |

***Household Relocation Model***

Objective

The Household Relocation Model predicts the relocation of households within the region each simulation year.

The Household Relocation Model is similar in form to the Employment Relocation Model described above. The same algorithm is used, but with rates or coefficients applicable to each household type. For households, mobility probabilities are based on the synthetic population from the MTC Travel Model. This reflects differential mobility rates for renters and owners, and households at different life stages.

Application of the Household Relocation Model requires subtracting mover households by type from the housing stock by building, and adding them to the pool of new households by type estimated in the Demographic Transition Model. The combination of new and moving households serves as a population of households to be located by the Household Location Choice Model. Housing vacancy is updated as movers are subtracted, making the housing available for occupation in the household location and housing type choice model.

An alternative approach configuration is to structure this as a choice model, and specify and estimate it using a combination of household and location characteristics. This could be linked with the location choice model, as a nested logit model. This was not possible to implement in this application due to limitations in the available household travel survey, which did not contain information on relocation of households from their previous residence to their current location.

Algorithm

The Household Relocation Model is implemented as a cross-classification rate-based model, with a probability of moving by age and income category applied to each household in the synthetic population, each simulation year. For example, if a household has head of age 31 and an income of 47,500, their probability of moving would be looked up by finding the interval within the age and income classes in the annual_household_relocation_rates table. Let's assume the rate in the table is .25. This means there is a 25% chance the household will move in any given year, and 75% chance they will not move in that year. The model uses Monte Carlo Sampling to determine the outcome. It works by drawing a random number (from the uniform distribution, between 0 and 1), and comparing that random draw to the probability of moving for each household. So with our example household's probability of 0.75 that they will stay, if we draw a random number with a value higher than 0.75, we will predict that the household will move in that year. The outcome of the model is implemented as follows. If a household is determined to be a mover because the random draw is greater than (1 - their move probability), then they are moved out of their current location. In practical terms, their building_id, which identifies where they are located, is simply reset to a null value. They remain in the household table but do not have a location.

Configuration

The configuration of the HRM is summarized in the following table:

**Table P.9: Configuration of Household Relocation Model**

| Element | Setting |
|---|---|
| Agent | Household |
| Dataset | Household |
| Model Structure | Cross-classification rate-based Model |

Data

The following tables are used in this model.

**Table P.10: Data Used by Household Relocation Model**

| Table Name | Brief Description |
|---|---|
| annual_household_relocation_rates | Annual relocation rates for households by type |
| households | Synthesized households |

***Household Tenure Choice Model***

Objective

The Household Tenure Choice Model predicts whether each household chooses to rent or own a housing unit each simulation year.

Algorithm

The Household Tenure Choice Model is structured as a choice model using a binary logit specification, and uses a combination of household characteristics to predict the relative probability of owning vs renting. A tenure outcome is predicted using Monte Carlo sampling as described previously, comparing a value drawn randomly from a uniform distribution to the probability of owning predicted by the binary logit model in order to assign a tenure status. Once a tenure is assigned, the household is active only in that side of the housing market: if they are determined to be a renter, then in the Household Location Choice Model they only consider rental housing units to locate in. Similarly for owner households, they only look at properties that are available for sale as owner-occupied units.

Configuration

The configuration of the HTCM is summarized in the following table:

**Table P.11: Configuration of Household Tenure Choice Model**

| Element | Setting |
|---|---|
| Agent | Household |
| Dataset | Household |
| Model Structure | Binary Logit Model |

Data

The following tables are used in this model.

**Table P.12: Data Used by Household Tenure Choice Model**

| Table Name | Brief Description |
|---|---|
| households | Synthesized households |

***Business Location Choice Model***

Objective

The Business Location Choice Model predicts the location choices of new or relocating establishments.

In this model, we predict the probability that an establishment that is either new (from the Business Transition Model), or has moved within the region (from the Business Relocation Model), will be located in a particular employment submarket. Submarkets are used as the basic geographic unit of analysis in the current model implementation. Each business has an attribute of space it needs based on the employment within the establishment, and this provides a simple accounting framework for space utilization within submarkets. The number of locations available for an establishment to locate within a submarket will depend mainly on the total square footage of nonresidential floorspace in buildings within the submarket, and on the density of the use of space (square feet per employee).

The model is specified as a multinomial logit model, with separate equations estimated for each employment sector. For both the business location and household location models, we take the stock of available space as fixed in the short run of the intra-year period of the simulation, and assume that locators are price takers. That is, a single locating establishment or household does not have enough market power to influence the transaction price, and must accept the current market price as given. However, the price is iteratively adjusted to account for market equilibrating tendencies as the aggregated demand across all agents increases in some submarkets and decreases in others. This topic is described in a later section on market price equilibration.

The variables included in the business location choice model are drawn from the literature in urban economics. We expect that accessibility to population, particularly high-income population, increases bids for retail and service businesses. We also expect that two forms of agglomeration economies influence location choices: localization economies and inter-industry linkages.

Localization economies represent positive externalities associated with locations that have other firms in the same industry nearby. The basis for the attraction may be some combination of a shared skilled labor pool, comparison shopping in the case of retail, co-location at a site with highly desirable characteristics, or other factors that cause the costs of production to decline as greater concentration of businesses in the industry occurs. The classic example of localization economies is Silicon Valley. Inter-industry linkages refer to agglomeration economies associated with location at a site that has greater access to businesses in strategically related, but different, industries. Examples include manufacturers locating near concentrations of suppliers in different industries, or distribution companies locating where they can readily service retail outlets.

One complication in measuring localization economies and inter-industry linkages is determining the relevant distance for agglomeration economies to influence location choices. At one level, agglomeration economies are likely to affect business location choices between states, or between metropolitan areas within a state. Within a single metropolitan area, we are concerned more with agglomeration economies at a scale relevant to the formation of employment centers. The influence of proximity to related employment may be measured using two scales: a regional scale effect using zone-to-zone accessibilities from the travel model, or highly localized accessibilities using queries of the area immediately around the given parcel. Most of the spatial queries used in the model are of the latter type, because the regional accessibility variables tend to be very highly correlated, and because agglomerations are expected to be very localized.

Age of buildings is included in the model to estimate the influence of age depreciation of commercial buildings, with the expectation that businesses prefer newer buildings and discount their bids for older ones. This reflects the deterioration of older buildings, changing architecture, and preferences, as is the case in residential housing. There is the possibility that significant renovation will make the actual year built less relevant, and we would expect that this would dampen the coefficient for age depreciation. We do not at this point attempt to model maintenance and renovation investments and the quality of buildings.

Density, the inverse of lot size, is included in the location choice model. We expect businesses, like households, to reveal different preferences for land based on their production functions and the role of amenities such as green space and parking area. As manufacturing production continues to shift to more horizontal, land-intensive technology, we expect the discounting for density to be relatively high. Retail, with its concentration in shopping strips and malls, still requires substantial surface land for parking, and is likely to discount bids less for density. We expect service firms to discount for density the least, since in the traditional urban economics models of bid-rent, service firms generally outbid other firms for sites with higher accessibility, land cost, and density.

We might expect that certain sectors, particularly retail, show some preference for locations near a major highway, and are willing to bid higher for those locations. Distance to a highway is measured in meters, using grid spatial queries. We also test for the residual influence of the classic monocentric model, measured by travel time to the CBD, after controlling for population access and agglomeration economies. We expect that, for most regions, the CBD accessibility influence will be insignificant or the reverse of that in the traditional monocentric model, after accounting for these other effects.

Estimation of the parameters of the model is based on a geocoded establishment file (matched to the parcel file to link employment by type to land use by type). A sample of geocoded establishments in each sector is used to estimate the coefficients of the location choice model. As

with the Household Location Choice Model, the application of the model produces demand by each employment type for building locations.

The independent variables used in the business location choice model can be grouped into the categories of real estate characteristics, regional accessibility, and urban-design scale effects as shown below:

- Real Estate Characteristics
  - Prices
  - Development type (land use mix, density)
- Regional accessibility
  - Access to population
  - Travel time to CBD, airport
- Urban design-scale
  - Proximity to highway, arterials
- Local agglomeration economies within and between sectors: center formation

Algorithm

Jobs to be located by this model are those that were added by the EmploymentTransitionModel or predicted to move by the EmploymentRelocationModel. The model selects all those jobs with no location, and identifies all available, vacant nonresidential space within the simulation year. Since the choice sets are generally too large, normally random sampling of alternatives is used to construct plausible sized choice sets. It then uses a Multinomial Logit Model structure to generate location choice probabilities across the choice set for each locating job. The location probabilities are used with Monte Carlo Sampling to make a determination for each job regarding which of the available locations they will choose. Once a job has chosen a location, that location is committed to the job (like a lease or purchase contract) and the space becomes unavailable for any other locating jobs, until such time as the occupying job is predicted to move.
In the current application, the Business Location Choice Model is run iteratively with a price adjustment component, to reflect a short-term price equilibration process.

Configuration

The configuration of the BLCM in the parcel model system is summarized in the following table:

**Table P.13: Configuration of Bmployment Location Choice Model**

| Element | Setting |
|---|---|
| Agent | Establishment |
| Location Set | Employment submarkets - which are defined by jurisdiction, building type, and transit proximity. |
| Dependent Variable | Location of each establishment: employment_submarket_id |
| Model Type | Multinomial Logit Model |
| Estimation Method | Maximum Likelihood |
| Submodels | Sector - separate models are specified for groups of jobs by employment sector |
| Independent Variables | Attributes of submarkets: Price, density, accessibility, composition of households and employment |

Data

The following tables are used by the Business Location Choice Model:

**Table P.14: Data Used by Business Location Choice Model**

| Table Name | Brief Description |
|---|---|
| establishment | Establishments table with an inventory of employment |
| employment_sectors | Employment sectors, defined using NAICS or SIC classifications of industry |
| buildings | Buildings from which available non-residential sqft are evaluated for location |
| zones | Zones are used to compute density, social composition, and accessibility variables |
| travel_data | Skims from the travel model are used to compute accessibility variables |

***Household Location Choice Model***

Objective

The Household Location Choice Model (HLCM) predicts the location choices of new or relocating renter and owner households.

In this model, as in the employment location model, we predict the probability that a household that is either new (from the transition component), or has decided to move within the region (from the household relocation model) and has determined whether to rent or own a unit (from the household tenure choice model), will choose a particular location defined by a residential submarket. As before, the form of the model is specified as multinomial logit, with random sampling of alternatives from the universe of submarkets with vacant housing.

For both the household location and business location models, we take the stock of available space as fixed in the short run of the intra-year period of the simulation, and assume that locators are price takers. That is, a single locating household does not have enough market power to influence the transaction price (or rent), and must accept the current market price as given. However, the price (or rent) is iteratively adjusted to account for market equilibrating tendencies as the aggregated demand across all agents increases in some submarkets and decreases in others. This topic is described in a later section on market price equilibration.

The model architecture allows location choice models to be estimated for households stratified by income level, the presence or absence of children, and other life cycle characteristics. Alternatively, these effects can be included in a single model estimation through interactions of the household characteristics with the characteristics of the alternative locations. The current implementation is based on the latter but is general enough to accommodate stratified estimation, for example by household income.

For the Bay Area application of the model, households are stratified by 4 income categories cross-classified with house- hold size of 1, 2, 3 or more. Income and household size provide a strong basis

for differentiating among consumers with substantially different preferences and trade-offs in location choices.

We further differentiate households by their tenure choice, given the importance of this distinction for understanding the impacts of housing prices and rents on location choices. Predictions of tenure for each household are made by the Household Tenure Choice Model, discussed in Section 4.5.

The variables used in the model are drawn from the literature in urban economics, urban geography, and urban sociology. An initial feature of the model specification is the incorporation of the classical urban economic trade-off between transportation and land cost. This has been generalized to account not only for travel time to the classical monocentric center, the CBD, but also to more generalized access to employment opportunities and to shopping. These accessibilities to work and shopping are measured by weighting the opportunities at each destination zone with a composite utility of travel across all modes to the destination, based on the logsum from the mode choice travel model.

These measures of accessibility should negate the traditional pull of the CBD, and, for some population segments, potentially reverse it. In addition to these accessibility variables, we include in the model a net building density, to measure the input-substitution effect of land and capital. To the extent that land near high accessibility locations is bid up in price, we should expect that builders will substitute capital for land and build at higher densities. Consumers for whom land is a more important amenity will choose larger lot housing with less accessibility, and the converse should hold for households that value accessibility more than land, such as higher income childless households.

The age of housing is considered for two reasons. First, we should expect that housing depreciates with age, since the expected life of a building is finite, and a consistent stream of maintenance investments are required to slow the deterioration of the structure once it is built. Second, due to changing architectural styles, amenities, and tastes, we should expect that the wealthiest households prefer newer housing, all else being equal. The exception to this pattern is likely to be older, architecturally interesting, high quality housing in historically wealthy neighborhoods. The preference for these alternatives are accommodated through a combination of nonlinear or dummy variable treatment for this type of housing and neighborhood.

A related hypothesis from urban economics is that, since housing is considered a normal good, it has a positive income elasticity of demand. This implies that as incomes rise, households will spend a portion of the gains in income to purchase housing that is more expensive, and that provides more amenities (structural and neighborhood) than their prior dwelling. A similar hypothesis is articulated in urban sociology in which upward social mobility is associated with spatial proximity to higher status households. Both of these hypotheses predict that households of any given income level prefer, all else being equal, to locate in neighborhoods that have higher average incomes. (UrbanSim does not attempt to operationalize the concepts of social status or social assimilation, but does consider income in the location choice.)

The age hypothesis and the two income-related hypotheses are consistent with the housing filtering model, which explains the dynamic of new housing construction for wealthy households that sets in motion a chain of vacancies. The vacancy chain causes households to move into higher status neighborhoods than the ones they leave, and housing units to be successively occupied by lower and lower status occupants. At the end of the vacancy chain, in the least desirable housing stock and the least desirable neighborhoods, there can be insufficient demand to sustain the housing stock

and vacancies go unsatisfied, leading ultimately to housing abandonment. We include in the model an age depreciation variable, along with a neighborhood income composition set of variables, to collectively test the housing filtering and related hypotheses.

One of the features that households prefer is a compatible land use mix within the neighborhood. It is likely that residential land use, as a proxy for land uses that are compatible with residential use, positively influences housing bids. On the other hand, industrial land use, as a proxy for less desirable land use characteristics, would lower bids.

The model parameters are estimated using a random sample of alternative locations, which has been shown to provide consistent estimates of the coefficients. In application for forecasting, each locating household is modeled individually, and a sample of alternative cell locations is generated in proportion to the available (vacant) housing. Monte carlo simulation is used to select the specific alternative to be assigned to the household, and vacant and occupied housing units are updated in the cell.

The independent variables can be organized into the three categories of housing characteristics, regional accessibility, and urban-design scale effects as shown below.

- Housing Characteristics
    - Prices (interacted with income)
    - Development types (density, land use mix)
    - Housing age
- Regional accessibility
    - Job accessibility by auto-ownership group
    - Travel time to CBD and airport
- Urban design-scale (local accessibility)
    - Neighborhood land use mix and density
    - Neighborhood Employment

Algorithm

Households to be located by this model are those that were added by the HouseholdTransition-Model or predicted to move by the HouseholdRelocationModel. The model selects all those households of a specified tenure status (renter or owner) that need to find a housing unit, and identifies all available, vacant housing units within the simulation year that are of the appropriate tenure. Since the choice sets are generally too large, normally random sampling of alternatives is used to construct plausible sized choice sets. It then uses a Multinomial Logit Model structure to generate location choice probabilities across the choice set for each household. The location probabilities are used with Monte Carlo Sampling to make a determination for each household regarding which of the available locations they will choose. Once a household has chosen a location, that location is committed to the household (like a rental contract or closing on a purchase of a house) and the residential unit becomes unavailable for any other households, until such time as the occupying household is predicted to move.

Configuration

The configuration of the Household Location Choice Model is summarized in the following table:

**Table P.15: Configuration of Household Location Choice Model**

| Element | Setting |
|---|---|
| Agent | Job |
| Location Set | Residential submarkets - which are defined by building type, school district, tenure, and transit proximity |
| Dependent Variable | Location of each household: submarket_id |
| Model Type | Multinomial Logit Model |
| Estimation Method | Maximum Likelihood |
| Submodels | Separate models can be specified for groups of households |
| Independent Variables | Attributes of households interacted with attributes of submarkets |

Data

The following tables are used by the Household Location Choice Model.

**Table P.16: Data Used by Household Location Choice Model**

| Table Name | Brief Description |
|---|---|
| households | Synthetic households table |
| buildings | Buildings from which available residential units are evaluated for location |
| zones | Zones are used to compute density, social composition, and accessibility variables |
| travel_data | Skims from the travel model are used to compute accessibility variables |

***Real Estate Price Model***

Objective

The Real Estate Price Model (REPM) predicts the price per unit of each building. For residential units, the sale price is estimated for owner units, and the rent is estimated for rental units.
UrbanSim uses real estate prices as the indicator of the match between demand and supply of land at different locations and with different land use types, and of the relative market valuations for attributes of housing, nonresidential space, and location. This role is important to the rationing of land and buildings to consumers based on preferences and ability to pay, as a reflection of the operation of actual real estate markets. Since prices enter the location choice utility functions for jobs and households, an adjustment in prices will alter location preferences. All else being equal, this will in turn cause higher price alternatives to become more likely to be chosen by occupants who have lower price elasticity of demand. Similarly, any adjustment in land prices alters the preferences of developers to build new construction by type of space, and the density of the construction.

We make the following assumptions:

1. Households, businesses, and developers are all price-takers individually, and market adjustments are made by the market in response to aggregate demand and supply relationships.
2. Location preferences and demand-supply imbalances are capitalized into land values. Building value reflects building replacement costs only, and can include variations in development costs due to terrain, environmental constraints or development policy.

Following on these assumptions and the best available theory regarding real estate price formation, we begin with a reduced-form hedonic regression model to establish the initial price and rent estimates based on structural and locational attributes, and combine this with a second step that incorporates short-term (within a year) market equilibrating tendencies.

Hedonic Price Regression

Real estate prices are modeled using a hedonic regression of the log-transformed property value per square foot on attributes of the parcel and its environment, including land use mix, density of development, proximity of highways and other infrastructure, land use plan or zoning constraints, and neighborhood effects. The hedonic regression may be estimated from sales transactions if there are sufficient transactions on all property types, and if there is sufficient information on the lot and its location. An alternative is to use tax assessor records on land values, which are part of the database typically assembled to implement the model. Although assessor records may contain biases in their assessment, they do provide virtually complete coverage of the land (with notable exceptions and gaps for exempt or publicly owned property).

The hedonic regression equation encapsulates interactions between market demand and supply, revealing an envelope of implicit valuations for location and structural characteristics. Prices are updated by UrbanSim annually, after all construction and market activity is completed. These end of year prices are then used as the values of reference for market activities in the subsequent year.
The independent variables influencing land prices can be organized into site characteristics, regional accessibility, and urban-design scale effects, as shown below:

- Site characteristics Development type
    - Land use plan
    - Environmental constraints
- Regional accessibility
    - Access to population and employment
- Urban design-scale
    - Land use mix and density
    - Proximity to highway and arterials

Algorithm

The Real Estate Price Model uses a hedonic regression structure, which is a multiple regression, estimated using Ordinary Least Squares (OLS), normally with the price specified as a log of price.

Configuration

The configuration of the REPM in the parcel model system is summarized in the following table:

**Table P.17: Configuration of Real Estate Price Model**

| Element | Setting |
|---|---|
| Dataset | Buildings |
| Dependent Variable | Log of Price Per Unit (per housing unit for residential, per square foot for non-residential buildings) |
| Model Type | Regression |
| Submodels | Separate models are specified for each type of building |
| Independent Variables | Constant, and attributes of building: density, accessibility, zonal composition of households and employment |

Data

These tables are used by the Real Estate Price Model:

**Table P.18: Data Used by Real Estate Price Model**

| Table Name | Brief Description |
|---|---|
| buildings | Individual buildings located on parcels (can be many per parcel) |
| residential_units | Individual residential units located within a building |
| zones | Zones used in the travel model, for accessibility and density variables |
| travel_data | Zone-to-zone skims from the travel model, for accessibility variables |
| households | Household data, for socioeconomic and density variables |
| jobs | Employment data, for accessibility and density variables |

Market Price Equilibration

Once initial market prices are estimated within a simulation year...

***Real Estate Developer Model***

Objective

The Real Estate Developer Model simulates the location, type and density of real estate development, conversion and re-development events at the level of specific parcels. The design draws partly on the parcel-level real estate development model created for the Puget Sound, which generates development proposals based on pre-defined templates. It generalizes the concept of templates to allow the developer model to configure multiple parameters of development projects in order to maximize profitability of development outcomes, subject to local physical, regulatory and market contexts.

Algorithm

This model is a process for evaluating a proforma for each building type allowed by zoning which should indicate the profitability of a development given a set of inputs which specify the context described above.

The proforma can be conceptualized as a spreadsheet implemented in Python code which performs cash flow analysis with standard financial discounting of cash flows. In this case, the developer model optimizes the building form so that it creates the building type and size which result in the greatest profitability (NPV) for each parcel.
The term developer model usually refers to this "outer loop" which optimizes the building form while the "pro forma" actually computes profitability based on cash flows given a specific set of inputs.

The code for the developer model is found in urbansim_parcel/proposal. developer_model.py is the controlling func- tion for this module - bform.py stores the building form currently used, profroma.py does the cash flow accounting, and devmdl_optimize.py performs the optimization.

Below is the complete set of inputs - the first section is the set of modeled inputs (i.e. output from another model) and the second section are exogenous inputs which are basic attributes of the parcel. The output of the model is simple: a single net present value and the building type and size of the building which results in the specified optimized NPV.

For this application, the developer model runs each simulated year on all empty parcels, on all parcels within a PDA, on parcels within 800m of Caltrain and BART, and a sampled portion of the other parcels to capture redevelopment of parcels.

For redevelopment, demolition cost is computed through one of the following: the value of residential owner housing, a simple multiplier for residential rental housing, the price estimated for nonresidential sqft, and a land price based on the value of nearby building prices.

Policies enter the developer model by the zoning (primarily by allowed FAR and building types), and also with a parcel subsidy/fee that is specified for each parcel.

***The Role of Accessibility***

Accessibility is a very important influence in urban space, and it similarly plays an important role in UrbanSim. Almost all models in UrbanSim consider the effects of accessibility. But unlike the monocentric or spatial interaction models, in which the choice of workplace is exogenous and residential locations are chosen principally on the basis of commute to the city center or to a predetermined workplace, we deal with accessibility in a more general framework. Accessibility is considered a normal good, like other positive attributes of housing, which consumers place a positive economic value on. We therefore expect that consumers value access to workplaces and shopping opportunities, among the many other attributes they consider in their housing preferences. However, not all households respond to accessibility in the same way. Retired persons would be less influenced by accessibility to job opportunities than would working age households, for instance.

We operationalize the concept of accessibility for a given location as the distribution of opportunities weighted by the travel impedance, or alternatively the utility of travel to those destinations. A number of alternative accessibility measures have been developed in UrbanSim. The utility of travel is measured as the composite utility across all modes of travel for each zone pair, obtained as the logsum of the mode choice for each origin-destination pair. We will evaluate alternative accessibility measures during model estimation and make a final decision on which measures to use based on those results.

The accessibility model reads the logsum matrix from the travel model and the land use distribution for a given year, and creates accessibility indices for use in the household and business location choice models. The general framework is to summarize the accessibility from each zone to various activities for which accessibility is considered important in household or business location choice.

Since UrbanSim operates annually, but travel model updates are likely to be executed for two to three of the years within the forecasting horizon, travel utilities remain constant from one travel model run until they are replaced by the next travel model result. Although travel utilities remain constant, the activity distribution in these accessibility indices is updated annually, so that the accessibility indices change from one year to the next to reflect the evolving spatial distribution of activities.

**Table P.19: Data Used by Real Estate Developer Model**

| Variable Name | Brief Description |
|---|---|
| PRICES | |
| single family | Price estimate for single-family housing |
| multi family | Price estimate for multi-family housing |
| rent single family | Rent estimate for single-family housing |
| rent multi family | Rent estimate for multi-family housing |
| office | Rent estimate for the office building type |
| retail | Rent estimate for the retail building type |
| industrial | Rent estimate for the industrial building type |
| ABSORPTION | |
| sales absorption | The absorption rate for sales units by building type |
| sales vacancy | The vacancy rate for sales units by building type |
| rent absorption | The absorption rate for rental units by building type |
| rent vacancy rates | The vacancy rate for rental units by building type |
| SIZES | |
| average lot size | Typical lot size in the zone for this parcel |
| sf unit size | Typical single-family unit size in the zone for this parcel |
| mf unit size | Typical multi-family unit size in the zone for this parcel |
| ZONING | |
| building types | Allowable building types for this parcel |
| FAR | Floor area ratio allowed for this parcel |
| height | Height limits for this parcel |
| max_dua | Max dwelling units for this parcel |
| POLICIES | |
| ISR | Whether to apply indirect source rule. ISR subsidies are user-specified |
| unit subsidy | User-specified per-unit subsidies |
| per sqft subsidy | User-specified per-unit subsidies for non-residential square feet |

### *User-Specified Events*

Given our current understanding, no model will be able to simulate accurately the timing, location and nature of major events such as a major corporate relocation into or out of a metropolitan area, or a major development project such as a regional shopping mall. In addition, major policy events, such as a change in the land use plan or in an Urban Growth Boundary, are outside the range of predictions of our simulation. (At least in its current form, UrbanSim is intended as a tool to aid planning and civic deliberation, not as a tool to model the behavior of voters or governments. We want it to be used to say "if you adopt the following policy, here are the likely consequences," but not to say "UrbanSim predicts that in 5 years the county will adopt the following policy.")

However, planners and decision-makers often have information about precisely these kinds of major events, and there is a need to integrate such information into the use of the model system. It is useful, for example, to explore the potential effects of a planned corporate relocation by introducing user-specified events to reflect the construction of the corporate building, and the relocation into the region (and to the specific site) of a substantial number of jobs, and examine the cumulative or secondary effects of the relocation on further residential and employment location and real estate development choices. Inability to represent such events, in the presence of knowledge about developments that may be 'in the pipeline,' amounts to less than full use of the available information about the future, and could undermine the validity and credibility of the planning process. For these reasons, support for three kinds of events has been incorporated into the system: development events, employment events, and policy events.

# Appendix Q. SCAG PECAS Estimated Aggregated TOD Impacts

**Overall Consumer Surplus Measures**

The integration of economic modelling with random utility modelling in the PECAS formulation allows the calculation of composite utility measures that are consistent with Consumer Surplus (Producer Surplus) measures, which is the difference of the willingness to pay to the actual price paid for commodities. If a household pays $1000 per month for their housing, while it is affordable and willing to pay $1500, the household gains a surplus of $500. These measures take into account households' and industries' tradeoffs between transportation, space/housing, technology/lifestyle, with error terms representing the advantages of variety and choice options (the *raison d'être* of large cities), with endogenous prices serving to balance supply and demand spatially.

In many modelling frameworks, the competing metrics of transportation services, land affordability, access to services and labor force mobility must be tabulated separately, and combined with care not to double-count into a measure of overall scenario performance. The PECAS AA module is designed to contain a complete representation of the spatial economy within a consistent theoretical framework, and, therefore, the relative tradeoffs between different elements of travel, location, land use, etc., are included in PECAS. This ability to combine the analysis is relevant in this study since gains in one dimension (e.g. better transit service) can be analyzed together with losses in other dimensions (e.g. less affordable housing). See (J.E. Abraham and Hunt 2007) for a detailed description of the comprehensive presentation of the economic system and its use for scenario comparison.

Benefits are calculated by comparing the SCAG PECAS version of "with" the estimated TOD-related parameters, *SD10*, against the *SDBU*, the version "without" parameters. The gains in consumer surplus due to the calibrated change in TOD desirability are shown in Table Q.1. The observed target displacement of low income households, changes in median income, and changes in rent in around TOD zones was achieved through changes in TOD attractiveness that caused a general increase in welfare of all types of households in the model. This is further investigated spatially in the following sections.

**Net Rent Change**

The AA module in PECAS is comprehensive in that it represents all of the transactions that occur in the economy, with both parties of a transaction - buyer and seller - represented. However, the landlords (and other property owners), and developers, are not represented in the AA module since they are normally modelled behaviorally in the SD module. When rents increase, there is a dis-benefit to the payers of rent (tenants), but it is a benefit to the receivers of rent (landlords or profits for developers).

The benefit to landlords/developers is calculated separately, as the net change in rent received, and is shown in Table Q.1 and Figure Q.1, separated into the housing types in the model. A decrease in the total rent charged for low density (single family) housing is apparent, and there is an increase in the rent charged for high-rise space.

The total benefit is $1.647 billion, and it does not include any rent leakage to absentee landlords. In other words, the owner-occupied dwellings are represented as if they are rented to the owner household, so increases in owner-occupied home value are included as a mitigating dis-benefit in the consumer surplus measures of Table Q.1, and a corresponding benefit.

**Table Q.1: Annual Gains and Losses due to Displacement**

| Activity | | Consumer surplus change | Benefit per Household |
|---|---|---|---|
| **Households** | INC0010 2 or less | $184.9 M | $260 |
| | INC0010 3 or more | $39.8 M | $342 |
| | INC1025 2 or less | $131.6 M | $272 |
| | INC1025 3 or more | $110.1 M | $307 |
| | INC2550 2 or less | $220.4 M | $285 |
| | INC2550 3 or more | $236.1 M | $300 |
| | INC5075 2 or less | $135.2 M | $321 |
| | INC5075 3 or more | $177.8 M | $341 |
| | INC75100 2 or less | $72.7 M | $372 |
| | INC75100 3 or more | $119.0 M | $387 |
| | INC100150 2 or less | $69.5 M | $306 |
| | INC100150 3 or more | $115.2 M | $352 |
| | INC150m 2 or less | $67.4 M | $272 |
| | INC150m 3 or more | $81.7 M | $286 |
| **Business** | Office | $1.4 M | |
| | Other | $9.5 M | |
| | Goods | $20.5 M | |
| | Services | $30.4 M | |
| | Exporters | -$0.2 M | |
| | Importers | -$27.8 M | |

**Table Q. 2: Aggregate Rent Change**

| Space types | Rent Change |
|---|---|
| VL Luxury | -6.6 M |
| VL Economy | -1.5 M |
| L Luxury | -111.2 M |
| L Economy | -78.5 M |
| MD Separate Entrance | -1.3 M |
| MD Shared Entrance | -0.5 M |
| Higher Density | -0.8 M |
| High-rise | 41.3 M |
| Urban MH | 11.1 M |




**Figure Q.1: Aggregate Rent Change (visual representation of previous table)**

**Benefits Categorized by Commodity**

A portion of the consumer surplus measures from the previous section is due to the changes of interaction between buyers and sellers. In the PECAS AA, the most frequently updated choice in its calculation process is the economic interactions between buyers and sellers, with one party usually travelling (e.g. to work, to school) and paying the transport cost. Figure Q shows the benefits and dis-benefits due to transactions. It is shown that much of the benefit is due to lower prices paid for low density single family dwellings (ResType3 and ResType4).

Notably, there are dis-benefits due to the transport costs of acquiring some household services including Retail, Restaurant, Personal Services, Education and Amusements. It is worth noting that *the zone-to-zone costs of transportation* were not changed in this analysis, and the same zone-to-zone travel time and cost matrix was used, while the attractiveness of TODs was instead simulated via a change in zonal attractiveness. Therefore, increases in transportation costs in Figure Q represent further distances travelled to certain types of personal services when households cluster closer to TODs. The current availability of retail service type space in TOD zones does not seem to be adequate to allow services to also cluster in TODs. It is important to allow for the development of non-residential space in adequate quantity to allow services to follow changes in household locations.

**Spatial Benefit Measures**

The impact of displacement on low income groups can better be understood through spatial maps. Figure Q.2 shows the benefit measures for the lowest income households. The outline color of the zone shows the downtown TOD and non-downtown TOD zones, while the interior coloring of the zones shows the estimated aggregate benefits for the household category.

Low income households are seen to be receiving benefits in the non-downtown TODs, with a substantially smaller negative impact in the downtown TODs. Outside of the TODs, low income households are receiving a small benefit.

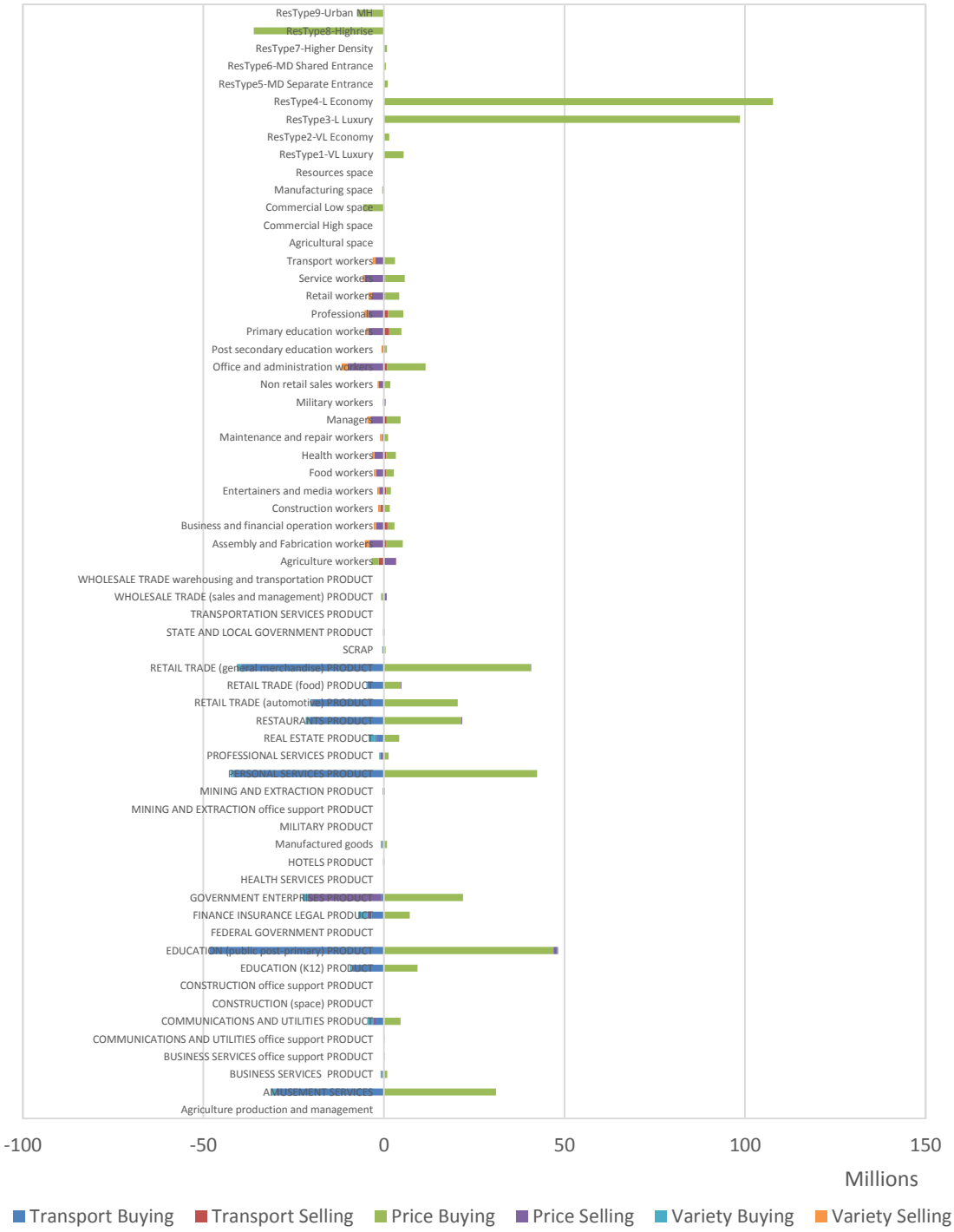



**Figure Q.2: Benefits and Dis-benefits Due to Transactions**

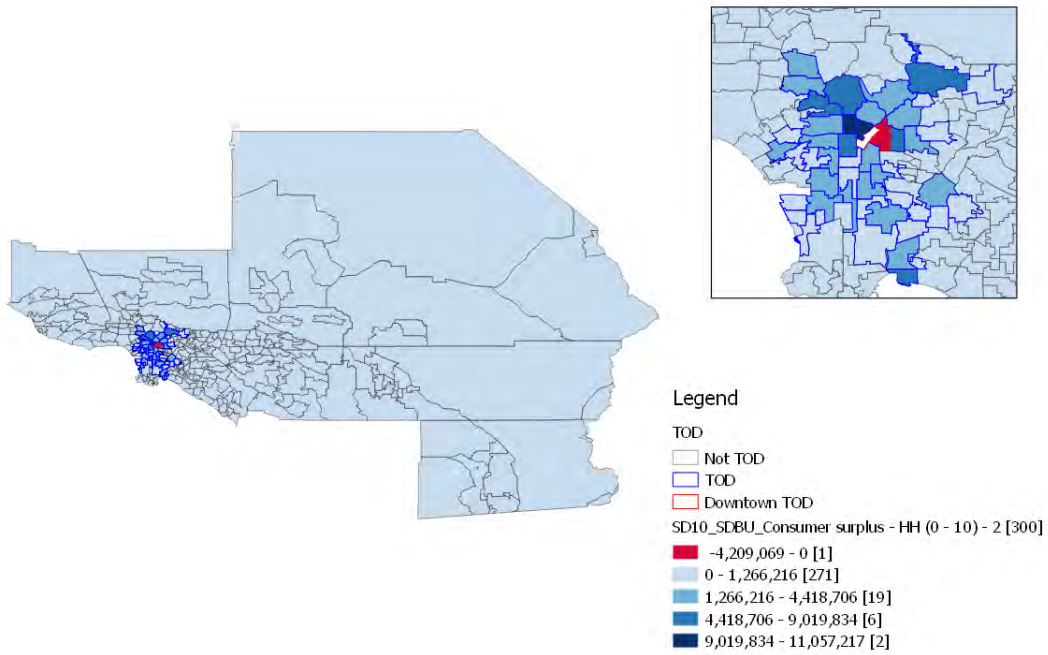



**Figure Q.2: Benefit measures for Households with $0 - $10k income and 2 or less**

Figure Q.4 shows the aggregate benefits to households in the 100-150k income group of size 3 or more. The aggregate benefits are smaller relative to that of the low income group and much of the benefit occurs in suburban zones. Even though the portion of wealthy people increases in the TOD zones in the scenario, these larger households (many with children) in the second highest income category are not generating most of their benefits from TOD zones. Rather, their benefits are predominantly due to effects in non-TOD zones, for instance slightly lower rents in the rest of the region could be benefitting these wealthier suburban households.

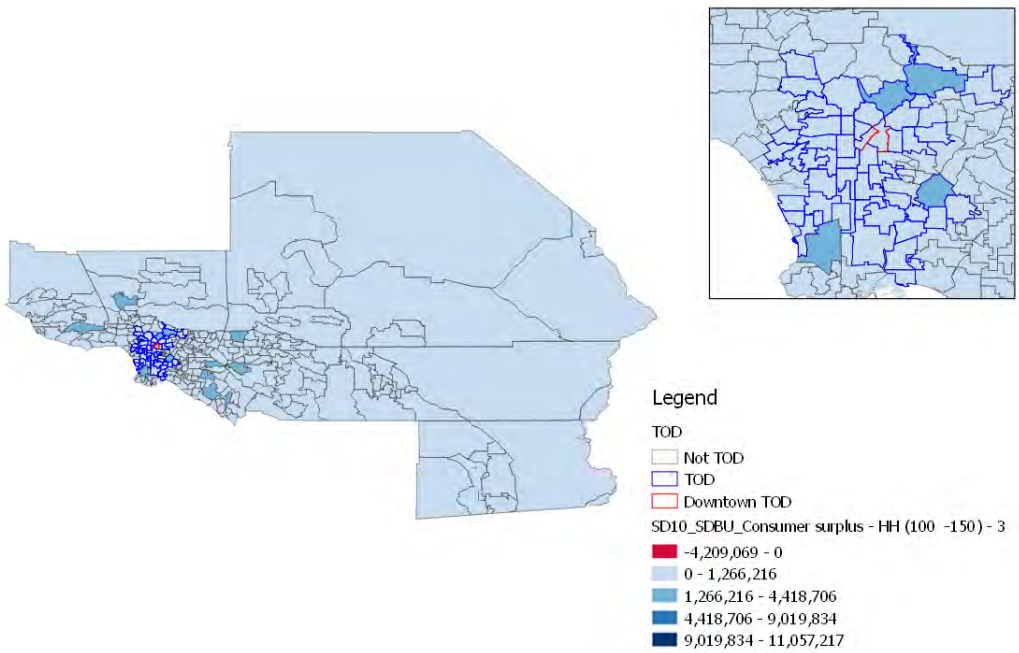



**Figure Q.4: Benefits to households in $100K - $150k income and 3 or more**

**Housing Consumption Changes**

The PECAS model represents housing choices, with flexibility in choice of dwelling type, the quantity of housing (measured in square feet) and the location of housing. Figure  shows the changes in the amount of housing in square feet consumed by each household category with the scenario, in the TOD zones. There is an increase in space use associated with higher numbers of households in the TOD zones, with most of the increased use occurring in the Low Density Economy category (ResType4).

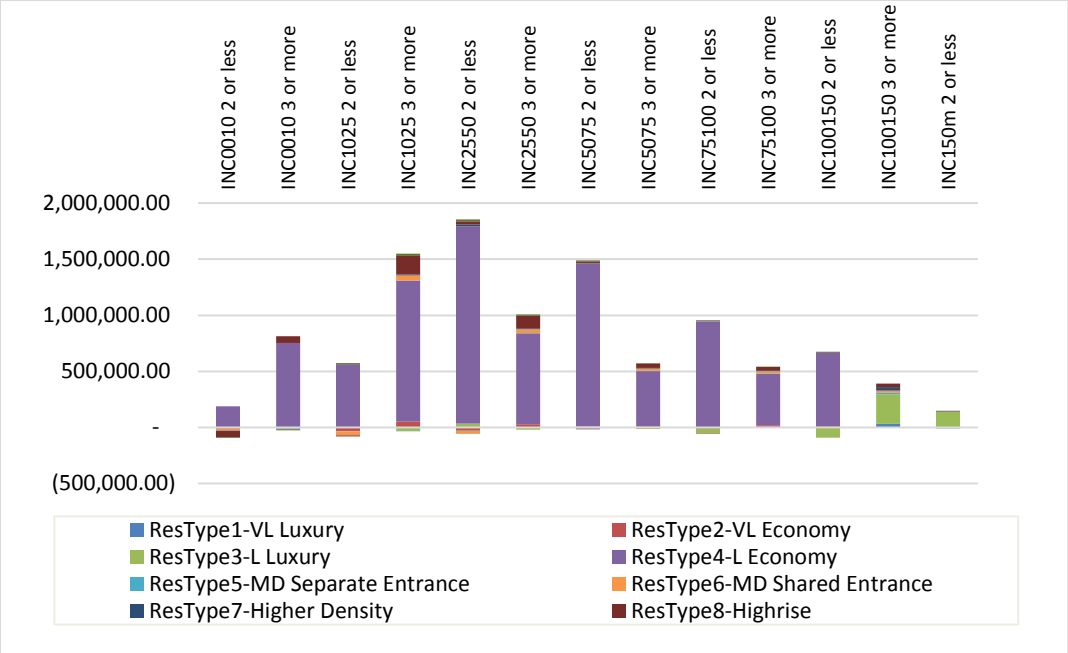



**Figure Q.5: Change in Consumption of Housing in TOD zones (sq. ft.)**

Figure  shows the region-wide change in housing consumption. The lower income categories of households end up using less space overall, since they squeeze into the single family dwelling space dominant around the TOD zones. The higher income households use more space overall. The pattern of changes in high-rise space consumption indicates a displacement, with higher income households consuming more high-rise space, and thus lower income households consuming less space per household.

Figure  shows the number of households in each space type in the TOD zones in each scenario, and Figure  shows its changes. Households are moving predominantly into low density economy space and high-rise dwellings in these zones. This is a partial reflection of the existing housing stock in these zones. Households who prefer to move into TOD zones in the SD10 scenario will consume the existing types of space in TOD zones, which are predominantly low density (single family) "economy" dwellings.

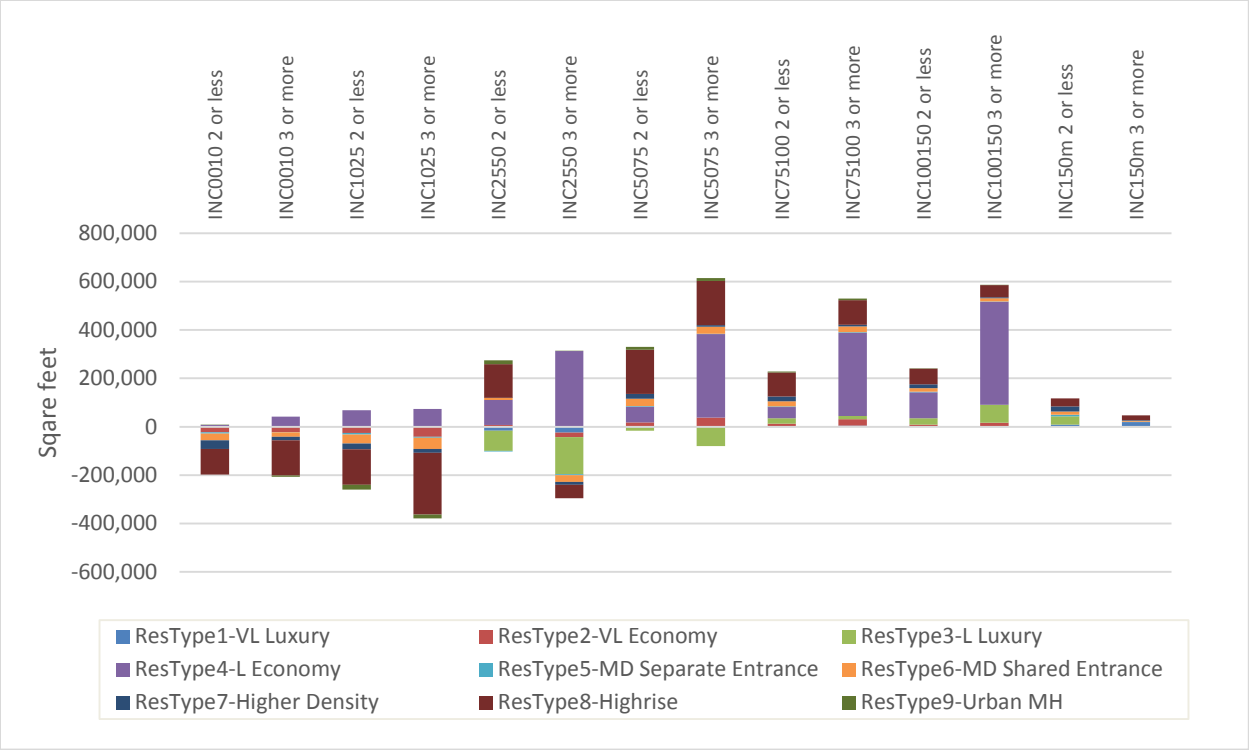



**Figure Q.6: Change in Consumption of Housing in Region (sq. ft.)**

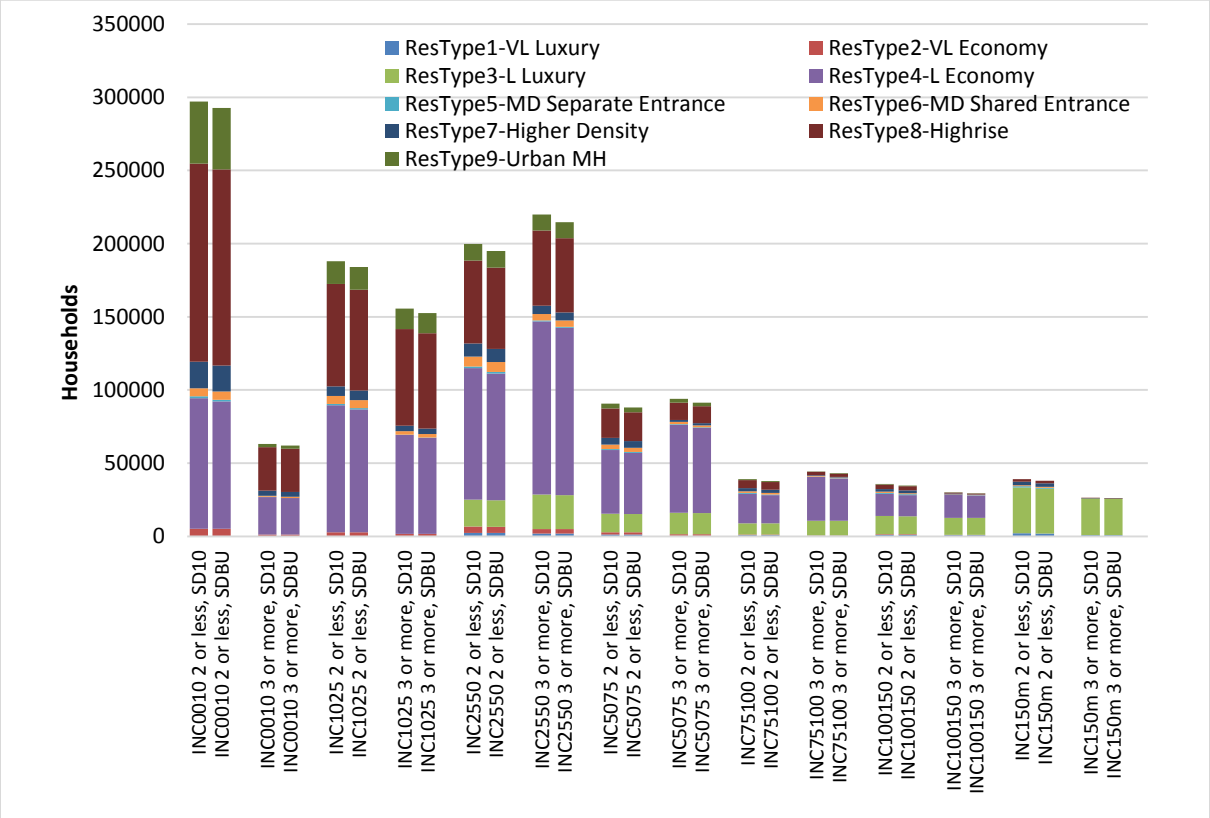



**Figure Q.7 Number of Households in Each Housing Type in Each Scenario, in the TOD Zones**

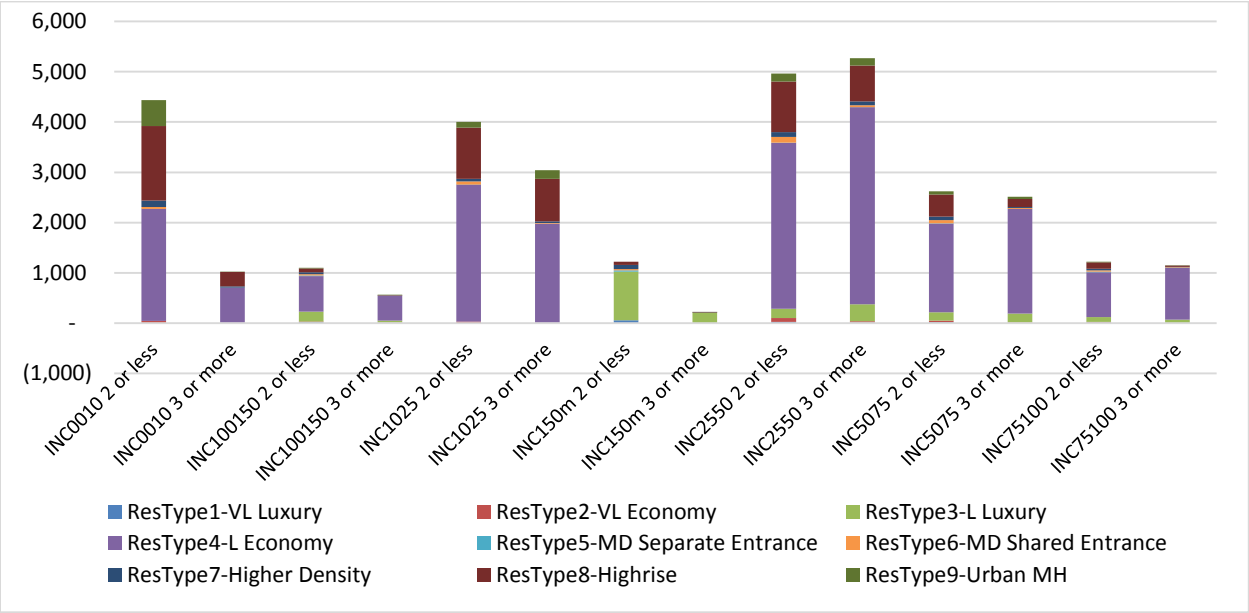



**Figure Q.8: Shift in housing type in TOD zones**

Figure  shows the changes in the number of households in different types of space in the entire region. When households move to TOD zones in this scenario, most households choose the same type of housing that they were choosing in their former zones.  A dominant shift is the move away from "luxury" single family dwellings (representing the larger dwellings) into high-rise and "economy" single family dwellings, representing the more modest single family dwellings that dominate the current stock of housing in the TOD zones.

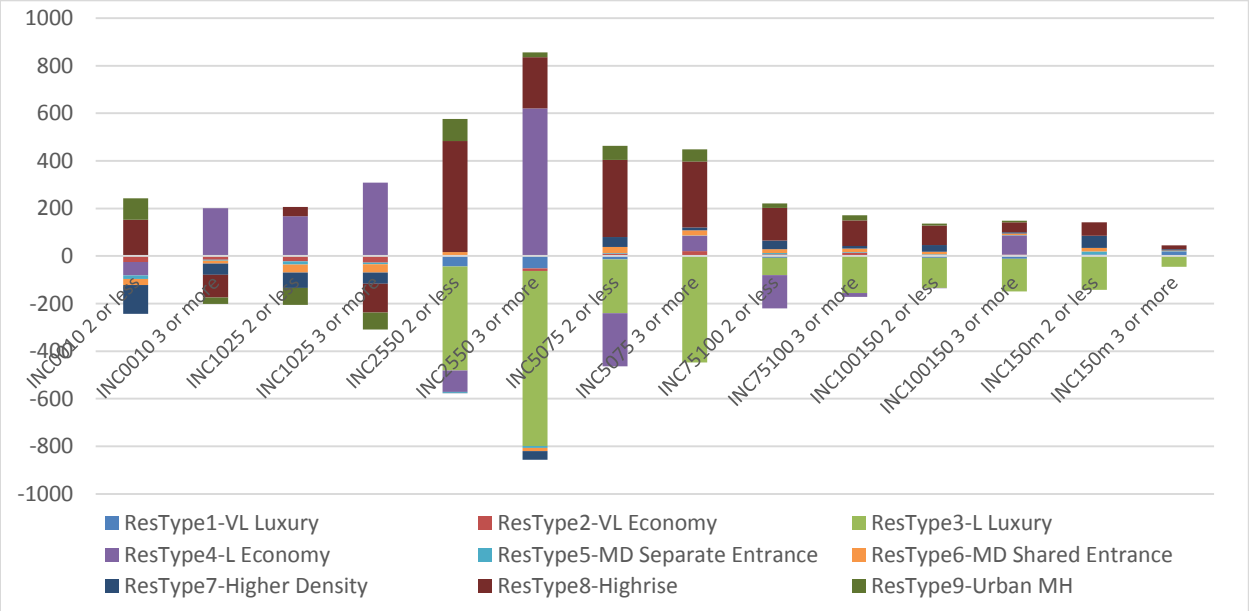



**Figure Q.9: Shift in housing type region-wide**

# Appendix R. In- and Out- Migration Regression Results

We initially ran regressions for both in and out migration rates including an extensive list of control variables. Table R.1 presents the regression results for both regions. The model shows that once we control for all other observed factors, TODs, specifically Downtown TOD, seem to dampen out-migration (a negative coefficient) in Los Angeles. This indicates that fewer people are moving out. Although the direction of the coefficient is the same for the Bay Area, the relationship was not significant. This may have to do with how Downtown TOD was defined, as being any TOD within the city boundaries of San Francisco, San Jose, and Oakland, which encompassed nearly half of all TODs in the region. While the model does produce a positive coefficient on in-migration (indicating that people are moving in), for both TOD variables the value is not statistically significant in Los Angeles. In the Bay Area, in-migration was positively correlated with Downtown TODs, although it was not statistically significant. On the other hand, TODs appear to dampen in-migration outside of the three main cities. One of the problems with this larger model is that many of the variables are collinear, producing problems of multi-collinearity and endogeneity.

## Table R.1: In- and Out-Migration, Multivariate Regressions, LA County and SF Bay Area 2009-13

| | In-Migration | | Out-Migration | |
|---|---|---|---|---|
| | **Los Angeles** | **Bay Area** | **Los Angeles** | **Bay Area** |
| Intercept | 2.930051 *** | 0.0894008 * | 2.120327 ** | -0.11876 * |
| Median Age | -0.00339 *** | -0.0030345 *** | -0.00237 *** | 0.00323 *** |
| Percentage of the Population Who are Female | -0.00065 ** | 0.0139567 | -0.00019 | -0.08772 * |
| Percentage of Population Between 25 and 35 | 0.000842 *** | 0.1274436 *** | 0.000678 | -0.10029 ** |
| Percentage of the Population 65 Years & Over | 0.000166 | 0.0580711 * | -0.00105 ** | -0.00527 |
| Percent Currently Enrolled in College | 0.000789 *** | 0.1834657 *** | 0.000713 *** | -0.11993 *** |
| Percent non-Hispanic black | -0.00006 | 0.0057104 | -0.00015 | 0.01332 |
| Percent Asian | 0.000191 * | -0.0119541 | 0.000294 * | 0.01703 |
| Percent Hispanic or Latino | -0.00062 *** | -0.053071 *** | -0.00049 *** | 0.06869 *** |
| Percent of the Population in Poverty | 0.001105 *** | 0.0892205 *** | 0.000875 *** | -0.03032 |
| Percent Renters | 0.000951 *** | 0.1125053 *** | 0.000876 *** | -0.09859 *** |
| Percent Vacancy | 0.00032 | 0.0047989 | 0.00086 *** | -0.06506 ** |
| Percent of Renters That are Housing Burdened | 0.000213 ** | 0.0331735 ** | 0.000164 | -0.01575 |
| Percent of Households With Children | -0.00018 | 0.0032998 | -0.00076 *** | 0.05627 * |
| Percent Female Headed Households | -0.00021 | | -0.0001 | |
| Median Household Income (/10,000) | 0.006448 ** | 0.0002876 | 0.000461 | 0.0047 |
| Median Household Income Squared | -0.00021 ** | 0.0001503 * | 0.000011 | -0.00032 *** |
| 20/80 Ratio (Household Income)[1] | -0.01486 | 0.0763761 *** | -0.01853 | -0.08849 *** |
| Percent of Population Who are Foreign-Born | -0.00095 *** | -0.0818435 *** | -0.00103 *** | 0.04187 |
| Percent of Available Section 8 Units | -0.0005 | 0.0669784 | -0.00052 | -0.0436 |
| Percentage of LIHTC Units | -0.00003 | -0.0336884 * | -0.00032 | 0.05858 ** |
| Percentage of Public Housing Units | -0.00037 | -0.0948952 *** | -0.00131 *** | 0.1004 ** |
| Jobs to Household Ratio (LEHD, 2011) | 0.000992 ** | 0.0004233 | 0.000261 | -0.00028 |
| Percent of the Population in Group Quarters | 0.00264 *** | 0.3606687 *** | 0.002332 *** | -0.38737 *** |
| Percent of Residential Structures With 20 or More Units | 0.000866 *** | 0.1003296 *** | 0.000619 *** | -0.08144 *** |
| Percent of Residential Buildings Built Pre 1950 | -0.00006 | -0.0171072 *** | -0.0001 | 0.02137 ** |
| Tracts Within a Mile of the Beach | 0.013456 *** | | 0.003896 | |
| Tracts Located on Hilly Areas | 0.007143 * | | 0.004643 | |
| Percent of Affordable Rental Units | -0.00038 *** | -0.0018706 | -0.00033 ** | 0.01037 |
| Area With Rent Regulation | -0.00635 ** | -0.0034646 | -0.00727 * | 0.00345 |
| Percent Open Space[2] | -0.00003 | -6.15E-07 | -0.00001 | 8.94E-07 |
| Tracts in North LA County | 0.010927 * | | 0.001999 | |
| CalEnviro Pollution Score | 0.000017 | | 0.00021 | |
| Change in Median Gross Rent (06-10 - 09-13) | -0.01203 | -0.0030426 | -0.03363 *** | 0.014 *** |
| Change in Median Home Value (06-10 - 09-13) | 2.731555 *** | -0.0197218 ** | 1.908278 * | 0.03138 *** |
| Joint Development Project | -0.01821 *** | | -0.01318 | |
| Downtown TOD[3] | 0.012943 | 0.0033894 | -0.07127 *** | -0.00666 |
| Other TOD Neighborhood | 0.000033 | -0.006383 ** | -0.00104 | 0.0073 |
| Adjusted R-Squared | 0.56236 | 0.5939 | 0.38797 | 0.4317 |
| n | 2,224 | 1545 | 2,224 | 1545 |

*** P<.01, ** p<.05, *p<.10

[1] The entropy index was used for the Bay Area, which measures the degree of income inequality

[2] Open space density (per 1,000 population) was used for the Bay Area

[3] For the Bay Area, Downtown TODs were consdered any TODs (within <1/2 mile of a rail station) in SF, San Jose, and Oakland

Source: 2006-10, 2009-13 ACS

Tabulations by C.Pech & P. Ong, May 2015, M. Zuk Aug 2015

# Appendix S. Average Daily VMT by Income and Rail Access

**Table S.1: Statewide average daily household VMT by income and rail access, NHTS 2009, and CHTS 2010-2012**

| NHTS 2009 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Near Rail | | Away Rail | | VMT difference | | t-test |
| Income categories | VMT | N | VMT | N | % of VMT difference | Absolute VMT difference | |
| <$50k | 32.6 | 411 | 40.5 | 7,958 | 19.57% | 7.92 | 3.08 |
| $50k-$75k | 49.4 | 115 | 60.4 | 3,116 | 18.14% | 10.95 | 3.04 |
| $75k - $100k | 47.4 | 90 | 71.9 | 2,577 | 34.10% | 24.53 | 5.76 |
| >$100k | 60.5 | 159 | 80.4 | 5,244 | 24.69% | 19.85 | 5.97 |
| Did not report | | 72 | | 1,483 | | | |
| Total | 41.9 | 847 | 58.0 | 20,378 | 27.88% | 16.18 | 9.84 |
| CHTS 2010-2012 | | | | | | | |
| | Near Rail | | Away Rail | | VMT difference | | t-test |
| Income categories | VMT | N | VMT | N | % of VMT difference | Absolute VMT difference | |
| <$50k | 16.6 | 882 | 28.6 | 13,481 | 42.08% | 12.04 | 9.75 |
| $50k-$75k | 29.3 | 358 | 44.6 | 6,544 | 34.41% | 15.36 | 4.66 |
| $75k - $100k | 29.6 | 287 | 50.4 | 5,581 | 41.31% | 20.81 | 6.63 |
| >$100k | 35.3 | 693 | 59.1 | 10,964 | 40.23% | 23.78 | 13.06 |
| Did not report | | 197 | | 3,444 | | | |
| Total | 26.1 | 2,417 | 43.5 | 40,014 | 40.11% | 17.46 | 18.16 |

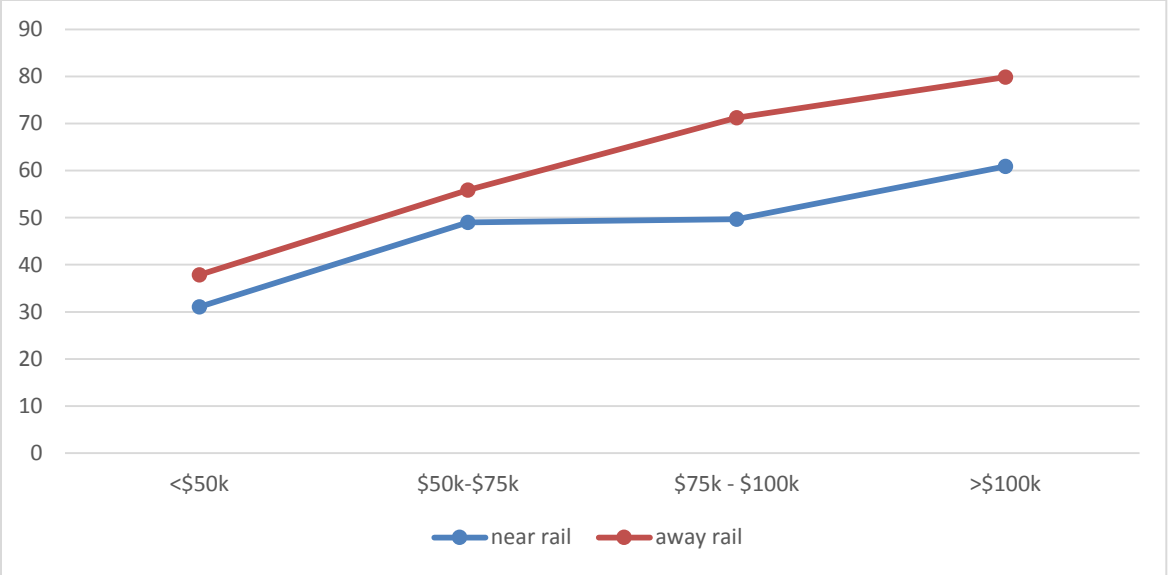



**Figure S.1: Statewide average daily household VMT by income and rail access (NHTS 2009 data)**

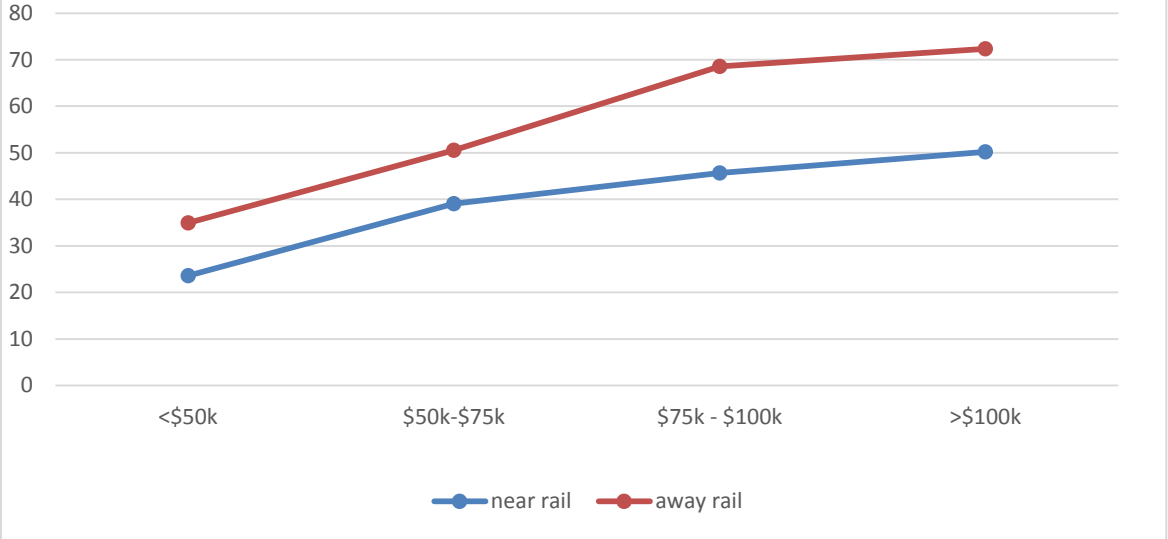



**Figure S.2: Statewide average daily household VMT by income and rail access (CHTS data)**

**Table S.2 Average daily household VMT by income category and rail access, San Francisco Bay Area only, NHTS 2009, and CHTS 2010-2012**

| NHTS 2009 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Near Rail | | Away Rail | | VMT difference | | t-test |
| Income categories | VMT | N | VMT | N | % of VMT difference | Absolute VMT difference | |
| <$50k | 23.58 | 147 | 34.95 | 1,134 | 32.53% | 11.37 | 4.12 |
| $50k-$75k | 39.04 | 63 | 50.52 | 636 | 22.72% | 11.48 | 3.07 |
| $75k - $100k | 45.67 | 58 | 68.56 | 538 | 33.39% | 22.89 | 4.18 |
| >$100k | 50.22 | 99 | 72.34 | 1,311 | 30.58% | 22.12 | 6.59 |
| Total | 36.91 | 367 | 56.23 | 3619 | 34.36% | 19.32 | 10.04 |
| CHTS 2010-2012 | | | | | | | |
| | Near Rail | | Away Rail | | VMT difference | | t-test |
| Income categories | VMT | N | VMT | N | % of VMT difference | Absolute VMT difference | |
| <$50k | 14.17 | 391 | 26.78 | 1,716 | 47.09% | 12.61 | 7.13 |
| $50k-$75k | 22.69 | 244 | 36.67 | 1,234 | 38.12% | 13.98 | 3.44 |
| $75k - $100k | 24.18 | 227 | 44.09 | 1,240 | 45.16% | 19.91 | 6.81 |
| >$100k | 31.85 | 564 | 54.42 | 3,635 | 41.47% | 22.57 | 11.56 |
| Total | 23.36 | 1,426 | 38.31 | 7,825 | 39.02% | 14.95 | 15.64 |

[1] *This is insignificant.*

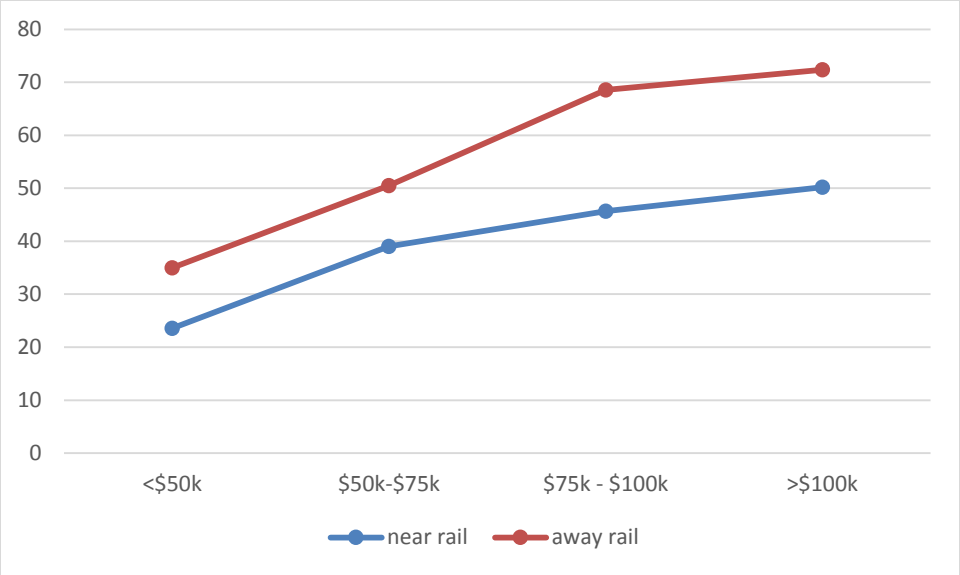



**Figure S.3: Average daily household VMT by income and rail access, SF Bay Area only (NHTS data)**

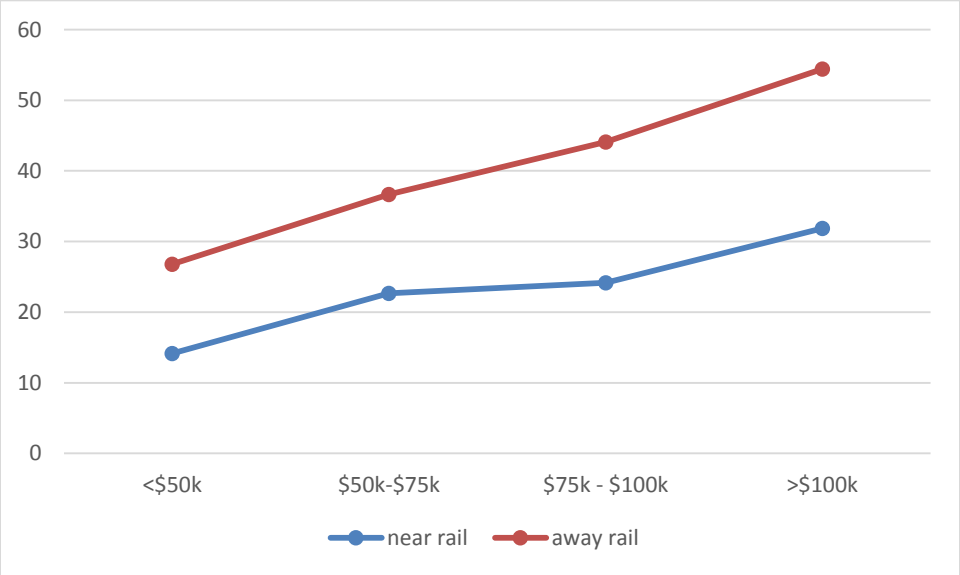



**Figure S.4: Average daily household VMT by income and rail access, SF Bay Area only (CHTS data)**

**Table S.3: Average daily household VMT by income category and rail access, Los Angeles region only, NHTS 2009, and CHTS 2010-2012**

| NHTS 2009 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Near Rail | | Away Rail | | VMT difference | | t-test |
| Income categories | VMT | N | VMT | N | % of VMT difference | Absolute VMT difference | |
| <$50k | 28.06 | 117 | 38.53 | 2,677 | 27.17% | 10.47 | 2.71 |
| $50k-$75k | 63.71 | 26 | 58.8 | 1,186 | -8.35% | -4.91 | (-0.44)[1] |
| $75k - $100k | 50.12 | 10 | 74.36 | 925 | 32.60% | 24.24 | 2.05 |
| >$100k | 65.29 | 15 | 82.38 | 1,660 | 20.75% | 17.09 | 2.32 |
| Total | 38.05 | 168 | 59 | 6,448 | 35.17% | 20.64 | 5.85 |
| CHTS 2010-2012 | | | | | | | |
| | Near Rail | | Away Rail | | VMT difference | | t-test |
| Income categories | VMT | N | VMT | N | % of VMT difference | Absolute VMT difference | |
| <$50k | 18.04 | 355 | 27.15 | 4,188 | 33.55% | 9.11 | 4.75 |
| $50k-$75k | 38.28 | 105 | 39.78 | 2,130 | 3.77% | 1.5 | (0.23)[1] |
| $75k - $100k | 35.25 | 74 | 46.27 | 1,951 | 23.82% | 11.02 | 2.62 |
| >$100k | 47.15 | 97 | 56.22 | 3,969 | 16.13% | 9.07 | (1.44)[1] |
| Total | 26.57 | 631 | 34.58 | 12,238 | 23.16% | 8.01 | 7.23 |

[1] *This is insignificant*

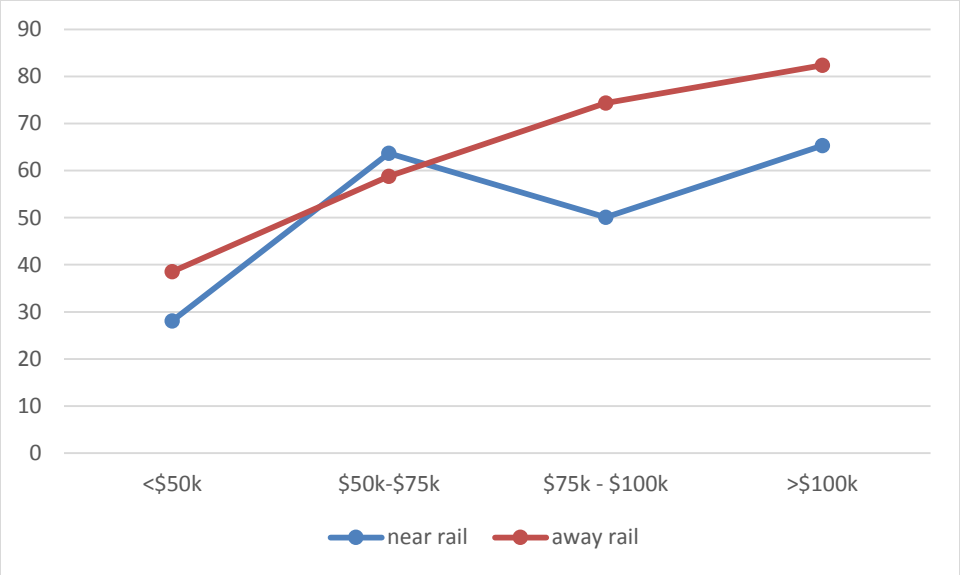



**Figure S.5: Average daily household VMT by income and rail access, LA Region only (NHTS data)**

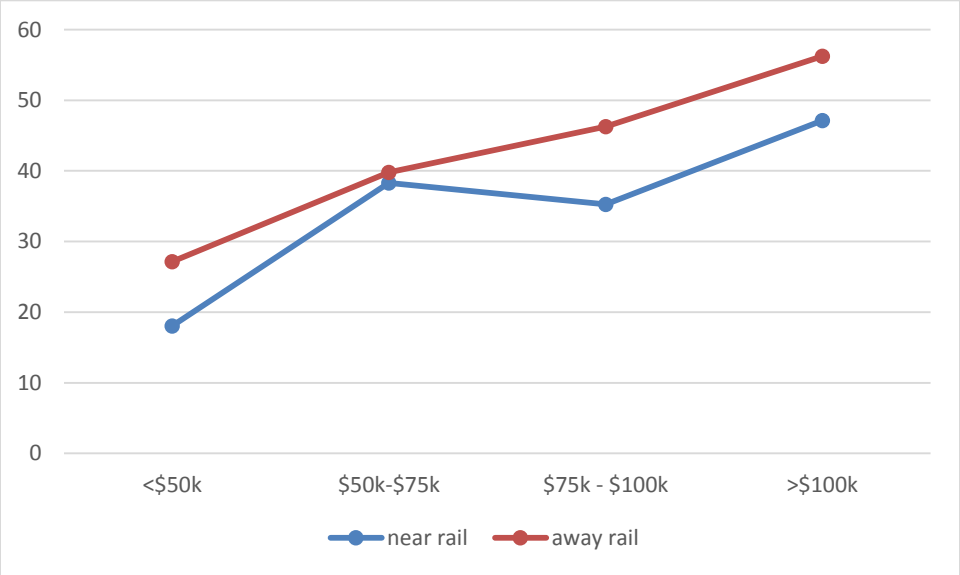



**Figure S.6: Average daily household VMT by income and rail access, LA region only (CHTS data)**

**Table S.4: Average VMT for different mover's profiles, by income category**

| Recent mover (last 5 years) VMT by mover profile and income | $0 to $49,999 | | $50,000 to $99,999 | | $100,000+ | | NA | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | Avg VMT[1] | N | Avg VMT | N | Avg VMT | N | Avg VMT | **Total N**[3] | Average VMT |
| Away to Near[2] | 1,050 | 30 | 697 | 46 | 703 | 54 | 153 | 33 | **2,603** | 41 |
| Away to Away | 1,122 | 32 | 892 | 53 | 680 | 61 | 162 | 41 | **2,856** | 46 |
| Near to Near | 121 | 13 | 108 | 26 | 120 | 32 | 15 | 35 | **364** | 24 |
| Near to Away | 22 | 28 | 12 | 24 | 18 | 43 | 3 | 66 | **55** | 34 |
| **Total** | **2,315** | | **1,709** | | **1,521** | | **333** | | **5,878** | |

*[1] Daily VMT aggregated to the household level, "complete households" only.*
*[2] Previous residential location defined at the zip code level.*
*"Near" is defined as having a rail station in the home zip code area.*
*[3] 16% of households in the CHTS data moved in the previous five years. Previous address locations outside of California are excluded.*

**Table S.5: Predicted change in VMT for a stylized one-to-one displacement scenario**

| Change of low-income households in TOD area | | | | -1000 | |
|---|---|---|---|---|---|
| Change of high-income households in TOD area | | | | 1000 | |
| | | Uncontrolled Descriptive analysis | | Tobit [1, 2] | |
| | | NHTS | CHTS | NHTS | CHTS |
| Before displacement | Average VMT for low-income households living near rail [2] | 34.61 | 15.61 | 22.7 | 2.5 |
| | Average VMT for high-income households living away from rail | 79.92 | 51.36 | 121.2 | 68.6 |
| | Aggregate | 114,530.0 | 66,970.0 | 143,900.0 | 71,100.0 |
| After displacement | Average VMT for low-income households living away from rail | 39.09 | 23.86 | 42.6 | 19.5 |
| | Average VMT for high-income households living near rail | 67.75 | 34.21 | 69.4 | 51.6 |
| | Aggregate | 106,840.0 | 58,070.0 | 112,000.0 | 71,100.0 |
| % changes of aggregated VMT | | -6.71% | -13.29% | -22.17% | 0.00% |

*[1] Each VMT estimate comes from multiplying regression coefficients by the household income value along with average values for all other dependent variables included in the model.*
*[2] Some of the values predicted by the Tobit model could be small, due to this prediction is based on the average number for each parameter and is only for hypothetical scenarios. Therefore only the differences in VMT between before and after displacement is essential in explaining the net VMT impact of displacement.*

**Table S.6: Predicted VMT change for a stylized one-to-two displacement scenario**

| Change of low-income households in TOD area | | | | -1000 | |
|---|---|---|---|---|---|
| Change of high-income households in TOD area | | | | 500 | |
| | | Uncontrolled Descriptive analysis | | Tobit | |
| | | NHTS | CHTS | NHTS | CHTS |
| Before displacement | Average VMT for low-income households living near rail [2] | 34.61 | 15.61 | 22.7 | 2.5 |
| | Average VMT for high-income households living away from rail | 79.92 | 51.36 | 121.2 | 68.6 |
| | Aggregate | 74,570.0 | 41,290.0 | 83,300.0 | 36,800.0 |
| After displacement | Average VMT for low-income households living away from rail | 39.09 | 23.86 | 42.6 | 19.5 |
| | Average VMT for high-income households living near rail | 67.75 | 34.21 | 69.4 | 51.6 |
| | Aggregate | 72,965.0 | 40,965.0 | 77,300.0 | 45,300.0 |
| % changes of aggregated VMT | | -2.15% | -0.79% | -7.20% | 23.10% |

**Table S.7: County median incomes and low-income threshold definitions**

| Median Household Income (2013 dollars) | **1990** | **2000** | **2013** |
|---|---|---|---|
| Los Angeles | $63,423 | $58,982 | $55,909 |
| Santa Clara | $90,456 | $100,352 | $91,702 |
| San Francisco | $62,818 | $74,548 | $75,604 |
| **Median Household Income (2010 dollars)** | **1990** | **2000** | **2013** |
| Los Angeles | $59,618 | $55,443 | $52,554 |
| Santa Clara | $85,029 | $94,331 | $86,200 |
| San Francisco | $59,049 | $70,075 | $71,068 |
| **80% of Median Household Income (2010 dollars)** | **1990** | **2000** | **2013** |
| Los Angeles | $47,694 | $44,354 | $42,044 |
| Santa Clara | $68,023 | $75,465 | $68,960 |
| San Francisco | $47,239 | $56,060 | $56,854 |

*Source: ACS 2009-2013; http://data.bls.gov/cgi-bin/cpicalc.pl to adjust 2013 dollars to 2010 dollars.*

# Appendix T. Anti-Displacement Strategies and Sources

***Displacement Protection Policies***

- Just Cause Eviction: Just cause eviction statutes are laws that protect tenants from eviction for an improper reason. Cities or states that have just cause eviction statutes allow landlords or owners to evict a tenant only for certain reasons, such as failure to pay rent or for violation of the lease terms.
- Rent Stabilization (or rent control) (RSO): The purpose of Rent Stabilization ordinances is to protect tenants from excessive rent increases, while at the same time allowing landlords a reasonable return on their investments (Los Angeles Municipal Code, Chapter XV). Such ordinances regulate the percentage of annual rent increase, but may allow rent to be reset at market-rate upon vacancy. Residential rental units covered by the RSO exclude single-family dwellings and exempt affordable housing units (ex. Section 8). RSO applies to the properties within the jurisdiction that were built prior to the policy implementation. In the City of Los Angeles for example the RSO applies to properties built prior to October 1, 1978.
- Rent Mediation (or rent review boards): Mediation helps the tenant and landlord reach a voluntary agreement on how to settle issues related to rent increases. The mediator normally does not make a binding decision in the case. In some jurisdictions all rent increases must also include a notice to the tenant of their right to mediation, and a tenant can file a mediation petition with the jurisdiction.
- Preservation of Mobile Homes, part of the Rent Stabilization Ordinance: Rent stabilization ordinances applicable to mobile homes, which are viewed as a source of affordable housing.
- Single Room Occupancy (SRO) Preservation Ordinance: Rent stabilization ordinances applicable to properties designated as "single room occupancy."
- Condominium Conversion Ordinance: Many cities have enacted condominium conversion ordinances that impose substantive restrictions on the ability to convert apartment units into condominiums, such as prohibiting conversions unless the city or regional vacancy rate is above a certain fixed amount or requiring that a certain number of units must be sold to persons of very low, low and moderate incomes. The purpose of such ordinances is to protect the supply of rental housing.
- Foreclosure Assistance: local programs that assist residents with foreclosure.
- First Source Hiring Ordinances: Such ordinances ensure that city residents are given priority for new jobs created by municipal financing and development programs.

***Affordable Housing Policies***

- Housing Development Impact Fee (or Jobs-Housing Linkage Fee): A per square foot or per unit development fee levied on market rate residential development that is used to develop or preserve affordable housing. In-lieu fees are different from impact fees and are not as flexible because they relate only to required dedications where they can be appropriately used. Impact fees can be applied before new development is started or completed, which may allow costs to be transferred to future residents in the area. Finally, impact fees can be implemented earlier than in lieu fees so that the capital need matches the need for services (Juergensmeyer and Roberts 2013). A jobs-housing linkage is assessed on developments that will create low-wage jobs and require affordable housing for those workers.
- Commercial Development Impact (or Linkage) Fee: A per square foot development fee levied on non-residential development that is used to develop or preserve affordable housing.

- Affordable Housing Trust Fund: creates affordable rental housing for low and very low-income households by making long-term loans for new construction or for the rehabilitation of existing residential structures through a competitive process (L.A. Housing and Community Investment Department 2014).
- Inclusionary Zoning/Below Market Rate Housing: When a jurisdiction requires a certain percentage of housing units in market-rate developments to be affordably priced to income-specified households. In-Lieu Fees allow a developer to "buy out" of an inclusionary housing obligation. This may seem to defeat the purpose of inclusionary zoning, but the revenue from these fees is used to develop affordable units off-site.
- Local Density Bonus Ordinance: Additional density allowance given in return for affordable housing. The local density bonus is in addition to mandated State requirements.
- Community Land Trusts: Community land trusts are nonprofit, community-based organizations whose mission is to provide affordable housing in perpetuity by owning land and leasing it to those who live in houses built on that land.

***Sources used to create the list of anti-displacement strategies***


ABAG (2014). *Affordable Housing Funding Gap Analysis*.

Bates, LK. (2013). *Gentrification and Displacement Study: Implementing an Equitable Inclusive Development Strategy in the Context of Gentrification.* Commissioned by City of Portland, Bureau of Planning and Sustainability. www.portlandoregon.gov/bps/article/454027

Causta Justa :: Just Cause (2014). *Development without Displacement: Resisting Gentrification in the Bay Area.* http://www.cjjc.org/images/development-without-displacement.pdf

Chapple K. (2009). *Mapping Susceptibility to Gentrification: The Early Warning Toolkit*. University of California Center for Community Innovation. http://communityinnovation.berkeley.edu/reports/Gentrification-Report.pdf

Cravens M, et al. (2009). *Development Without Displacement, Development with Diversity.* Association of Bay Area Governments. www.bayareavision.org/initiatives/dwd-final.pdf

Damewood R, Young-Laing B. (2011). *Strategies to Prevent Displacement of Residents and Businesses in Pittsburgh's Hill District.* www.prrac.org/pdf/Hill_District_Anti-Displacement_Strategies-final.pdf.

Great Communities Collaborative. (2007). "Preventing Displacement Policy Fact Sheet." www.mapc.org/sites/default/files/Preventing%20Displacement%20Policy%20Fact%20Sheet.pdf

Figueroa Corridor Coalition for Economic Justice and Los Angeles Coalition to End Hunger and Homelessness. (2002). *Share the Wealth: A Policy Strategy for Fair Redevelopment in L.A.'s City Center.* A Policy Paper Submitted to the Community Redevelopment Agency and the Los Angeles City Council. www.saje.net/atf/cf/%7B493B2790-DD4E-4ED08F4EC78E8F3A7561%7D/sharewealth2.pdf

Levy DK, Comey J, Padilla S. (2006). Keeping the Neighborhood Affordable: A Handbook of Housing Strategies for Gentrifying Areas. The Urban Institute, Metropolitan Housing and Communities Policy Center. www.urban.org/uploadedPDF/411295_gentrifying_areas.pdf

Mallach A. (2008). Managing Neighborhood Change: A Framework for Sustainable and Equitable Revitalization. Prepared for The National Housing Institute. www.nhi.org/pdf/ManagingNeighborhoodChange.pdf

# Appendix U. Policies Adopted by each Los Angeles County City

| Policy | # | % | Jurisdictions |
|---|---|---|---|
| Condo Conversion Regulations | 24 | 27% | Agoura Hills, Beverly Hills, Burbank, Calabasas, Culver City, Diamond Bar, Glendale, Hermosa Beach, Huntington Beach, Inglewood, La Canada Flintridge, La Mirada, La Verne, Lakewood, Lawndale, Long Beach, LA City, Manhattan Beach, Pasadena, San Gabriel, Santa Monica, Sierra Madre, West Hollywood |
| Preservation of Mobile Homes | 16 | 18% | Azusa, Calabasas, Carson, Gardena, Hawthorne, La Verne, Lakewood, LA City, LA County, Malibu, Palmdale, Paramount, Pomona, Santa Clarita, Santa Monica, West Covina |
| Inclusionary Zoning/ In-Lieu Fees | 16 | 18% | Agoura Hills, Artesia, Calabasas, Claremont, Duarte, Glendale, Huntington Beach, La Verne, Long Beach, Malibu, Monrovia, Pasadena, Rancho Palos Verdes, San Fernando, Santa Monica, West Hollywood |
| Affordable Housing Trust Fund | 7 | 8% | Calabasas, L.A. City, L.A. County, Long Beach, Pasadena, Santa Monica, West Hollywood |
| Local Density Bonus | 7 | 8% | Alhambra, Arcadia, Beverly Hills, Downey, LA City, South Pasadena, West Covina |
| Just Cause | 5 | 6% | Beverly Hills, Glendale, LA City, Santa Monica, West Hollywood |
| Rent Stabilization/Control | 4 | 4% | Beverly Hills, LA City, Santa Monica, West Hollywood |
| SRO Preservation | 4 | 4% | Cudahy, Huntington Beach, LA City, Pasadena |
| Commercial Development Impact Fee | 3 | 3% | Calabasas, LA City (certain areas), West Hollywood |
| Housing Development Impact Fee | 3 | 3% | La Verne, Pasadena, Rancho Palos Verdes |
| Rent Mediation | 2 | 2% | Culver City, Gardena |
| Foreclosure Assistance | 2 | 1% | Lancaster, L.A, County |
| Community Land Trusts | 1 | 1% | City of Los Angeles |
| First Source Hiring Ordinance | 1 | 1% | City of Los Angeles |

# Appendix V. Challenges facing Inclusionary Zoning

A 2013 Center for Housing Policy brief outlined the key challenges affecting policies going forward as follows (Hickey 2013):

1. ***The Growing Difficulty of Applying Inclusionary Housing to Rental Properties***

   Jurisdictions in California have generally responded in one of three ways to prohibitions on inclusionary rental units:

   a. **No longer applying inclusionary requirements to rental developments.** This appears to be the case for a majority of California jurisdictions with existing inclusionary policies.
   b. **Applying rental requirements only to developers that request some form of "assistance," such as zoning modifications or upzoning.** In this case, the municipality conditions its assistance on voluntary compliance with inclusionary rental requirements. This approach is less impactful in places that have recently upzoned desirable development areas — since developers no longer need special approval for higher density — and in places that have made attractive zoning terms available "by right."
   c. **Shifting to a fee-based policy (sometimes with the option to waive out of the fee by providing units).** Rather than require inclusionary units to be built as part of new market-rate developments, several jurisdictions are instead assessing an affordable housing fee on new rental development. Some jurisdictions offer developers the option to produce units on site as an alternative to paying the fee — in essence, the opposite of a traditional inclusionary zoning policy with the option to pay a fee in lieu of including affordable units.

2. ***The Elimination of Redevelopment in California Undermined Many Inclusionary Housing Policies***

   This decision led many jurisdictions in the state to stop enforcing inclusionary policies that were applied only to local redevelopment areas, while significantly decreasing funds for the staff who administer inclusionary housing programs in many municipalities.

3. ***New Inclusionary Housing Policies Have Become Harder to Pass***

   While most inclusionary policies remain on the books, the market decline has made it more difficult for advocates promoting inclusionary housing to pass new policies — particularly in areas that are not experiencing major upzoning or new transit investments.

4. ***It May Get Harder to Support Inclusion Through In-Lieu Fees***

   Most communities with inclusionary housing policies allow developers the option of satisfying their inclusionary requirements by paying an in-lieu fee. Often, the in-lieu fee is set low enough that developers prefer to pay the fee rather than produce the inclusionary units themselves.

   The primary issue with an overreliance on in-lieu fees is that it can work against the goal of creating inclusive communities, particularly if fees are used to support affordable housing outside the area where new market- rate development is occurring.

A second challenge is that in-lieu fees are sometimes set too low to produce an equal number of affordable units elsewhere in the community — regardless of the setting (Hickey 2013, 12).

A third issue is that some communities lack local, affordable housing developers with the capacity to use fee revenues to produce new affordable homes.

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# L.A. agrees to spend $1.3 billion to fix sidewalks in ADA case



By EMILY ALPERT REYES
APR 01, 2015 | 3:34 PM



A buckled sidewalk at 4th and Main streets in downtown L.A. (Gary Friedman / Los Angeles Times)

Los Angeles is pledging to spend more than $1.3 billion over the next three decades to fix its massive backlog of broken sidewalks and make other improvements to help those with disabilities navigate the city as part of a tentative deal being described as a landmark legal settlement.

The proposed agreement would resolve a lawsuit filed by attorneys for the disabled, who argued that crumbling, impassable sidewalks and other barriers prevented people in wheelchairs or others with mobility impairments from accessing public pathways in violation of the Americans With Disabilities Act.

The final terms must still be approved by a federal judge, but attorneys described it as the biggest agreement of its kind in U.S. history.

City leaders said the proposed deal marks the beginning of a sorely needed effort to eliminate one of Los Angeles' most intractable neighborhood nuisances: the ugly and treacherous obstacle courses created by miles of buckling walkways.

City officials and advocates for the disabled praised the agreement at a news conference. Communities Actively Living Independent and Free Executive Director Lillibeth Navarro, whose group was among those suing the city, called it "a major win" for people with disabilities who had suffered frustration and injuries trying to move around the city. Councilman Paul Krekorian said it was a historic victory not only for people with disabilities, but also for the elderly and "anyone who is ever a pedestrian."

Under the terms of the proposed settlement agreed to by the City Council and announced Wednesday, the city must spend $31 million annually on sidewalk and other improvements beginning in the next budget year. That amount would gradually increase to $63 million in future years to adjust for rising costs.

The settlement doesn't identify any new source of funding. But City Administrative Officer Miguel Santana noted that the deal does not limit the type of funding Los Angeles can use to pay for the repairs, meaning the city could

seek various grants for the work.

It's unclear whether the promised money will completely eliminate the backlog. The Bureau of Street Services has estimated that about 40% of city sidewalks need repairs. At one point, the price tag was estimated at $1.5 billion. But Santana said there is no reliable estimate for the full cost.

UCLA urban planning professor Donald Shoup said: "It's sad to think that the only thing that has caused any movement in 40 years is a lawsuit.... But of course I'm glad they're doing it."

Even with the promised spending, he added, "It would take decades to fix our sidewalks."

Mayor Eric Garcetti said he believed the spending would be enough to stay ahead of any ongoing deterioration of aging city sidewalks. Attorney Guy Wallace, one of several lawyers representing plaintiffs in the case, said the record agreement was larger than a major, $1.1-billion settlement reached several years ago with Caltrans, the state transportation agency.

The Los Angeles suit alleged that lack of public access for Angelenos in wheelchairs "relegates them to second-class citizen status" and prevents them from being independent. Wallace said at a news conference that more than 200,000 Angelenos with mobility disabilities had struggled to navigate "dysfunctional and inaccessible" sidewalks. Tim Fox, a Denver-based attorney who is on the national board of the American Civil Liberties Union, said the settlement represented an unprecedented move by a city to broadly improve access to its sidewalks for the disabled.

The city plans to start by repairing sidewalks around parks and other city facilities, but will also fix walkways in other areas that are heavily trafficked, close to hospitals or workplaces, or requested by people with mobility challenges, including those alongside homes, Santana said. The only sidewalks that would be categorically left out are those next to buildings run by other government entities, including the Los Angeles Unified School District or federal or state agencies.

Funding to fix sidewalks has been haphazard over the years, and the city abandoned any systematic sidewalk repair program after the recession hit seven years ago. As the economy has improved, the city has revived its program and budgeted $27 million for repairs this year.

So far, Los Angeles has focused its efforts on walkways next to parks and other city facilities. Some council members have also devoted money from their discretionary funds to fix sidewalks in their districts. But the problem remains glaringly obvious in many areas and has cost the city more than $6 million in trip-and-fall payouts in less than four years, according to the city attorney's office.

Kathleen Law, 73, a Hollywood resident whom the city paid $50,000 after she tripped on a jagged sidewalk and shattered her right knee cap in 2008, said the plan was overdue.

"It's absolutely a must," said Law, adding that she still suffers pain from her injury and has had to drastically curtail her preferred form of exercise — walking. "There are some streets I just can't walk on because it's too risky."

The deterioration of city sidewalks is tied to a historic tug of war over who is responsible for fixing them. Los Angeles once held property owners responsible for fixing the adjacent sidewalks, conforming with California law. But decades ago, with federal funding in hand, the city took on responsibility for fixing sidewalks damaged by city trees.

That federal money quickly dried up and Los Angeles voters proved unwilling to pony up more tax money to continue repairs. In 1998, a move to authorize $769 million in bonds for sidewalk work was rejected. Last year, lawmakers abandoned a plan to ask voters to hike the sales tax to pay for street and sidewalk repairs.

Shoup argued that the city should pursue additional measures, including requiring owners to fix broken sidewalks next to their property when they sell.

The proposed settlement is silent on who is legally responsible for sidewalks next to private property — leaving the

door open for that kind of program, Shoup suggests. Santana said city lawmakers still have to grapple with those types of issues.

Under the terms announced Wednesday, the city can reduce its annual spending slightly — to $25 million — but it must make up for it within the next three years.

With the City Council's approval of the settlement terms, city lawyers can present a final agreement to the court.

In addition to the $1.3 billion pledged for repairs, the city will pay $15 million in attorneys fees and costs. Wallace said the city is also creating a position to monitor the work and will draft reports on its progress twice yearly.

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Emily Alpert Reyes

Emily Alpert Reyes covers City Hall for the Los Angeles Times. She previously reported on the census and demographics, tracking how our lives are changing in Los Angeles, California and the country. Before joining The Times, she worked for the pioneering nonprofit news website voiceofsandiego.org, winning national awards for her reporting on education. She has also traveled to Bolivia as a fellow with the International Reporting Project and survived the University of Chicago.



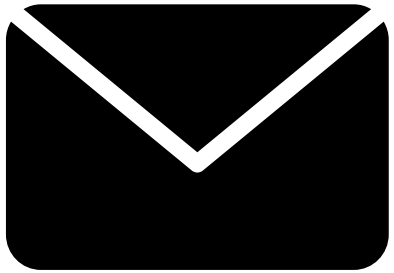
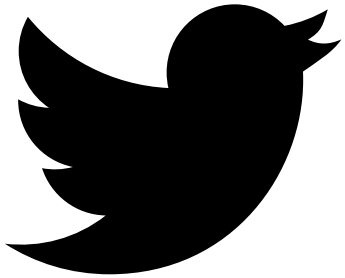

Mayor Eric Garcetti announces a $1.4 billion settlement of a lawsuit brought by disabled residents over broken city sidewalks and missing curb ramps April 1, 2015. Attorney Guy Wallace, center, represented wheelchair user Lillibeth Navarro and other plaintiffs in the class action.
*Sharon McNary*

Sharon McNary | April 1, 2015

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Los Angeles settled a giant class action lawsuit Wednesday brought on behalf of a quarter-million disabled city residents. They contended that L.A.'s broken sidewalks impaired their rights under the Americans with Disabilities Act (ADA) to move freely around the city.

Now, Los Angeles' cracked and crumbling sidewalks are on track to get $1.4 billion in repairs, over the next 30 years.

Quadriplegic resident Mark Willits sued the city in 2010, and his case was broadened to a class action.

Lillibeth Navarro, a plaintiff, praised the settlement at a news conference with city leaders.

"It's a major win for the disability community of Los Angeles," she said. "Those with disabilities risk their lives and safety traversing miles and miles of inaccessible L.A. sidewalks," she said, and spoke of the frustration of trying to navigate broken paths in her wheelchair.

In Chinatown, Andre Davidson uses a walker to help him stand. He said the city's broken sidewalks and slippery curb ramps need upgrades.

"They are quite unsafe, you have a lot of cracks and dents, especially at the ramps, they are kind of dangerous," he said.

# How did we get here?

A 1911 state law made sidewalk repairs the financial responsibility of adjoining property owners in most of California. But in the mid-70s, Los Angeles accepted a multi-million dollar federal grant for sidewalk repairs. In exchange for the money, the city took over financial responsibility for sidewalks damaged by trees.

The money ran out within a few years, and the city fell behind in repairing sidewalks to the point that one city estimate said it would cost $1.5 billion to do the entire job.

Sidewalk repairs have been close to non-existent in recent years, partly because the city was holding back spending while it waited for settlement with this case. A shortage of workers, and the lack of a clear policy over which paths were greatest priority led to further delays.

City Attorney Mike Feuer said the settlement terms require the city to set aside $31 million a year (a base amount that would grow with inflation over time) and to spend at least $25 million annually on repairs.

The city has already been paying out about $6.5 million dollars a year in injury claims stemming from broken sidewalks, Feuer said. But over the past two years, it has managed to still put aside as much as $27 million in funds for repairs. The money that was placed in the sidewalk repair trust fund will be the first monies applied toward the settlement.

Mayor Eric Garcetti said the city's general fund, used to pay for many city services, will make up the the rest of the funds.

# What will be repaired first

The first year's spending calls for $5 million for installing curb ramps, the rest on sidewalks, Feuer said.

Sidewalks adjacent to city land are the top priority for repairs, followed by sidewalks on the most used main streets. Over time, smaller residential streets will be fixed, but it could take years for some areas to see repair crews.

Setting priorities for which residential sidewalks to fix will be a district-by-district decision, Garcetti said.

The settlement must still be approved by a federal judge.

*Correction: In a previous version of this article, City Attorney Mike Feuer misstated the amount the city of Los Angeles has paid out in legal claims for injuries due to broken sidewalks and tree roots. The amount is $6.5 million in payouts for sidewalk and tree root injuries since July 2011.*


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# WILLITS V. CITY OF LA SIDEWALK SETTLEMENT ANNOUNCED

APRIL 1, 2015

An agreement to resolve the Willits v. City of Los Angeles case was reached today that will result in a more than $1 billion investment in city sidewalk repairs and other pedestrian improvements.

The class action sought to ensure better access for persons with mobility disabilities to the city's sidewalks, curb ramps, crosswalks, pedestrian crossings and other walkways.

Plaintiffs included Mark Willits, Judy Griffin, Brent Pilgreen, and Communities Actively Living Independent and Free ("CALIF"). They were represented by a team of lawyers led by Guy Wallace of Schneider Wallace Cottrell Konecky Wotkyns, LLP, Linda M. Dardarian of Goldstein, Borgen, Dardarian and Ho, Jinny Kim of the Legal Aid Society-Employment Law Center, and Anna Rivera of Disability Rights Legal Center.

The City of Los Angeles was represented by City Attorney Mike Feuer and Chief Deputy City Attorney Jim Clark, Assistant City Attorney Laurie Rittenberg, and the City's outside Counsel Kevin Gilbert of Lozano Smith, and Christopher Wong and David Raizman of Ogletree, Deakins.

In addition, the Mayor's Office, City Council President Herb Wesson, City Council Members Paul Krekorian and Joe Buscaino, and City Administrative Officer Miguel Santana all played key roles in the shaping of the agreement.

Plaintiffs' lead counsel Guy Wallace said, "This $1.4 billion settlement is the largest disability access class action settlement in U.S. history. It will make the City's sidewalk system accessible to persons with mobility disabilities. It will install curb ramps throughout the City, fix sidewalks that are broken and torn up by tree roots, install accessible sidewalks where they do not exist, and remove many other barriers. By making the City's sidewalks and crosswalks accessible, this settlement will make it much easier for persons with mobility disabilities to get to and use government facilities, to find or get to jobs and workplaces, to go shopping, to go to the doctor, to participate in community life, and to be with their friends and families.

"Under the settlement, people with disabilities will also be able to make requests for access fixes in their own neighborhoods, such as for curb ramp installation, or tree root repairs. Over the course of the settlement, the City's sidewalks will be transformed. And the lives of persons with mobility disabilities will be made a lot better. We are very thankful to Mayor Eric Garcetti, City Attorney Mike Feuer, Chief Deputy City Attorney Jim Clark, City Administrative Officer Miguel Santana and all of the City officials who have made this outstanding and historic result possible."

Lillibeth Navarro, Executive Director of CALIF, said, "This settlement vindicates the central purposes of the ADA: access, independence and equality. In Los Angeles, for too long, wheelchair users and people with other types of mobility disabilities have been forced to struggle with curbs that don't have curb ramps, sidewalks that are broken and torn up, and crosswalks that are filled with potholes and

cracks. We are pleased that the City has finally made a real commitment to making its public sidewalk system accessible. Now people with mobility disabilities will be able to go whether they need to go, and also where they want to go. That is what the ADA is all about."

Linda Dardarian, said "This historic agreement shows what can be accomplished when the City and its residents work together to solve chronic, systemic, seemingly intractable problems. The City's sidewalks have been deteriorating for decades, but due to the dedication and commitment of the City and the community of people with mobility disabilities, this trend is being reversed, to the benefit of everyone who lives in or visits Los Angeles."

"This agreement shows how we are changing the way we do business at City Hall and are getting back to basics," said Mayor Eric Garcetti. "Instead of fighting against fixing our sidewalks, we came to the table to reach an agreement to invest more than a billion dollars in our sidewalk infrastructure – which will improve access and safety, and boost property values and neighborhood pride."

"Today we make an ironclad long-term commitment to repair L.A.'s broken sidewalks," said City Attorney Mike Feuer. "It's so much better to prevent residents from being injured in the first place than to react after the fact. This settlement directs taxpayer dollars to where they belong: solving one of our City's most longstanding problems."

"This historic settlement is good news. After five years of litigation, we can now look to the future and what will be achieved to enhance the quality of life for everyone in the City of Los Angeles," said Council President Herb Wesson.

"This settlement is an enormous step forward for the City of Los Angeles and its residents," said Councilmember Paul Krekorian, chair of the Budget and Finance Committee. "For decades, buckled sidewalks have plagued neighborhoods from the San Fernando Valley to the South Bay. All of that is going to change starting today with the city's historic commitment to fix our sidewalks and make them accessible to everyone. I have been intimately involved in this case from day one and will continue to work with the Mayor, the City Attorney and my colleagues on the City Council to achieve our goal of implementing a comprehensive sidewalk repair program that improves every community in this great city."

"As chairman of the Public Works committee, I have been committed to finding solutions to fixing our streets and sidewalks since my first day on the Los Angeles City Council," said Councilmember Joe Buscaino. "The settlement of this lawsuit is a win for not only the mobility impaired, but for all Angelenos as it finally requires the city to fix its broken sidewalks. There are no losers here. I look forward to hearing from the public as we develop the details in the Public Works Committee on how residents can submit repair requests, which locations to prioritize and how quickly we can start the work."

The agreement calls for a $1.4 billion investment in the city's sidewalks and other walkways over the next 30 fiscal years, starting at the beginning of FY 15-16. Annual investments will range from $31 million during the next five years to more than $63 million in years 26 to 30. The amounts increase over time to ensure value is not lost due to inflation.

The settlement proposal will now go to the supervising court for approval and ultimate implementation.

###

Email*

Zip

**GET UPDATES**

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**Willits v. City of Los Angeles**
**Term Sheet as of March 30, 2015**

1. **Program Access Fund**

The settlement shall include an annual commitment of $31 million per year for 30 years ($930 million), to be used for program access improvements and barrier removal, excluding new construction and alterations, commencing on the date the Judgement becomes final (the "Compliance Period").

The City will have the discretion to determine the revenue sources it will use to meet the terms of this agreement.

The City will maintain the present value of the $31 million by adjusting the amount of the commitment by 15.3% every 5 years. The annual commitment will be as follows:

| | | |
|---|---|---|
| Years 1-5: | $ | 31,000,000 per year |
| Years 6-10: | $ | 35,743,000 per year |
| Years 11-15: | $ | 41,211,679 per year |
| Years 16-20: | $ | 47,517,066 per year |
| Years 21-25: | $ | 54,787,177 per year |
| Years 26-30: | $ | 63,169,615 per year |
| **Grand Total:** | **$** | **1,367,142,684** |

During the 2014-15 Fiscal Year the City will spend $11 million to make Program Access Improvements (or for other expenditures to implement the Settlement Agreement). Therefore, the City may comply with its obligation for the first year by spending $20 million.

The amounts set forth are the targeted commitment of funds. If the total commitment is not met each year, the uncommitted portion of that year's target will be utilized in subsequent years as soon as practical, but within no longer than the next three fiscal years. Excess commitments in any given year will be credited toward the target commitment in future years. In no fiscal year (other than the first year) shall the City spend less than $25 million as its Annual Commitment.

2. **Prioritization of Access Improvements**

Pedestrian facilities shall be prioritized as follows:

1. City of Los Angeles government offices and facilities;
2. Transportation corridors;
3. Hospitals, medical facilities, assisted living facilities and other similar facilities;
4. Places of public accommodation such as commercial and business zones;
5. Facilities containing employers; and,
6. Other areas, such as residential neighborhoods and undeveloped areas.

Highest priority will go to the Program Access Improvements needed to address the most severe access barriers and the most significant safety hazards for class members, based on 2010 ADA Standards.

Access work with respect to City government offices shall be prioritized with the goal of completing such work within the first five years of the Compliance Period, if feasible.

3. **Access Request Program** -
   - For the first year of the Compliance Period, 20% (equal to $6.2 million) of the annual commitment will be allocated to the Access Request Program. Thereafter, the City and Class Counsel will meet and confer to discuss if the allocation should be changed to be more responsive to community need. Requests shall be reviewed and investigated in the order received.
   - The City will use its best efforts to investigate requests within 30 days and, if appropriate, schedule repairs as resources allow within 120 days.
   - Individual requests for program access fixes will be prioritized in residential neighborhoods or that are necessary to provide access to bus stops or other forms of public transit.

4. **Curb Ramps**
   For the first year of the Compliance Period five million dollars will be allocated to curb ramp installation or remediation. Thereafter, the City and Class Counsel will meet and confer to discuss if the allocation should change to be more responsive to community need.

5. **Site Constraints, Technical Infeasibility, and Unusually Expensive Remediation**
   At the discretion of the City, unusually expensive repairs may be addressed in connection with larger, street-related capital projects. Work on difficult sites may be postponed if there is an alternative accessible route within no more than 200 feet, to the maximum extent feasible. Locations at which site constraints make compliance with applicable design standards impracticable may be made compliant with the standards to the maximum extent feasible.

6. **Exemption for Program Access Improvements**
   The City will be exempted from any obligation to perform a Program Access Improvement at a particular location if:
   - There exist barriers to remediation that are controlled by third parties; and/or,
   - The location requires an improvement that is required to be performed by a third party pursuant to a lawfully-issued permit.

7. **Support Costs**
   The City will only charge incremental costs that the City will incur as a result of implementing the program, which would not otherwise be incurred if the program did not exist.

8. **New Construction and Alterations**
   Otherwise, as previously agreed, new construction and alterations within the meaning of 28 C.F.R. § 35.151 will not count toward the $31 million, including work such as resurfacing or repaving, street widening and similar new construction and alterations.

9. **Sidewalks of Other Governmental Agencies**

The settlement will not include work on the pedestrian rights-of-way immediately adjacent to the facilities of other governmental agencies, such as the United States, State of California, Los Angeles Unified School District, County of Los Angeles, MTA, CalTrans, etc.

Within two years, the City will identify the locations of the Pedestrian Facilities that the City believes are immediately adjacent to such governmental facilities.

10. **Other Provisions**

- **Trees** - The purpose of the program is to provide accessibility to sidewalks. However, trees that are the cause of sidewalk barriers will be preserved to the extent feasible. Tree removals may only be removed in accordance with the Los Angeles Municipal Code, and all other applicable City codes, rules, and policies relative to trees.
- **Methodology** - The City will retain the discretion to use whatever technology, methodology, tools, equipment and/or materials that are available to further advance the program.
- **Access Survey** - The settlement will not include a mandatory access survey.
- **Access and Construction Database** - The settlement shall include the implementation of sidewalk and curb ramp asset management system.
- **ADA Coordinator** - The settlement shall include the employment of an ADA Coordinator for the Pedestrian Rights-of-Way, who must be a licensed architect or engineer, with the requisite credentials, such as CASP certification, and no less than five years' experience, and employed by the City within the first 12 months after commencement of the Compliance Period.
- **Reporting** - The settlement shall include reporting requirements. For the first five years, the ADA Coordinator will be responsible for reporting in writing, two times each fiscal year on the status of the City's compliance with the terms of the Settlement Agreement. After that time, such reports shall be provided on an annual basis. A final report will be submitted within six months of the conclusion of the Compliance Period detailing the completion of all physical access barrier removal projects undertaken by the City.
- **Monitoring and Fees** – During the first five years of the Compliance Period, Plaintiffs may conduct semi-annual inspections of the City's drawings and/or designs regarding the pedestrian rights of way, as well as the City's pedestrian rights of way and facilities to monitor compliance. After such time, during the Compliance Period, expert inspections of drawings and/or designs and/or the condition of the pedestrian right of way may be conducted annually. Plaintiffs' monitoring fees, costs and expenses, exclusive of any disputes resolved by the District Court, shall be paid out of the Annual Commitment and be capped as follows:

| | | |
|---|---|---|
| Years 1-5: | $ | 250,000 per year |
| Years 6-10: | $ | 135,000 per year |
| Years 11-15: | $ | 166,177 per year |
| Years 16-20: | $ | 191,602 per year |
| Years 21-25: | $ | 220,917 per year |
| Years 26-30: | $ | 254,716 per year |
| Maximum Total: | $ | 6,092,060 |

All requests for reasonable and necessary monitoring fees must be submitted to the City in writing and shall be subject to the same standard rules and procedures applicable to the City's payment of attorneys' fees and costs to outside counsel.

- **Dispute Resolution** - The parties shall meet and confer regarding any dispute, attempt mediation of the dispute, and if mediation is unsuccessful, the parties may submit the issue(s) to the District Court for resolution. The City's attorneys' fees and costs incurred in any such motion may be paid from the annual $31 million commitment for program access except that the Court may deny the City such payment and may further award to Class Counsel their reasonable attorneys' fees and costs (which the City shall be responsible for paying without reimbursement from the annual $31 million commitment for program access) in the event that the Court determines that Plaintiffs are the prevailing parties in accordance with the prevailing party standards under the ADA.
- **First Year Grace Period** – For a period of one year following commencement of the Compliance Period, the Plaintiffs agree not to sue, provide notice of violation, or initiate any legal proceeding, or otherwise seek to enforce any rights based upon or as a result of any alleged failure to perform any provision of the Settlement Agreement by the City.
- **Release** - The settlement shall release the class claims for declaratory and injunctive relief only for members of the Plaintiff class certified by Judge Marshall pursuant to Federal Rule of Civil Procedure 23(b)(2). The settlement herein resolves the litigation between the Plaintiffs and the Defendant in Willits v. City of Los Angeles in the District Court and any pending appeals in the Willits case.
- **Recitals** - The joint or stipulated proposed judgment shall contain recitals stating that:
  a) The District Court made no liability findings in this case;
  b) The District Court made no findings that the City has, in its handling of curbs, sidewalks, and pedestrian rights of way located in the City of Los Angeles: (i) acted intentionally to discriminate against persons with mobility disabilities; (ii) acted with reckless disregard of the rights of persons with mobility disabilities; or (iii) acted in any manner that would support a finding that the City is liable for damages under Title II of the Americans with Disabilities Act, or under Section 504 of the Rehabilitation Act of 1973; and,
  c) The District Court made findings that its opinion regarding the availability of an undue burden defense under Section 504 of the Rehabilitation Act of 1973: (i) addressed a novel issue of law; (ii) the District Court certified the issue for interlocutory appeal; (iii) the issue was fully briefed at the time of settlement; (iv) the issue is an important one for recipients of federal financial assistance and persons with mobility disabilities to understand their respective rights and obligations under Section 504 of the Rehabilitation Act of 1973; (v) the District Court's opinion on this point is not binding on any other court.
- **Service Awards** - The City of Los Angeles shall pay service awards to each of the individual class representatives in Willits [redacted], pay a service award to organizational Plaintiff CALIF [redacted] for services rendered to the Willits class, and [redacted] to each of the Willits Plaintiffs as compensation for alleged physical injuries and damages as alleged in the Griffin Action.

- **Class Notice** - The City shall, publish notice of the Settlement Agreement in the Los Angeles Times, the Los Angeles Daily News, and La Opinion, in addition to its website. With respect to all such costs of providing notice, the City shall receive reimbursement for such costs from the $31 million annual commitment for program access. Class Counsel shall also provide notice of the Settlement Agreement to ten organizations that serve the interest of disabled persons residing in the City and establish a website where a copy of the Notice of Settlement will be available. Class Counsel's costs for noticing will be reimbursed from the Annual Commitment.
- **Attorney's Fees and Costs** – The City shall pay Class Counsel $13.3 million as reasonable attorney's fees and $1.7 million for costs and expenses, for a total of $15 million. These fees must be paid within 30 days of District Court's final approval of the Settlement Agreement and the award of attorney's fees.
- **Press Release** - Counsel for the parties shall prepare a joint written press release regarding the Settlement Agreement for issuance immediately after the final Settlement Agreement is executed.