

Streamlining Permitting and Installation of Heat Pump Water Heaters

Data Analysis and Recommendations
for Next Steps

May 14, 2024



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Executive Summary

Required California building code permits are critical to ensuring safety and quality work, but the permitting process can be challenging to navigate and can add significant time and cost to projects. To achieve California decarbonization goals, streamlining the permitting process is critical, particularly for heat pump water heaters, since they are typically done as an emergency replacement of a failing gas powered water heater. The TECH Clean California Permitting Pilot team is part of an ongoing effort to identify and overcome the barriers to widespread residential heat pump water heater adoption posed by inefficient or otherwise burdensome practices of local building and permitting departments throughout the state of California.

To help identify the barriers, the team conducted quantitative analysis of 1,143 TECH Clean California heat pump water heater claims for installations completed from December 2021 to April 2023 and within jurisdictions with publicly accessible online permit portal systems. The large majority, 92 percent, of these claims were for projects in the Sacramento Valley and San Francisco Bay Area. Fifty-one jurisdictions distributed across the state were represented in the permit data sample.

Key Findings and Recommendations

The team conducted qualitative research targeting 100 jurisdictions associated with the 1,143 TECH Clean California heat pump water heater incentive claims to obtain responses from representatives at 36 of those jurisdictions as a basis for their research. Takeaways included:

- Thirty-two percent of the claims in the data set, associated with 69 percent of jurisdictions, had an average timeline to permit issue of more than one day.
- Permit staff who have personally seen a heat pump water heater installation responded to questions with greater confidence.
- Building staff relied heavily on their own interpretations of the California Building Standards Code without more targeted guidance from industry groups or trusted third-party sources, resulting in wide variations in permitting requirements.
- Twenty-eight percent of outreach respondents explicitly stated that they do not differentiate between heat pump water heaters and other water heater types during the permitting process.
- Heat pump water heaters are commonly installed by plumbers who lack sufficient experience or licensing to properly address the electrical components of a jurisdiction's heat pump water heater permitting requirements.

The team determined that permitting barriers vary widely by locality and makes prioritized recommendations as follows for the adoption and implementation of a streamlined, same day permitting process for heat pump water heaters;

- Increase distribution of permitting educational materials through formal and recognized and trusted channels.
- Equip building department staff at all levels with online, on-demand, and in-person training and resources.

- Direct experiential learning opportunities tailored to address the specific knowledge gaps of building and permitting departments.
- Conduct targeted outreach to jurisdictions with the highest volume of TECH Clean California heat pump water heater claim submissions to identify additional best practices.
- Conduct targeted interviews with contractors installing heat pump water heaters to increase understanding of permitting barriers.

The results of this research suggest that future efforts should focus on providing experiential learning opportunities tailored to address regional needs and that serve varying levels of expertise among permitting staff. Revised training will be the most effective approach to achieving the goals of the pilot.

Research Goals

The TECH Clean California Permitting Pilot team supports city and county building departments by providing resources designed to aid permitting staff in efforts to modify and streamline traditional permitting processes that have created barriers to the widespread residential market adoption of heat pump water heaters. The team seeks to better understand and to establish methods to overcome these barriers and to accelerate the development and implementation of a simple, streamlined, same day permitting process for heat pump water heaters.

This report aims to identify friction points created by current permitting practices and to provide recommendations to overcome such barriers. The team achieved this via an analysis of quantitative data from TECH Clean California heat pump water heater incentive claims submitted between December 2021 and April 2023, as well as qualitative responses from 36 informal surveys with building department staff from various authorities having jurisdiction (AHJs) conducted between April 2023 and June 2023.

Methodology

The quantitative analysis leveraged access to TECH Clean California heat pump water heater rebate claims data and corresponding public records from permitting offices across the state. The team found that high-quality permit data is not readily available on statewide or regional levels, and that data would need to be collected from individual jurisdictions and standardized for analytical purposes. As the structure and granularity of permit records vary significantly by jurisdiction, the labor requirements and administrative burden of such a task inclusive of all statewide heat pump water heater data were beyond the scope of this pilot. However, the TECH Clean California heat pump water heater rebate claims data provided enough information to serve as a starting point for data collection efforts.

The team sought public permit records corresponding to the permit numbers submitted with TECH Clean California heat pump water heater claims. The information extracted from those records was then used to identify a rough distribution of permitted heat pump water heater installations throughout the state of California and to estimate the average permit processing timelines at jurisdictional, regional, and statewide levels. The results provided insight into adoption trends and potential barriers faced throughout the permitting timeline. The team expects that these findings will be useful in the strategic development and targeted distribution of future heat pump water heater permitting resources.

The qualitative portion of the analysis is based on informal survey responses obtained via phone and email outreach to 100 jurisdictions included in customer addresses in TECH Clean California heat pump water heater claims. Outreach targeting the building department staff within these jurisdictions aided the team in identifying scalable best practices that can be integrated into future permitting resources, and some specific barriers that will need to be overcome. Of the 100 jurisdictions contacted, the team received 36 responses that provided useful information about the given jurisdiction's practices and points of friction that they commonly encounter during the permitting timeline. A detailed description of how jurisdictions were identified to conduct outreach is available in the [Qualitative Informal Surveys with Building Departments](#) section of this report.

Quantitative Permit Data Analysis

Data Selection

The quantitative portion of this analysis references heat pump water heater permit data manually extracted from online public record portals. The team began with an initial internal dataset reflecting all TECH Clean California heat pump water heater rebate claim submissions occurring between December 2021 and April 2023. This provided an initial data sample of 1,692 heat pump water heater installation project claims.

Of these projects, 1,143 occurred within jurisdictions with accessible online permit portal system through which the public can obtain public records information. The team used these online permit portal systems to individually identify building permits. From this sample, the team successfully verified the processing details of 774 heat pump water heater permits. For the purposes of this analysis, “verified permits” include those for which the team was able to locate a valid permit record via an online portal with values matching the permit number or address submitted by a contractor with their TECH Clean California rebate claim. Permit verification was determined by the presence of at least one identifiable date indicative of at least one of the steps typically denoted within public permit records: application, approval, issued (obtained), finalized, or expiration.

Where relevant, the team used the larger dataset of 1,692 project claims. However, the data referenced below in section [3. Permit Processing Timelines, Averages](#) reflects only the 774 verified permits as defined above.

1. Geographical Distribution of TECH Clean California Heat Pump Water Heater Projects

The team used the initial data sample of 1,692 heat pump water heater projects to assess the geographic distribution of heat pump water heater rebate claims, each of which corresponds to a residential heat pump water heater installation.

Figure 1 demonstrates the distribution of heat pump water heater installations by zip code. A concentration of these installations around the Greater San Francisco Bay Area can be seen below in Figure 2.

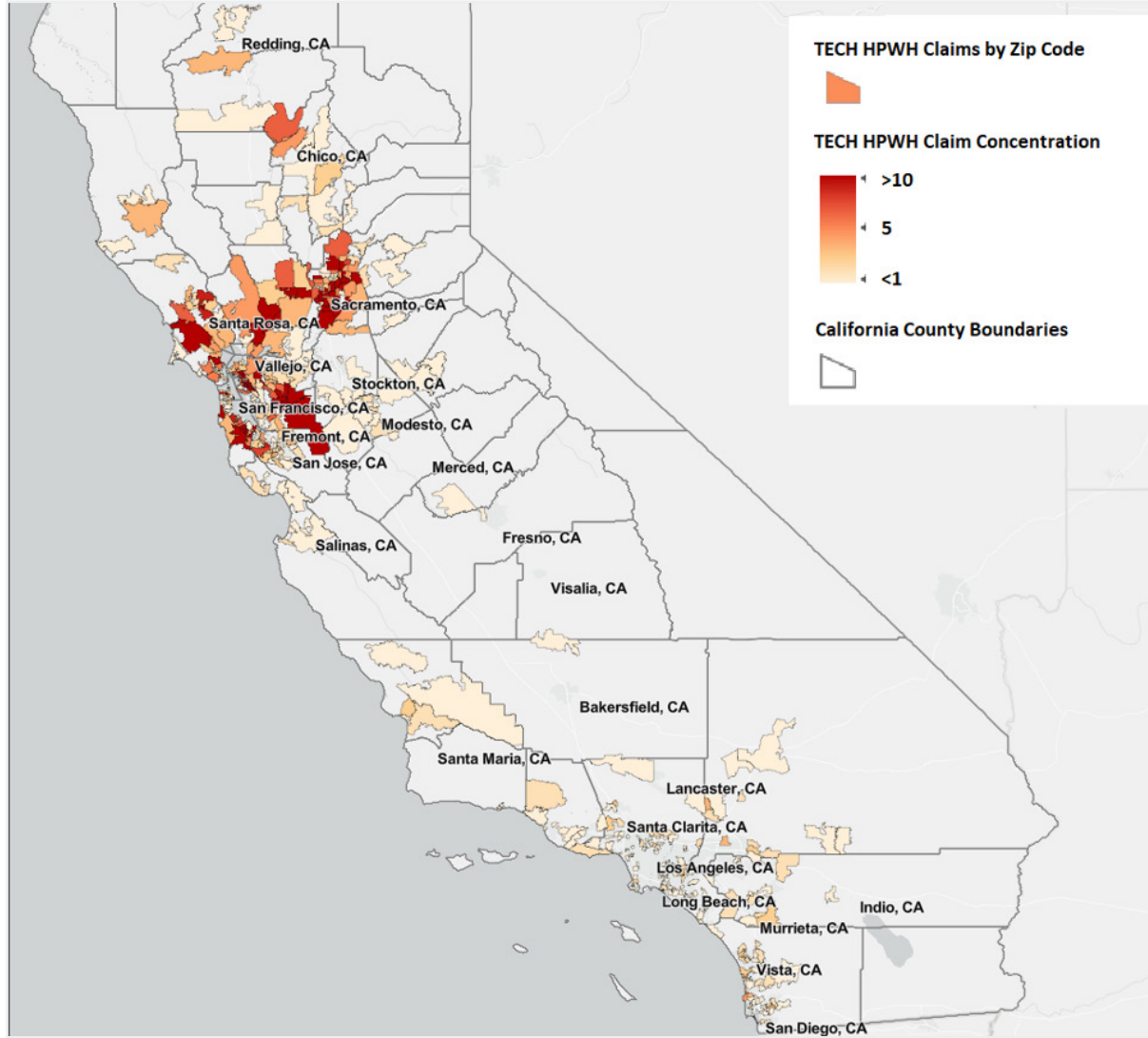


FIGURE 1: GEOGRAPHICAL DISTRIBUTION OF TECH CLEAN CALIFORNIA STATEWIDE HEAT PUMP WATER HEATER CLAIMS

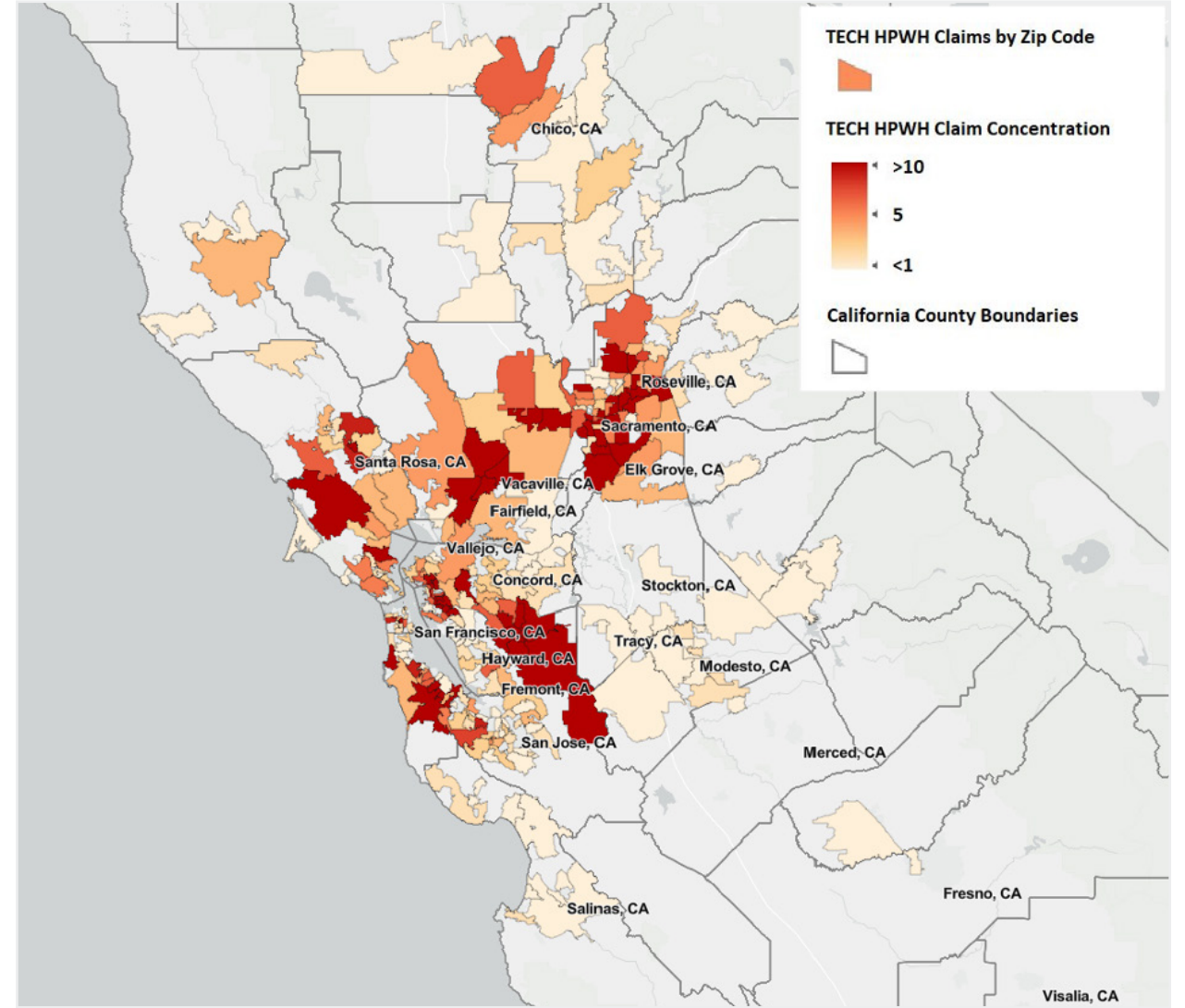


FIGURE 2: GEOGRAPHICAL DISTRIBUTION OF TECH CLEAN CALIFORNIA HEAT PUMP WATER HEATER CLAIMS IN THE GREATER SAN FRANCISCO BAY AREA

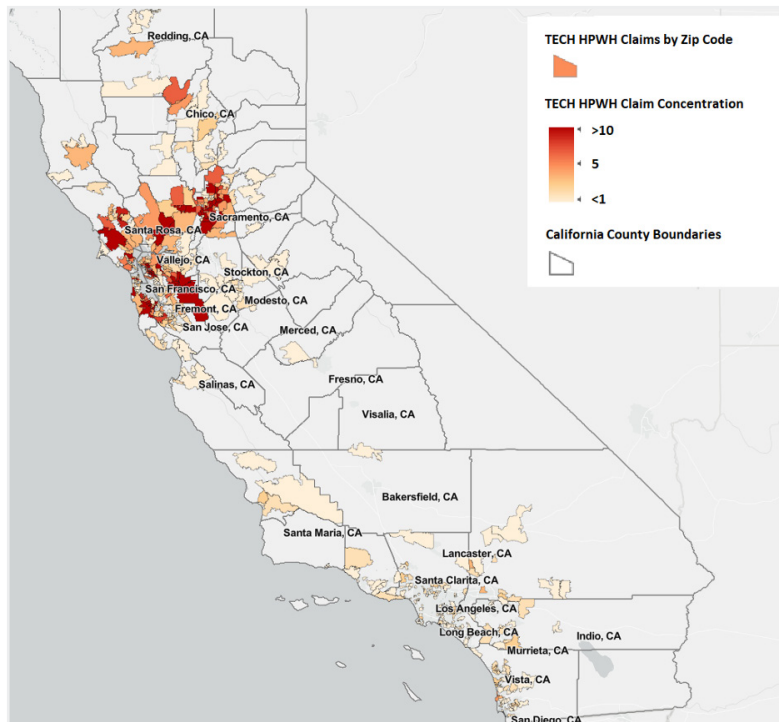


FIGURE 1: GEOGRAPHICAL DISTRIBUTION OF TECH CLEAN CALIFORNIA STATEWIDE HEAT PUMP WATER HEATER CLAIMS

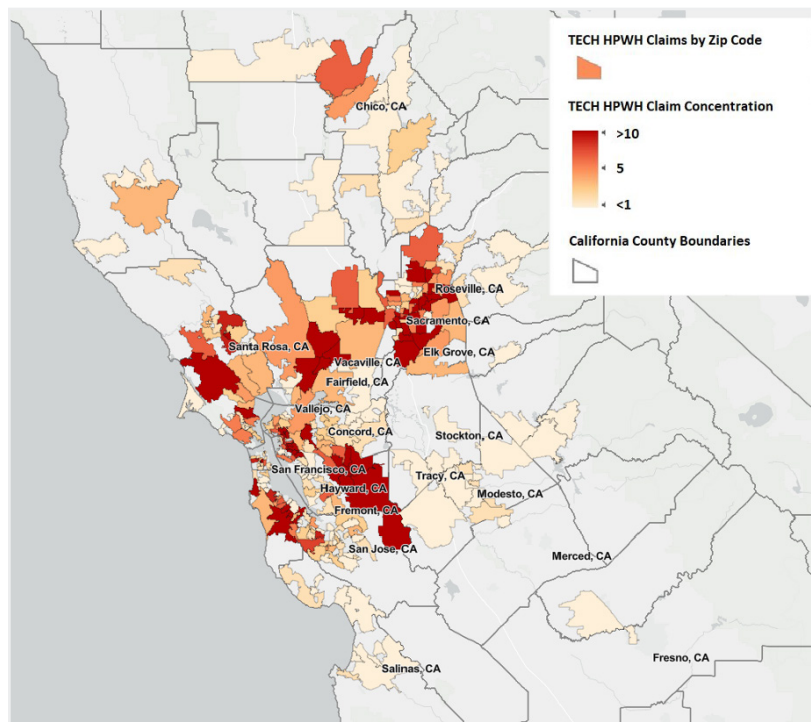


FIGURE 2: GEOGRAPHICAL DISTRIBUTION OF TECH CLEAN CALIFORNIA HEAT PUMP WATER HEATER CLAIMS IN THE GREATER SAN FRANCISCO BAY AREA

2. Differentiating Jurisdictions with Greater Rates of Claim Submission

This portion of the analysis aided the team in identifying the relative concentration of TECH Clean California heat pump water heater rebate claims, while accounting for differences in the number of single family homes per jurisdiction. The intent was to distinguish whether a greater concentration of claims within a jurisdiction was merely the result of there being a greater concentration of single family homes, or if there were other factors unique to that jurisdiction that may be influencing the rate of heat pump water heater adoption.

Figure 3 demonstrates that a comparatively higher number of heat pump water heater claims within a jurisdiction does not necessarily correlate to a comparatively greater percentage of single family homes¹ installing a heat pump water heater within that jurisdiction. Thus, the volume of claim submissions from within a particular jurisdiction is not always a reliable indicator of an increased rate of heat pump water heater technology adoption.

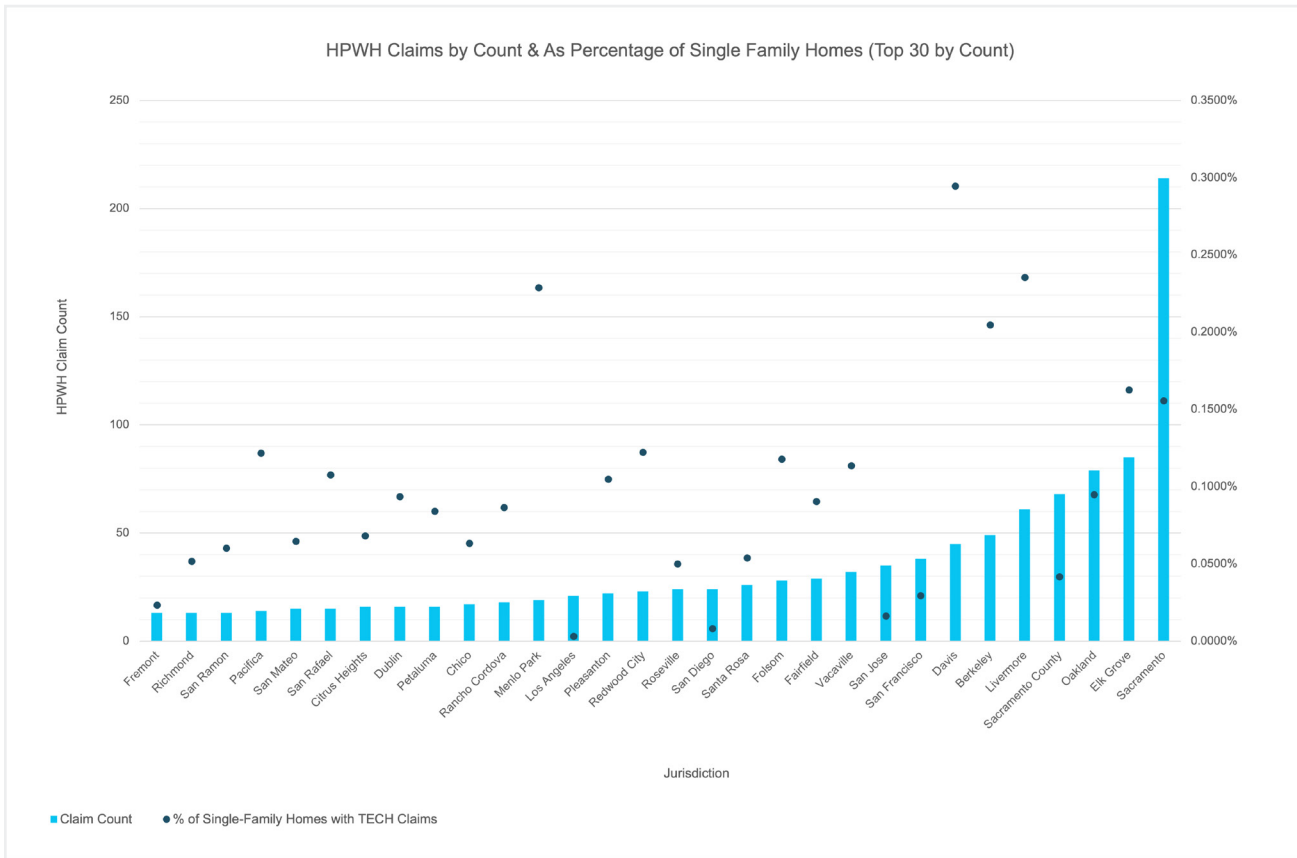


FIGURE 3: HEAT PUMP WATER HEATER CLAIMS FOR TOP 30 JURISDICTIONS BY COUNTY AND AS A PERCENTAGE OF SINGLE FAMILY HOMES

1 Household Data collected from State of California E-5 Population and Housing Estimates for Cities, Counties, and the State.

Figure 4 presents submission data from the opposing perspective to Figure 3. Note that some of the highest performing jurisdictions as measured by percentage of single family homes with HPWH installations incentivized by TECH Clean California are Point Arena, Trinidad, and Portola Valley, with populations of 460, 307, and 4,460, respectively. Although these jurisdictions show the greatest concentration of heat pump water heater rebate claim submissions as measured by percentage of households, they are substantially smaller jurisdictions than others within the data sample, so the overall quantity of submissions from within these jurisdictions is comparatively low. This suggests that resource distribution efforts should target jurisdictions of all sizes.

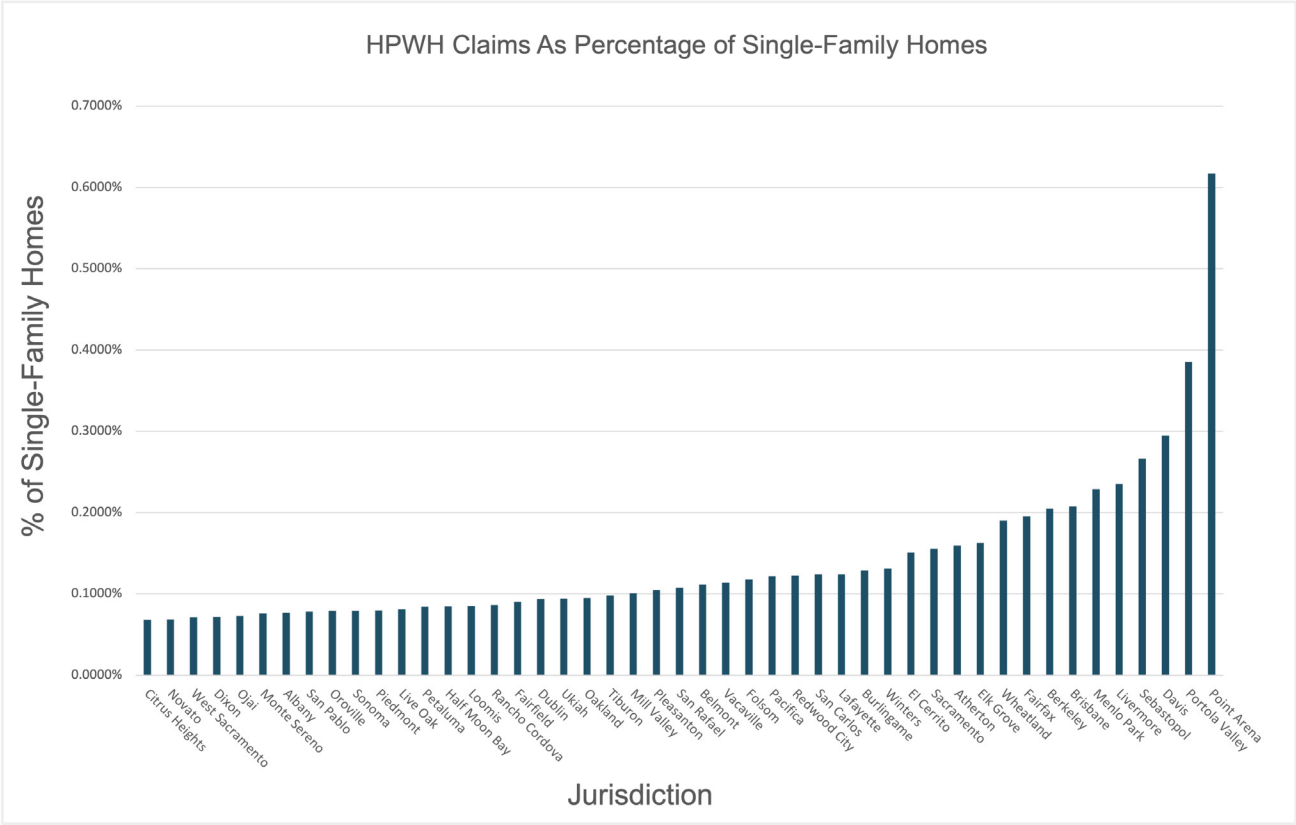


FIGURE 4: HEAT PUMP WATER HEATER CLAIMS AS A PERCENTAGE OF SINGLE FAMILY HOMES

3. Permit Processing Timelines, Averages

The team used the permit records obtained from online portals to calculate regional average processing times for each major milestone within the typical permit processing timeline. Regional variations in processing timelines demonstrate that the barriers faced by permitting offices are not consistent. Acknowledging these differences aided the team in identifying points of friction on a regional basis, which will be useful in crafting further permitting resources that can be distributed where they will be most useful.

For the purposes of this analysis, the team focused on the first three of these milestones, hereafter referred to as “Application,” “Approval,” and “Issued”, as the intent of this research was to identify barriers to one-day permitting for heat pump water heater. The first three dates are the most relevant. For descriptions of the typical heat pump water heater permitting milestones found in the analysis refer to the process on the right.

The remaining milestones are the two possible outcomes or endpoints for the permit. “Expiration” refers to a point at which the permit is no longer valid, typically one year from the date of issue. “Finaled” is the point at which a building department representative completes a final inspection of the project post-construction, inclusive of any modifications to the original plans, and verifies that the project complies with the applicable building code. While these are important components of the permitting process, they are not pertinent for streamlining heat pump water heater permitting and have been omitted from the following analytical summary. It is also important to note that not every jurisdiction includes all five of these typical processing dates in their publicly available permit records. Some permit records collected by the team were thus unable to be used for calculating average processing times.

The average processing time between the Application, Approval, and Issued milestones is comparable, as seen below in Figure 5. However, there is a dramatic regional variance in these average processing times, as can also be seen in Figure 5. The team examined averages from the San Francisco Bay Area (55 percent of sample data), and the Sacramento Valley Area (37 percent of sample data) to explore these variations. These areas were selected for analysis because 92 percent of the available sample data originated from within these two regions.



HEAT PUMP WATER HEATER PERMITTING MILESTONES

Permitting offices typically employ a multistep permit process. The dates available within a permit record most often reflect one or more of the following steps, in this order:

1. Application

Date permit application is submitted to the jurisdiction for approval of the project.

2. Approval

Date of application approval. A site plan is required by some jurisdictions. A plan typically involves a drawing of the building layout with annotations of building setbacks and zoning regulations being met.

3. Issued

Permit obtained. Date permit is issued with authorization to begin construction.

4. Finaled

Date official project approval following post-construction inspection.

5. Expiration

Date of permit expiration.

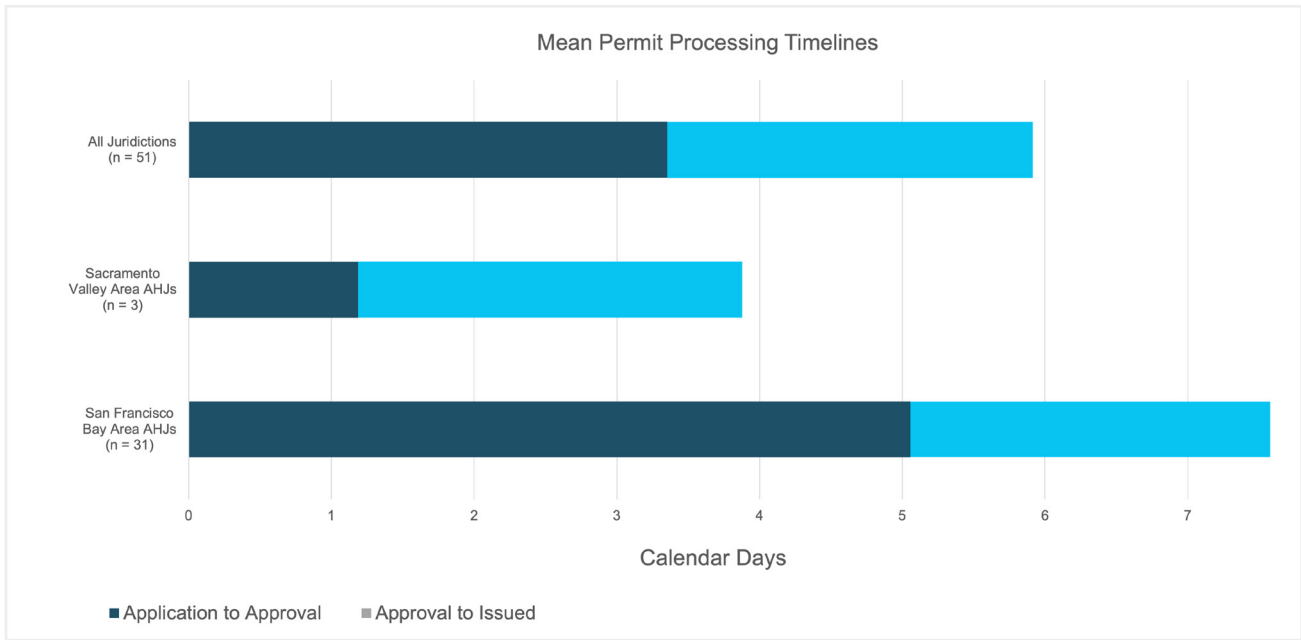


FIGURE 5: AVERAGE PERMIT PROCESSING TIMELINES

The team observed that in jurisdictions that typically process applications in a single day, some projects appeared to take longer in the “Application to Approval” phase. Based on a spot check on a handful of permits fitting this description across several jurisdictions, permits with a longer-than-expected “Application to Approval” timeframe typically fell into two categories:

The permit application required some back-and-forth communication with the contractor to confirm a completed application.

The permit application was part of a larger building retrofit, and the heat pump water heater was just one component of a project requiring additional review, including site plan review.

Table 1: Calendar Days to Permit Issued by Region shows the average time elapsed between the “Application” and “Issued” milestones, illustrating how these differ dramatically between the Sacramento Valley and San Francisco Bay areas, despite the cumulative processing time from approval to issued being similar between the two regions. This is an important consideration, as it suggests that each region may benefit from support at different points during the permit processing timeline.

Table 1: Average Calendar Days to Permit Issued by Region

Region	Application to Approval, Days	Approval to Issue, Days	Total, Days
Sacramento Valley Area	1.19	2.69	3.88
San Francisco Bay Area	5.06	2.52	7.58
All Jurisdictions with Claims	3.35	2.56	5.91

The team observed that in jurisdictions that typically process applications in a single day, some projects appeared to take longer in the “Application to Approval” phase. The team performed a spot check on a handful of permits fitting this description across several jurisdictions. Permits with a longer-than-expected “Application to Approval” timeframe typically fell into two categories:

1. The permit application required some back-and-forth communication with the contractor to confirm necessary documentation had been submitted.
2. The permit application was part of a larger building retrofit, and the heat pump water heater was just one component of a project requiring additional review.

On a per-jurisdiction basis, 31 percent of jurisdictions reviewed have an average permit issuance timeline of less than a single day. This is shown in Table 2: Percent Jurisdictions with Single-Day Permit Issued Timeline.

Table 2: Percent Jurisdictions with Average Single-Day Permit Issued Timeline

Average Timeline to Issue Permit	Jurisdictions	Percent
Less than or equal to one day	16	31%
More than one day	35	69%

4. Permit Processing Timelines, Percentage Single-Day

Looking at averages provides some useful information but doesn’t tell the whole story. Residential construction projects can vary widely in scope and size — for example, a heat pump water heater permit might be pulled for someone who is adding square footage and a bathroom to their home or for someone who is only pursuing an emergency water heater replacement. Individual large projects with longer review timelines can skew the average permit issued timeline, making it appear much longer than a representative single measure project. So, the team reviewed the data to see which jurisdictions are typically delivering a single day permit issuance timeline. The analysis shows that 25 out of 51 jurisdictions, or 49 percent of jurisdictions, issue permits to 75 percent or more of their heat pump water heater permit projects in one day or less.



Table 3: Jurisdictions Processing 75 Percent or More of Their Heat Pump Water Heater Permits in Less Than One Day

Jurisdiction (n = 25)	Avg. Time from Application to Issued (Calendar Days)	Permit Sample Count per Jurisdiction	% of Permits w/ Processing Time ≤ 1 Day
Fontana	0.00	3	100%
Irvine	0.00	10	100%
Laguna Niguel	0.00	1	100%
Livermore	0.00	72	100%
Napa	0.20	5	100%
Oakdale	0.00	1	100%
Pleasant Hill	0.00	1	100%
San Anselmo	0.50	2	100%
San Diego	0.00	13	100%
San Francisco	0.00	16	100%
San Luis Obispo	0.00	1	100%
San Rafael	0.00	10	100%
Santa Cruz County	0.00	1	100%
Sonoma	0.00	2	100%
Thousand Oaks	0.00	2	100%
Tracy	0.00	1	100%
Sacramento	1.75	139	94%
San Jose	2.68	34	88%
Dublin	2.68	19	84%
Vacaville	1.68	31	84%
Sacramento County	1.87	68	84%
Cupertino	1.60	5	80%
Oceanside	14.75	4	75%
Orinda	1.50	4	75%
Vallejo	15.50	4	75%

Finally, the team decided to look at this data comprehensively, using verified permits statewide rather than on a jurisdiction-basis. In Table 4: Percent Claims Receiving Single-Day Permits, the team found that 66 percent of heat pump water heater permits statewide were issued within one day.

Table 4: Percent Claims Receiving Single-Day Permits

Average Timeline to Issue Permit	Claims (n = 774)	Percent
Less than or equal to one day	527	68%
More than one day	247	32%

5. Permit Processing Timelines, Relationship to Number of Permits Processed

The team explored the potential for correlation between the quantity of heat pump water heaters permitted within a jurisdiction and any change in average processing time for those permits. Figure 8: Number of Permits Issued vs. Average Days to Permit Obtained by Jurisdiction provides a visual for this comparison of permit quantity and average processing times. Although jurisdictions that have issued a greater quantity of heat pump water heater permits generally have processing times under ten days, there is not a sufficiently obvious correlation so as to suggest a causal relationship between these factors. While there is the potential that a larger data sample may reveal a stronger correlation, the team does not yet have reason to suggest that processing more heat pump water heater permits necessarily leads to reduced processing time. This implies that guidance designed to streamline permit processing will be useful to permitting offices regardless of their degree of experience with heat pump water heater systems.

Additionally, although not demonstrated by Figure 8, it is important to note that a greater claim submission rate is not always indicative of permitting practices that ensure code compliance or adherence to manufacturer specifications. As will be discussed in the [Qualitative Informal Surveys with Building Departments](#) section of this report, representatives of some of the jurisdictions with the greatest quantity of permitted heat pump water heaters explicitly communicated that they do not require plan checks or differentiate between heat pump water heaters and other system types, e.g. electric resistance and natural gas water heaters, during their permitting processes.

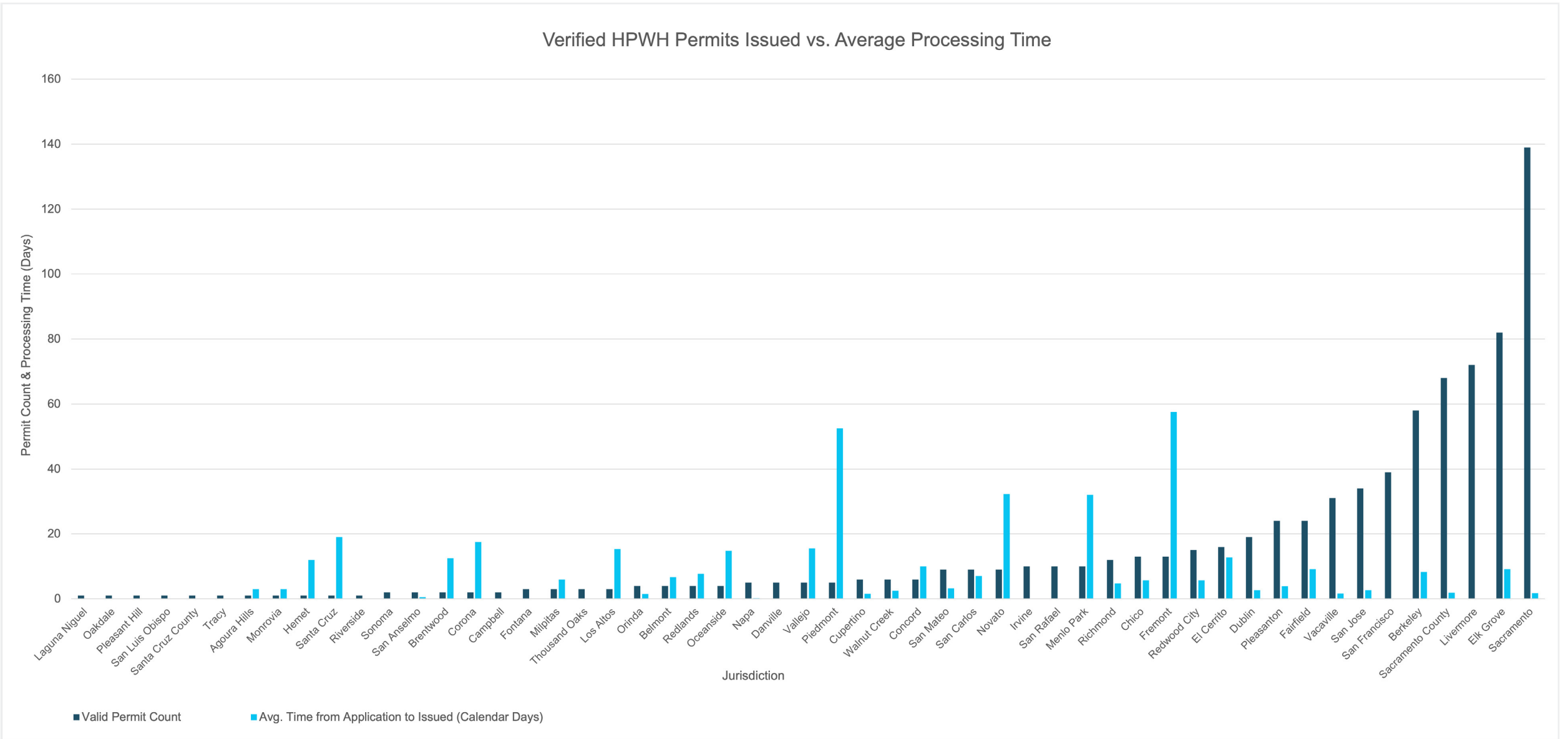


FIGURE 6: NUMBER OF PERMITS ISSUED VS. AVERAGE DAYS TO PERMIT OBTAINED BY JURISDICTION

Qualitative Informal Surveys with Building Departments

Data Selection and Strategy

The team's outreach attempts primarily targeted jurisdictions from within which TECH Clean California heat pump water heater incentive claims were submitted between December 2021 and April 2023. This ensured that the jurisdictional outreach aligned with the available heat pump water heater distribution and permitting data discussed in the [Quantitative Permit Data Analysis](#) section above. The team completed outreach attempts to 100 building departments and permit offices via phone call and email campaigns. Although the team initiated these attempts with a list of standard questions, the conversational nature of the outreach calls consistently brought the discussion beyond the bounds of the prepared questions. This was similarly true during email outreach attempts. As a result, the standard question list was used as a launch pad, and the outreach adapted to allow for free-form discussion with respondents. This encouraged respondents to identify and discuss unique elements of their own jurisdiction's processes or experience that may have been unforeseen by the team. Trends identified within these responses are discussed below in the Informal [Informal Survey Themes](#) section of this report.

The team identified 541 unique authorities having jurisdictions within the State of California, but the team narrowed the scope of its outreach targets to 100 jurisdictions that were listed in customer addresses in the TECH Clean California heat pump water heater rebate claim submissions between December 2021 and April 2023. This allowed for more direct comparison of the quantitative analytical findings to the qualitative comments provided by the outreach respondents. However, this narrowing also naturally limited the diversity and geographical distribution of the team's outreach targets. Thus, this analysis does not provide any definitive representation of jurisdictions that do not have a publicly available online permit portal system or from within which no TECH Clean California heat pump water heater rebate claims were submitted during the sample period.

The team received responses from 36 of the 100 jurisdictions targeted, representing 36 percent of outreach targets. Responses varied in detail and completeness, but given the limited response sample, the team felt that even partial responses were valuable, and they were thus included in this analysis.

Responding Jurisdictions Surveyed

Agoura Hills	Irvine	Murrieta	Sacramento County
Arroyo Grande	Lafayette	Napa County	San Luis Obispo
Burbank	Laguna Niguel	Novato	San Rafael
Cupertino	Lake Elsinore	Oceanside	San Ramon
Danville	Livermore	Palo Alto	Santa Barbara
Dublin	Los Angeles	Petaluma	Santa Clara County
Elk Grove	Menifee	Rancho Cucamonga	Santa Cruz County
Fairfield	Menlo Park	Roseville	Thousand Oaks
Fontana	Monterey Park	Sacramento	Ventura County

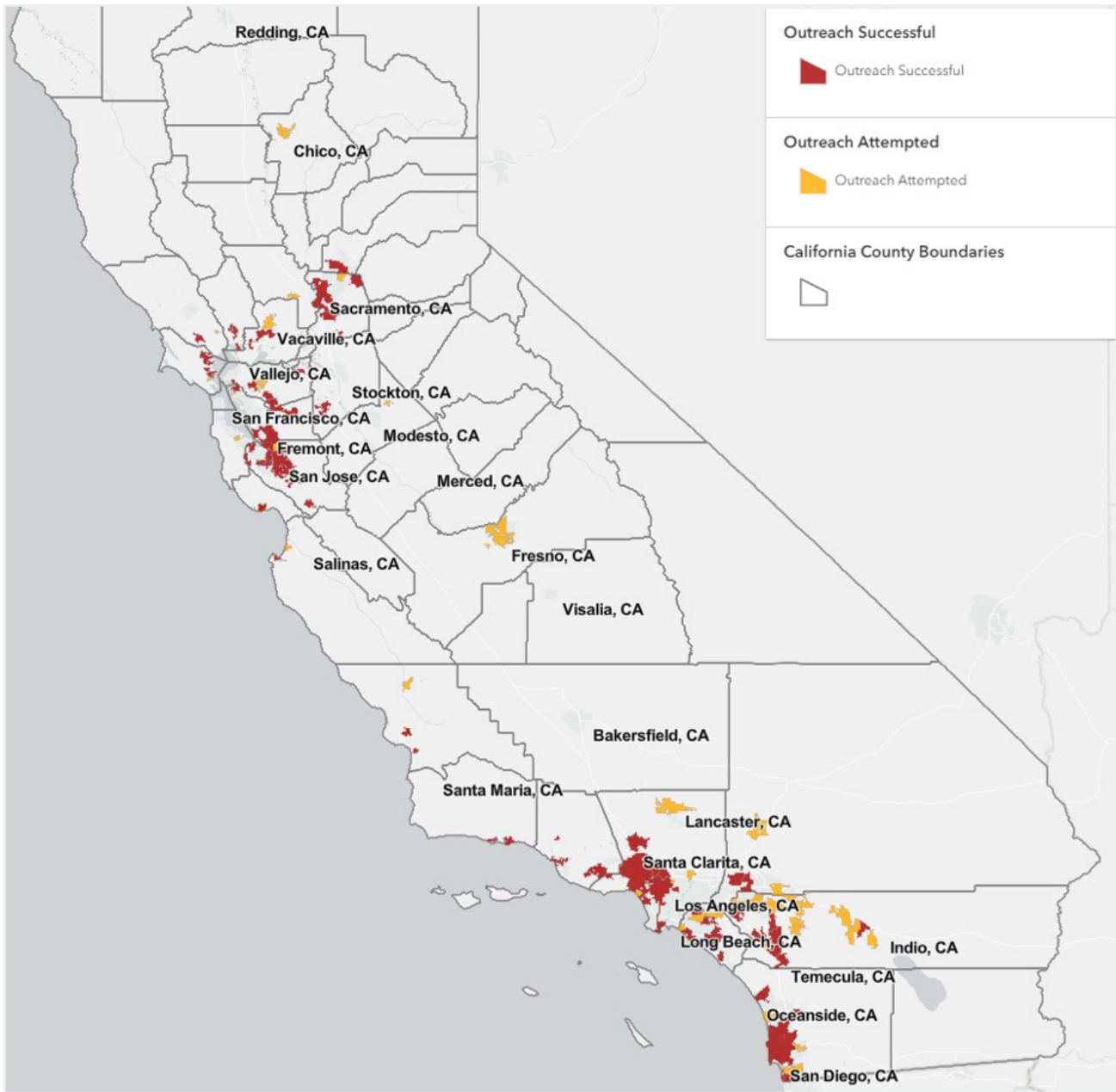


FIGURE 7: OUTREACH EFFORTS BY AUTHORITY HAVING JURISDICTION

Respondents generally consisted of permit office and building department staff, though they varied in position and seniority within their departments.

Figure 7 provides geographical context for the team’s outreach attempts. The red fill indicates that a response was received from a representative of the jurisdiction. An orange fill indicates that outreach was attempted but did not receive any response or engagement.

Findings

Data Analysis

The quantitative analysis yielded findings among the specific set of data points, including:

- The large majority, 92 percent, of TECH Clean California heat pump water heater claims were for projects in the Sacramento Valley and San Francisco Bay Area.
- Fifty-one jurisdictions distributed across the state were represented in the permit data sample.
- Thirty-two percent of the claims associated with 69 percent of jurisdictions in the dataset had an average timeline to permit issue of more than one day.
- The volume of claim submissions from within a particular jurisdiction is not a reliable indicator of an increased rate of heat pump water heater technology adoption.
- A correlation between processing more heat pump water heater permits, and reduced processing time was not found. This implies that guidance designed to streamline permit processing will be useful to permitting offices regardless of their degree of experience with heat pump water heater systems.
- There is a dramatic regional variance in average heat pump water heater permit processing times. The team examined average calendar days to permit issued from the San Francisco Bay Area (55 percent of sample data), and the Sacramento Valley Area (37 percent of sample data) to explore these variations. Sacramento Valley Area 3.88 days and San Francisco Bay Area 7.58 days. Permits with a longer-than-expected “Application to Approval” timeframe typically fell into two categories:
 1. The permit application required some back-and-forth communication with the contractor to confirm a completed application; or
 2. The permit application was part of a larger building retrofit, and the heat pump water heater was just one component of a project requiring additional review, including site plan review.
- Per jurisdiction, 31 percent of jurisdictions reviewed have an average permit issuance timeline of less than a single day.
- Twenty-five out of 51 jurisdictions, or 49 percent of jurisdictions, issue permits to 75 percent or more of their heat pump water heater permit projects in one day or less.

Informal Survey Themes

Given the limited sample size and the informal nature of the responses to the team's outreach, a numerical analysis was not appropriate. However, some common themes emerged in the responses. A summary of these themes, including the collective insights of the surveyed staff and related observations of the team, are detailed below:

REGIONAL VARIATION

The team observed that Southern California jurisdictions tended to have more detailed upfront requirements for permit applications. The team obtained accounts of jurisdictions requiring full plan checks, documentation of all gas appliances within the home, and other similarly comprehensive items. This appeared to be less common in Northern California jurisdictions.

PERMIT STAFF EXPERTISE

Permit staff who have personally seen a heat pump water heater installation responded to questions with greater confidence. The team spoke with one respondent in particular who described how his personal experience installing a heat pump water heater in his home helped him to identify gaps in, and opportunities for improvement of, his department's permitting process.

A general lack of expertise, and a resulting lack of confidence, regarding heat pump water heater permitting was apparent among outreach respondents. Permit staff from three jurisdictions indicated that they did not know what a heat pump water heater was or how it differed from an electric resistance water heater. One permit staff member stated that their jurisdiction had not yet issued any permits for heat pump water heaters, although the team located heat pump water heater permit records during a review of that jurisdiction's online portal. This suggests that the differences between water heater system types may seem ambiguous to the department staff.

There was a notable pattern of permit staff deferring to their superiors, as they had not been given direct access to the resources necessary to build expertise in emerging technologies and the permitting processes developed in support of them. It should be noted that the team did not observe a distinct correlation between the size of a jurisdiction and the expertise of its permitting staff, indicating that resource distribution issues may exist regardless of the size of a given building department.



STAFFING LEVELS

Staffing was a common concern identified by the respondents that specifically impacted internally developed permitting practices. Jurisdictions with staffing concerns generally shared a common goal of developing same day permitting practices, but typically for the sake of limiting the amount of time spent by their staff on processing permits, and less so for the sake of accelerating heat pump water heater adoption or easing the burdens of permit applicants.

PROFESSIONAL RESOURCES

The surveyed staff relied heavily on their own interpretations of the California Building Standards Code in the absence of more targeted guidance from industry groups or other third-party sources, including those developed and distributed by TECH Clean California and its program partners. Respondents cited a certain degree of trust in their own locally developed procedures, which resulted in ambivalence toward external written resources. Of those jurisdictions that did use resources from external organizations or trade groups, the most frequently cited were various chapters of the International Code Council (ICC) (33 percent of respondents), California Building Officials (CALBO) (17 percent), the California Energy Commission (CEC) (14 percent), and Energy Code Ace (11 percent). Seventeen of the outreach respondents accepted resources offered by the team following their interviews.

The team noted a particular divide amongst jurisdictions regarding the degree of trust that they placed in resources distributed by the state. Although this did not appear to be a majority opinion, the team encountered personnel who voiced that the state had a poor understanding of their jurisdiction's local circumstances, which they felt rendered state resources untrustworthy. These jurisdictions were more likely to rely on proprietary processes, or resources distributed through channels not affiliated with the state.



PROCESS DIFFERENTIATION

- Twenty-eight percent of outreach respondents explicitly stated that they do not differentiate between heat pump water heaters and other water heater types during the permitting process. This included respondents who cited the use of external resources provided by third-party organizations or trade groups.
- Those who do differentiate between heat pump water heaters and other system types collectively identified the following factors for consideration:
 - Conversions from electric vs. gas heaters
 - » Jurisdictions may not draw distinctions between heat pump water heaters and electric resistance water heaters but may still distinguish between heat pump water heaters and gas water heaters due to the added electrical load imposed by heat pump water heaters.
 - Differences in required supporting infrastructure between tank and tankless systems
 - » The team received reports of jurisdictions treating all tank water heaters alike, emphasizing that the supporting infrastructure of an existing water heater tank should be sufficient to support another of a different kind. In these cases, plan checks were only required if the heat pump water heater was replacing a tankless system in a home that did not have pre-existing supporting infrastructure for a water heater tank.
 - Condensate requirements
 - » Heat pump water heater liquid condensate is sometimes falsely equated with, and thus treated with similar caution as, the acidic flue gas condensate produced by combustion water heaters. This fails to differentiate between the corrosive chemical contents of flue gas condensate and the neutral condensate produced by a heat pump water heater from the ambient moisture of the surrounding air, resulting in more stringent condensate management requirements than are necessary.
 - Perceived importance of safety and plan checks
 - » installations may be considered minor jobs and thus unworthy of full plan checks. Respondents with this perspective communicated that a simple review of the parcel history would be sufficient in the absence of any previous code violations or enforcement issues at the residence.
 - » Alternatively, heat pump water heater installations may be considered major retrofits, deserving of rigorous plan reviews meant to ensure adequate compliance with electrical requirements and other installation standards.

BARRIERS ORIGINATING WITH CONTRACTORS

Heat pump water heaters are commonly installed by plumbers who lack sufficient experience or licensing to properly address the electrical components of their jurisdiction's heat pump water heater permitting requirements. This either necessitates the involvement of subcontractors, or results in errors and omissions in the required project documentation. This may also result in the inadvertent lack of oversight of important electrical upgrades, which then creates a safety concern and may necessitate rework at the project site.

Contractors may be unfamiliar with electronic documents and the digital submission processes commonly employed by permitting offices. These limitations in computer literacy result in submission errors or delays.

Table 6: Prioritized Recommendations and Source Basis

Prioritized Recommendations	Data Analysis	Interviews
Education, support, and outreach strategies should be tailored to suit the varying needs and experience of each region.	X	X
Continue to provide educational materials through a variety of formal and recognized channels, including state and local governments, ICC, CALBO, CEC, and Energy Code ACE.	X	X
Ensure direct distribution of resources to staff members at all levels within their respective building departments. In-person training sessions may be appropriate for departments with greater staff availability. Online and on-demand resources may more effectively serve jurisdictions whose staff are not able to attend in person.		X
Establish an experiential training program for HPWH technology. Consider a “Learn and Earn” model through which regional in-person training is provided both to contractors and to building department staff to build localized expertise in heat pump water heater installation and permitting best practices.		X
Continue targeted outreach to jurisdictions with the highest volume of TECH Clean California heat pump water heater claim submissions to identify any best practices used within those jurisdictions that may have played a role in stimulating local adoption of heat pump water heater technology.	X	X
Conduct targeted interviews with contractors to develop a more comprehensive understanding of contractors’ direct experiences with heat pump water heater permitting and the barriers they have encountered.	X	
Provide high-touch support to select building departments during the permitting of their first 10–20 heat pump water heater projects.	X	X
Reconvene the TECH Clean California Working Group to discuss initial findings in this report.		

Recommendations

The team has assembled the following recommended future actions to further the goals of this pilot. These recommendations have been informed either by the quantitative data analysis, qualitative interviews, or both, as indicated in the table below.

Next Steps

The TECH Clean California Permitting Pilot team is tasked with supporting building departments by providing resources designed to streamline their heat pump water heater permitting processes with the goal of accelerating regional adoption of heat pump water heater technology. This report has identified and prioritized recommendations that will aid in continuing this effort.

As resources allow, the team intends to pursue these prioritized recommendations, particularly those focused on outreach and education. The results of the team's research suggest that providing experiential learning opportunities tailored to address regional needs and to serve varying levels of permitting staff expertise will be the most effective approach to achieving the goals of the pilot. Particular attention should be paid to the topics discussed in the Interview Themes section of this report when crafting these educational resources. The team also sees the benefit of future research into contractors' direct experiences with heat pump water heater permitting practices, and how their experiences may differ from those voiced by the building department staff interviewed by the team to date. All additional efforts that are pursued through this pilot will be documented as part of the final Pilot Progress Report.

Appendix

BayREN Territory Analysis

By request of the Bay Area Regional Energy Network (BayREN), a TECH Clean California program partner, the team completed a supplemental, concentrated analysis of TECH Clean California heat pump water heater rebate claims data originating from within the nine San Francisco Bay Area counties. This territory includes Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara, Solano, Sonoma, and San Francisco counties. The concentrated analysis used the verified permit portal data as defined in the [Quantitative Permit Data Analysis](#) section of this report.

As 55 percent of the permit portal data used for the Permit Processing Timeline section of the preceding analysis originated from within these same nine counties, the findings outlined here are substantially similar to those of the broader analysis detailed within this report.

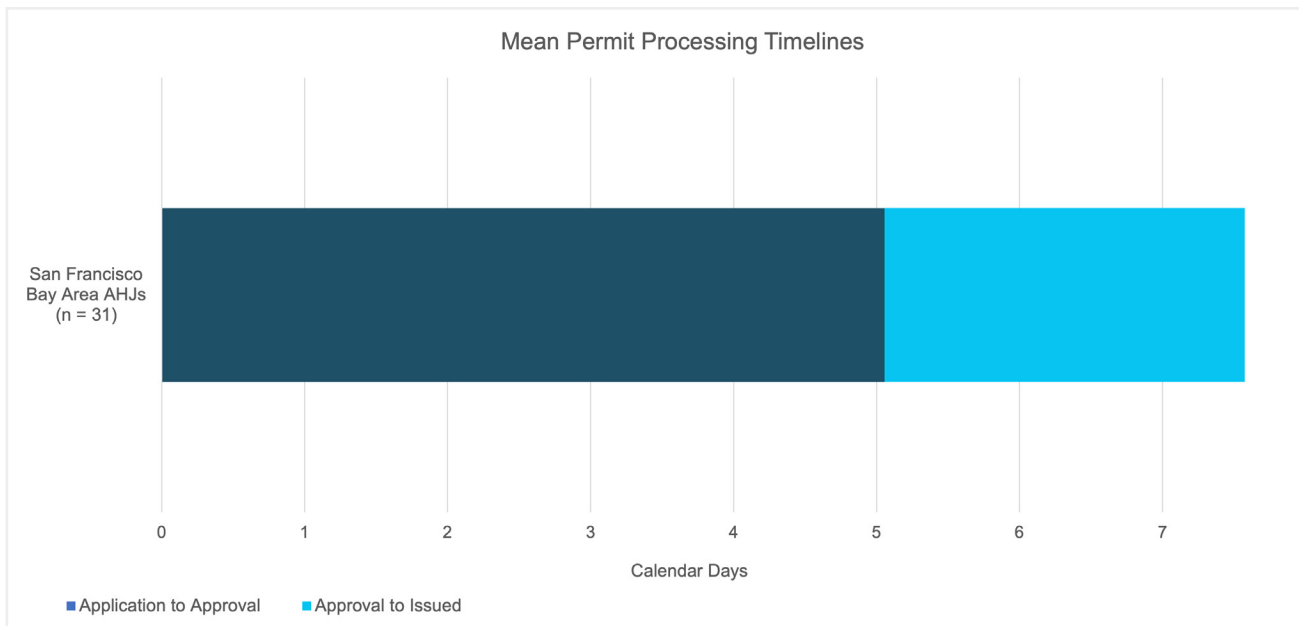


FIGURE A.1: AVERAGE PERMIT PROCESSING TIMELINE, SAN FRANCISCO BAY AREA

As can be seen in Figure A.1 above, permit processing from the time of application to the time at which the permit is granted to the contractor or homeowner (Permit Issued) takes, on average, roughly 7.5 calendar days. The greater portion of this time (5.1 calendar days) occurs during the initial stage of the permitting timeline between the time of application and the time at which the plan is approved by the permitting jurisdiction. This suggests that permitting resources or guidance provided within this region may have the greatest impact if crafted to address this initial stage.

Figures A.2 and A.3 (shown below) show distributions like those shown in Figure 3 and Figure 5 included in the Quantitative Permit Data Analysis section of this report. Please see the preceding data analysis for key findings.

HPWH Claims by Count & As Percentage of Single Family Homes (Top 30 by Count)

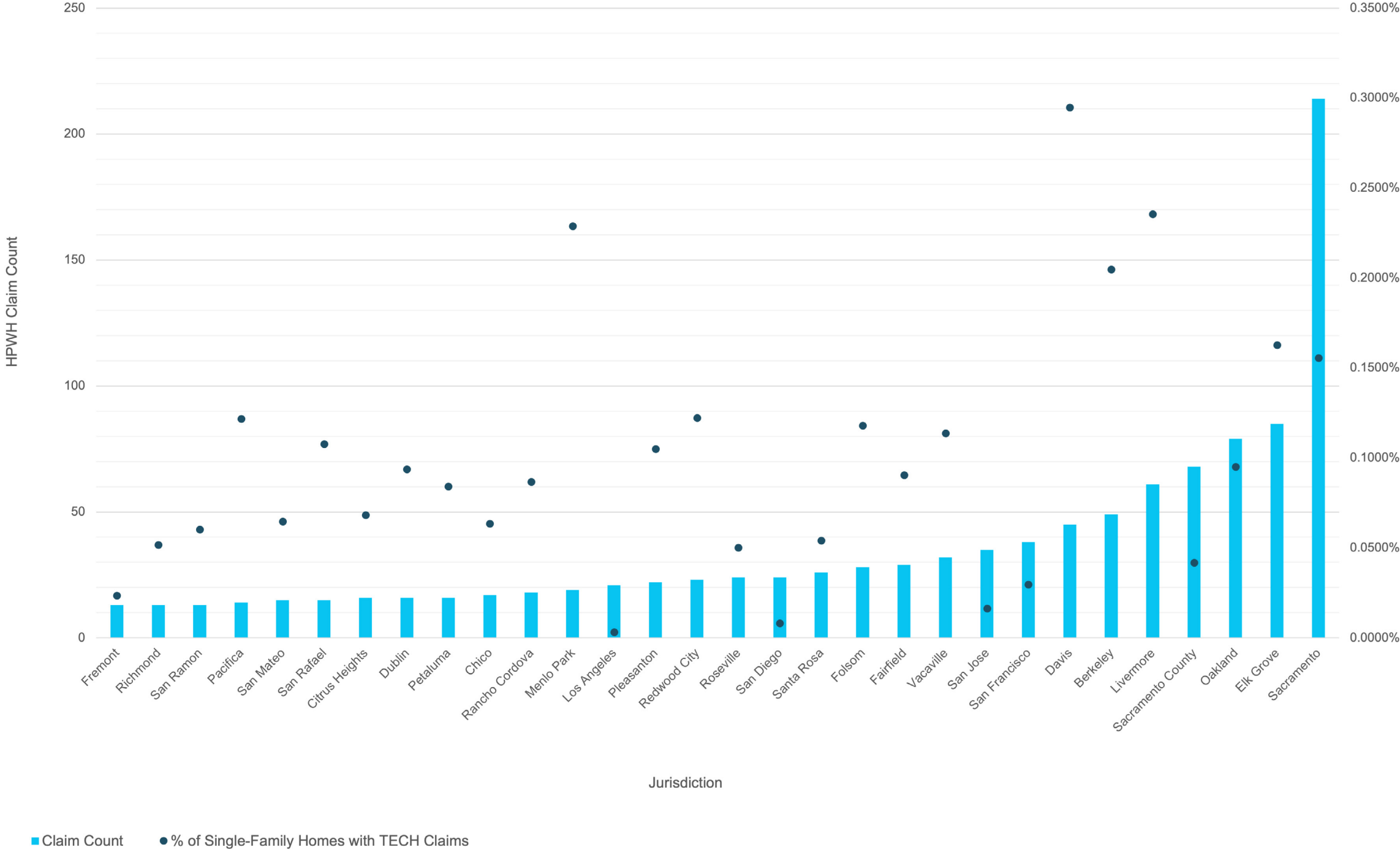


FIGURE A2: HEAT PUMP WATER HEATER CLAIMS BY COUNT AND AS PERCENTAGE OF SINGLE FAMILY HOMES, SAN FRANCISCO BAY AREA

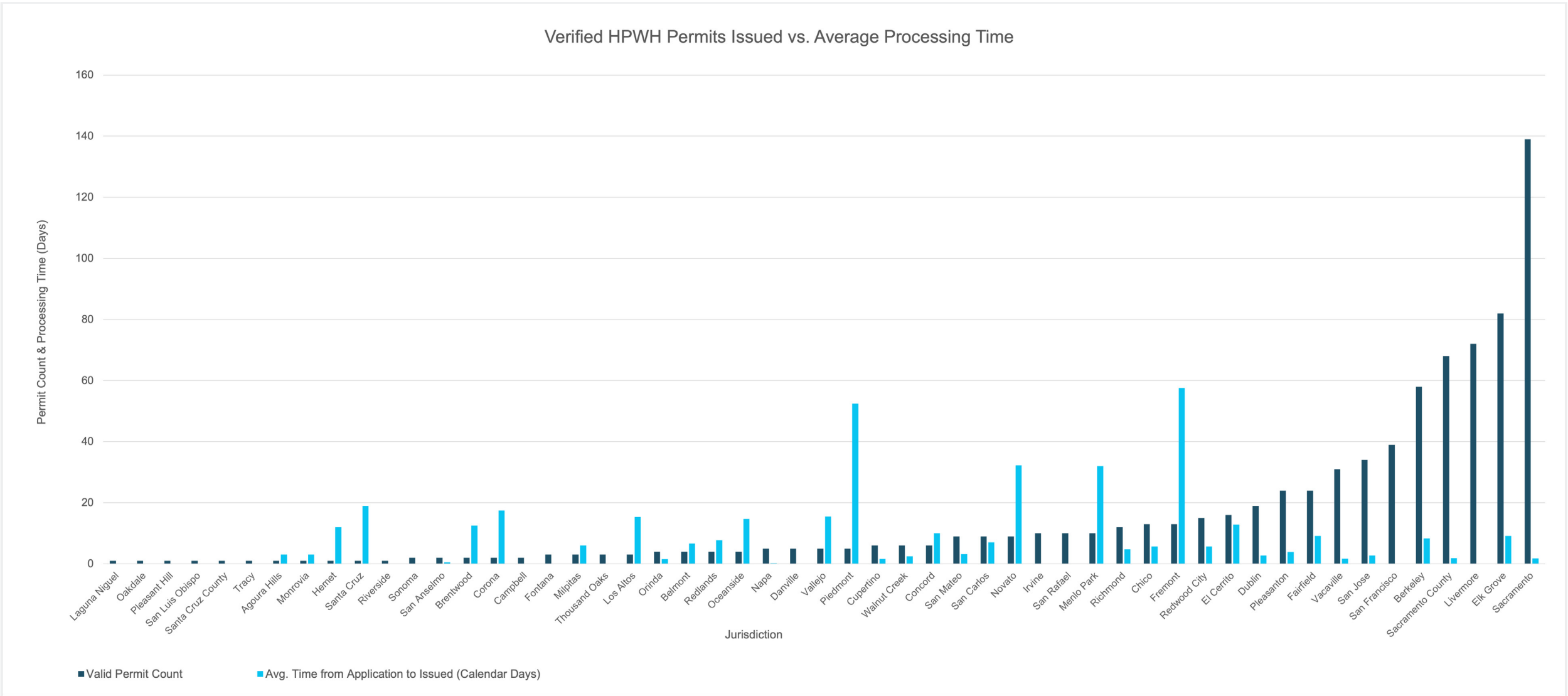


FIGURE A3: VERIFIED HEAT PUMP WATER HEATER PERMITS ISSUED VS. AVERAGE PROCESSING TIME, SAN FRANCISCO BAY AREA



TECH

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California's award-winning heat pump program, TECH Clean California, has allocated \$80.2 million in funds for heat pump water heater installations, designed to help accelerate the market for heat pump technology across the state through incentives, workforce training, and consumer education to create a pathway for achieving California's targets of six million heat pumps by 2030 and carbon-free, climate-ready homes by 2045.

TECH Clean California is funded by California ratepayers and taxpayers and administered by Southern California Edison Company under the auspices of the California Public Utilities Commission.

The TECH Clean California team is led by Energy Solutions and partners with Ardena Energy, Association of Energy Affordability, Building Decarbonization Coalition, Electrify My Home, Frontier Energy, National Comfort Institute, Energy Outlet, Recurve Analytics, The Ortiz Group, Tre' Laine Associates, and VEIC.

