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STANFORD URBAN RESILIENCE INITIATIVE

2025 Palisades Fire Recovery Analysis for the City of Malibu

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Summary

- Most homeowners can expect to rebuild their homes between 2027 and 2033, with the total time to rebuild of about 5 years on average. Assuming optimistic permitting capacity, the average time to rebuild can be reduced to about 3.5 years, with most homeowners rebuilding between 2027 and 2030. Assuming pessimistic permitting capacity, the average time to rebuild is 7 years, with last construction finishing around 2037.
- The separation between rebuilding progress in the optimistic, baseline, and pessimistic recovery scenarios increases substantially after the second year of recovery. This indicates that policy choices and capacity constraints compound over time, meaning that improvements in early recovery processes can translate into large differences in long-term outcomes.
- Recovery forecasts are based on our best efforts and publicly available data through mid-November 2025. We do not consider potential recovery restarts due to future wildfires and assume owners will proceed with rebuilding as soon as possible. Delays caused by potential legal actions, lengthy lot sales or significant unforeseen supply-chain disruptions are not accounted for.
- We hope that this report serves as a start of a structured dialogue on how predictive models can support recovery management in the City of Malibu. As we gain more information through data collection, interviews, and collaborations, we can update model parameters, increase the reliability and comprehensiveness of recovery timeline forecasts and better support recovery management.

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Contents

1 Introduction

This paper focuses on the recovery of destroyed single-family homes in the City of Malibu following the January 2025 Palisades Fire. It presents an overview of a year-long effort to collect data, analyse ongoing recovery efforts and forecast future recovery timelines using predictive models. The aim is to provide an estimate of what the community can expect from the recovery process under different future scenarios. Beyond forecasting, this effort aims to support recovery management by testing, designing, and monitoring recovery policies in a structured, data-driven, and as-objective-as-reasonably-possible way using the data and models presented in this analysis.

Recovery management is complex and disaster recovery is a time of extreme collective uncertainty [29]. Following wildfires, gaps in timely, accurate, and accessible data slow down recovery and complicate coordination across agencies and stakeholders [9]. In addition, more than 40 years of experience in housing disaster recovery shows that insufficient access to data, as well as limited proactive planning remain key barriers to achieving timely and equitable recovery outcomes [42].

Today, unlike in the past, we believe we have the technology to address these well-known problems. This study applies regional recovery modeling to reduce uncertainty of the recovery process by providing data-driven forecasts of how housing recovery is likely to unfold. These forecasts are intended to support city officials, recovery managers, and affected residents by clarifying what timelines and bottlenecks can be expected, and how different policy and resource allocation decisions may influence recovery outcomes. The modeling approach integrates site-specific data, lessons from past wildfire recoveries, expert judgment, early recovery trends observed on the ground, and predictive modeling to generate recovery timelines under different recovery scenarios. Finally, the data compiled and analyzed in this report are designed to be transferable to future wildfire events, allowing lessons learned from the 2025 Palisades Fire to inform preparedness and recovery planning both in Malibu as well as other communities.

This analysis is possible due to the cooperation of local experts, transparent recovery management by the City of Malibu, documented experience from past wildfires, publications addressing recovery following the 2025 Palisades Fire [3, 43] and publicly available data on 2025 Palisades Fire damage and recovery progress through public-facing dashboards.

The recovery analysis is tailored to support decision-making of the city government. The recovery scenarios analysed in this report focus on what the city can do to improve recovery. However, it should be noted that many factors driving recovery are outside the control of the city government. The impact of some of those factors on recovery will be considered, but policies targeting those factors won't be further analysed in this report. We believe that small interventions early in the recovery will accumulate and make a significant difference in the recovery trajectory later on. This report aims to support the recovery of the City of Malibu using objective, data-driven analysis by identifying such interventions.

The recovery analysis presents our best effort to provide timeline forecasts and support decision-making. However, there is inherent uncertainty in the future. In this paper we compare our forecasts with the recovery progress made so far to understand how much trust can be placed in our forecasts. We plan to monitor recovery progress and keep updating recovery forecasts as new data is available. Nevertheless, structured data collection and policy testing made possible with our solution can support decision-making resulting in a more predictable and efficient recovery.

2 Brief recovery analysis of the 2018 Woolsey fire

The November 2018 Woolsey Fire destroyed 465 homes in the City of Malibu. By October 2025, seven years later, 45% of homes have been rebuilt, with additional 36% being in the process of rebuilding and 19% of affected homeowners not yet contacting the City to initiate the rebuild process [20, 23].

The recovery following the 2018 Woolsey Fire is analysed to inform the recovery analysis following the 2025 Palisades Fire. Building permits for new single-unit homes issued in the City of Malibu from 2018 to 2023 are shown in Figure 1. The trend shows that within 6 months after the fire there is a sharp increase in the number of issued building permits. Maximal number of building permits issued per month is 20. This indicates the upper bound of the administrative capacity of the City of Malibu following the 2018 Woolsey Fire. Note the drop in the building issuance trend in 2020 and early 2021. We assume this was caused by the COVID-19 Pandemic.

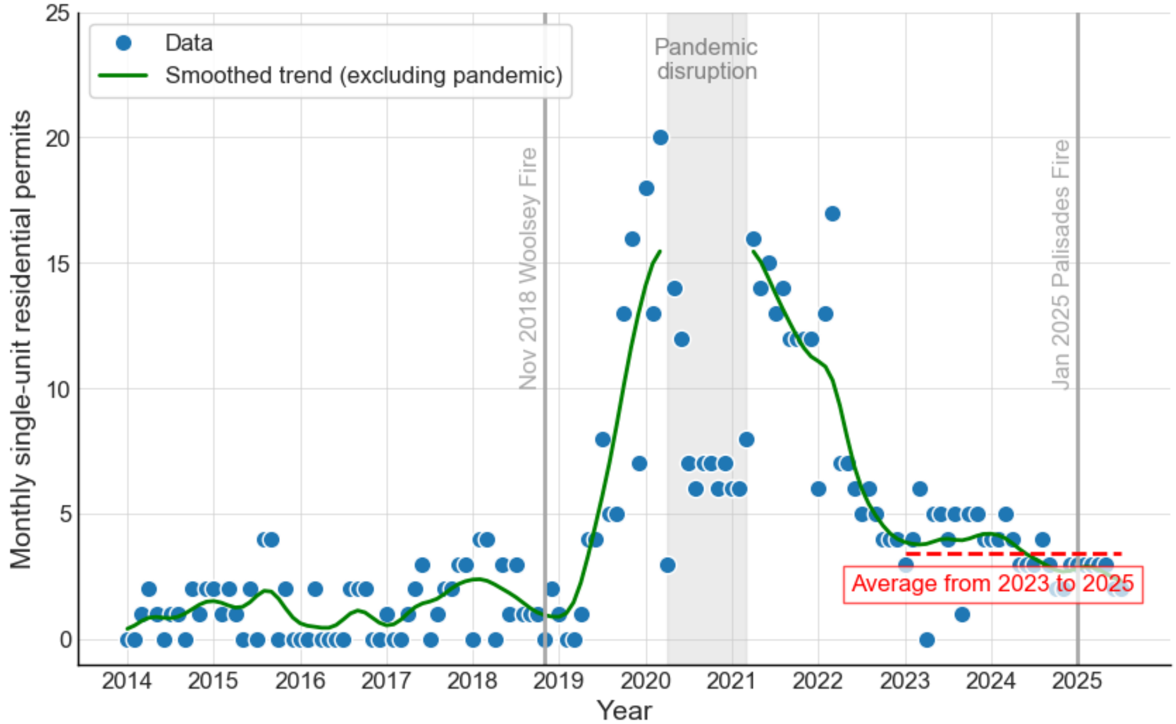

Figure 1: Issued building permits in City of Malibu for single-unit residential buildings following the 2018 Woolsey Fire.

We used tax assessor data [39] to analyze the sales of lots with single-family homes from 2014 to 2024 in the City of Malibu. An increase in the number of sold lots can be seen from 2020 to 2022. We believe that part of this increase can be explained by the 2018 Woolsey Fire. The important conclusion is that the increase in lot sales persisted from 2 to 4 years following the fire (Figure 2).

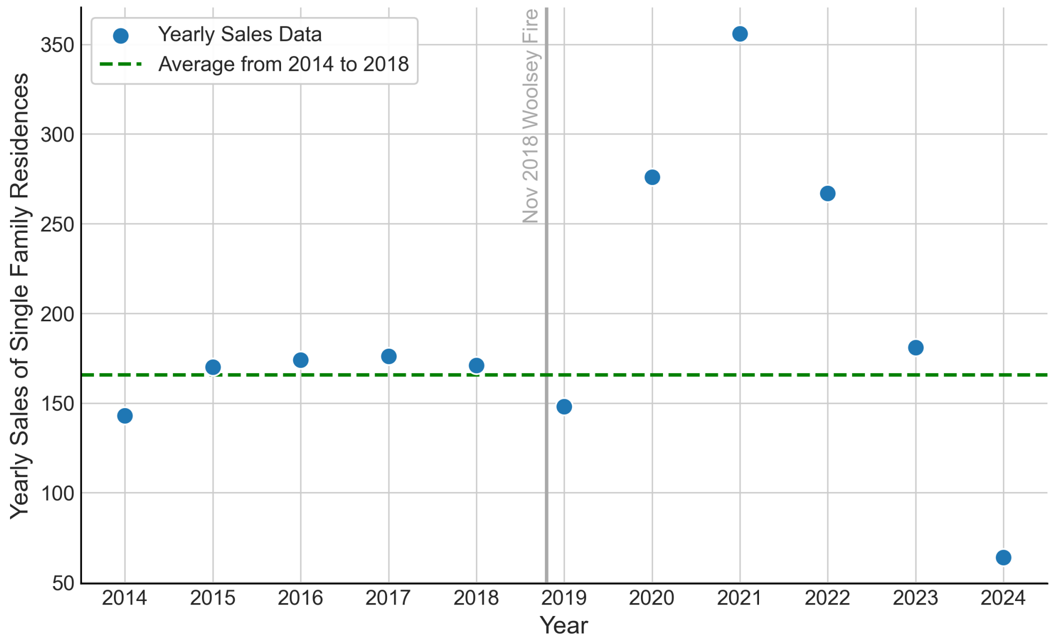

Figure 2: Sales of lots with single-family homes in Malibu from 2014 to 2024. Note the increase in sales after the 2018 Woolsey Fire.

3 Building damage in the City of Malibu following the 2025 Palisades Fire

Building damage caused by the 2025 Palisades Fire in the City of Malibu is obtained from the CalFire damage inspection data [5]. Building damage data is geolocated and overlaid with tax assessor data [39] to identify the occupancies, the year built and the total living area of damaged buildings. Building information regarding number of stories, structural type, and the number of occupants is retrieved from the National Structure Inventory. Table 1 presents damaged buildings per occupancy type. Parcels containing damaged buildings are shown in Figure 3. 97% of destroyed buildings are residential buildings, with 82% single-family homes. We estimate that 535 buildings are single-family homes with additional 82 multi-unit residential buildings.

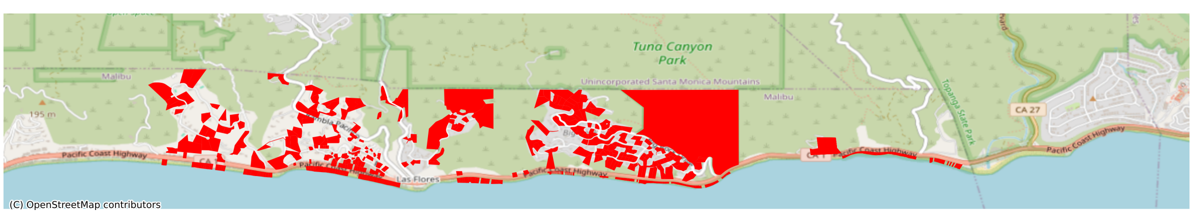

Figure 3: Parcels containing damaged buildings in the City of Malibu following the 2025 Palisades Fire

Table 1: Damaged buildings in the City of Malibu categorized by occupancy class per tax assessor data [39] and CalFire damage data [5].

Occupancy Class	Number of damaged buildings
Single-family Residential	535
Multi-family Residential 2-unit (Duplex)	44
Multi-family Residential 3-unit	7
Multi-family Residential 4-unit	15
Multi-family Residential Other	16
Vacant Residential	14
Mixed-use	4
Commercial	11
Government owned	4
Total	650

4 Modeled steps to rebuild a destroyed single-family home

The many steps to rebuilding a home after a disaster each require resources and time. Some steps can proceed in parallel, while others start after preceding steps are finished.

We propose a recovery steps model required to rebuild a single-family home (Figure 4) based on past experiences, scientific literature and interviews with local experts. These steps are not exhaustive, and the recovery process will look different for different owners and buildings. These steps represent our best effort to identify common steps for a typical single-family home that was destroyed in the fire and is rebuilt in the City of Malibu. Recovery timelines can vary for homes situated on slopes, beachfront properties, or flat parcels, as well as for owners with differing socioeconomic resources. These variations are not explicitly modeled in our study; rather, we present a range of recovery times with more complex rebuilds being closer to the upper bound and the more simple rebuilds having recovery time closer to the lower bound of the forecasted range.

The recovery process starts with damage assessment. Following damage assessment, we consider three streams of parallel steps. The first stream considers the steps required to finance rebuilding. In this analysis, we assume that owners rely on insurance payouts to rebuild. In terms of the time needed to receive the funds to rebuild, this is a conservative assumption, as some owners might use immediately accessible private funds and thus not face delays related to claims settlement, while others might sell their lot [44]. Based on statutory timelines, empirical evidence from past California wildfires, and insurance payout data, we estimate that most insurance claims are settled within approximately 2 to 6 months following damage assessment. While some claims may take longer, this range captures the period during which the majority of homeowners should receive funds needed to proceed with rebuilding.

The second stream considers the time owners need to make a decision, prepare the building design, receive the necessary approvals, and complete construction. Once damage to their home is assessed, owners start considering their options. Owner decision-making is highly variable and can range from weeks to several years, with evidence from prior wildfires indicating that up to three years may pass before some owners apply for a building permit. After the decision to rebuild, architectural design typically takes 1 to 2.5 months, followed by planning approval, engineering design and plan check. Based on information provided by a local expert [41], we assume that the architectural design starts once owners have made a decision and is submitted for planning approval after the debris are removed. Time needed to receive a planning approval and plan check depends on the city's administrative capacities and the quality of the submissions. We combine local expert opinion, trends observed in the first 10 months of recovery, and past experiences to assess the execution times for these steps and the administrative capacities of the City of Malibu. Due to its geography, Malibu faces permitting challenges not common to inland, flat, terrain. Thus, we made an effort to obtain administrative capacities and timelines specifically related to the City of Malibu to account for these challenges. Once permits are issued and financing is in place, construction begins. Given the prevalence of custom homes in Malibu and the surge in post-fire demand, we estimate typical construction durations of approximately 12 to 18 months for most single-family homes. Although larger, more complex, homes might take up to 48 months to complete.

In parallel with these two streams, a third stream encompasses site clearance activities, including hazardous waste removal and debris removal. These steps are completed relatively quickly compared to the overall recovery timeline, generally within weeks to months after the fire, and therefore do not significantly influence long-term recovery forecasts, which are measured in years. Together, these three parallel streams define the sequence and timing of recovery, with longer-term recovery timelines primarily driven by owner decision-making, permitting, and construction rather than early post-fire cleanup activities.

The execution time required for each step are assessed based on past experience, expert opinion, disaster recovery literature, and data collected in the first 10 months of recovery (Table 2). Note that the execution times provided in Table 2 represent the active time to perform each step at the individual site once it begins. Execution times do not account for the disaster scale issue, such as waiting or queue times. These are captured in the predictive model by considering the regional availability of resources. Therefore, the time that each recovery step starts can be different for each home, depending on when resources are allocated and preceding steps are completed. We provide further details for each of the modeled steps in the Appendix (Section 14).

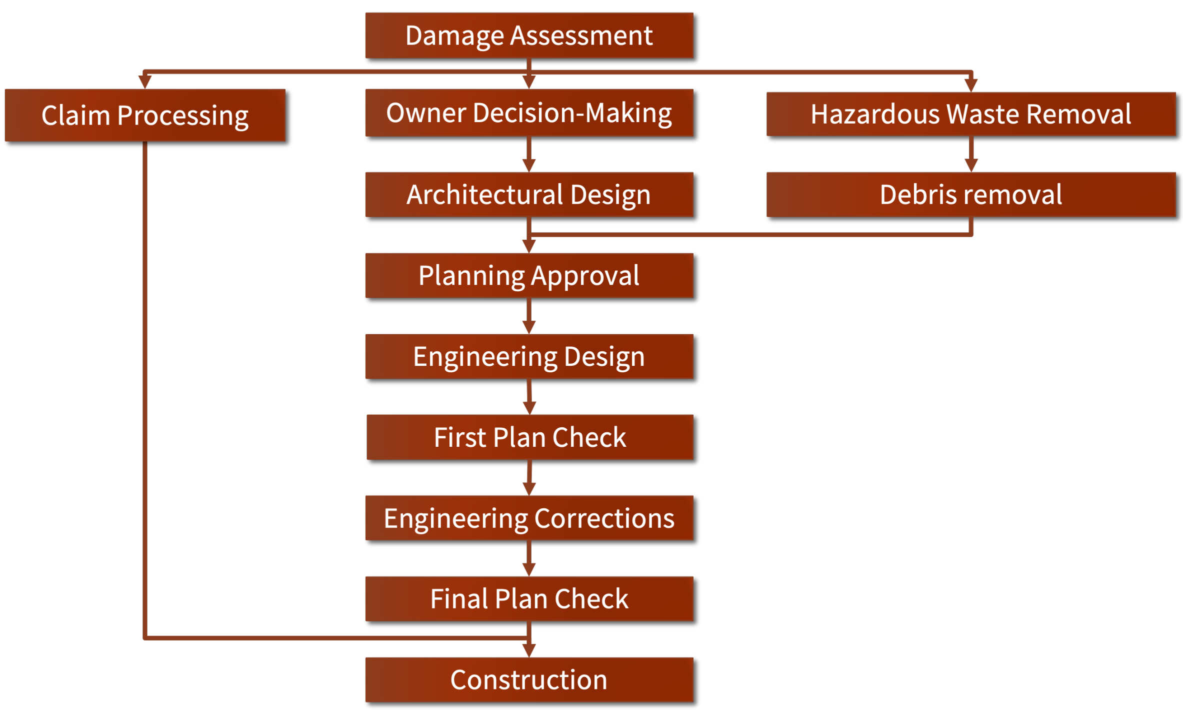

Figure 4: Modeled recovery steps for destroyed single-family homes in the City of Malibu following the 2025 Palisades fire.

Table 2: Assumed execution times for recovery steps for single-family homes in the City of Malibu. Execution times refer only to the active time required to perform each step once it begins. They do not include any waiting or queue time before the activity starts.

Recovery Activity	**Execution Time (calendar days)**		**Source**
	Lower bound	**Upper bound**	
Damage Assessment	<1	<1	News reports (Section 14.1)
Claim Processing	56	180	Literature, Past experience (Section 14.5)
Hazardous Waste Removal	<1	<1	News reports (Section 14.2)
Debris Removal	2	3	News reports (Section 14.3)
Decision-Making	7	1080	Past experience (Section 14.4)
Architectural Design	28	70	Expert opinion (Section 14.6)
Planning Approval	30	30	Initial recovery trajectory (Section 14.7)
Engineering Design	28	70	Expert opinion (Section 14.8)
(limited availability)	84	119	Initial recovery trajectory (Section 14.8)
First Plan Check	14	21	Expert opinion (Section 14.9)
Engineering Corrections	21	28	Expert opinion (Section 14.10)
Final Plan Check and Fees	21	28	Expert opinion (Section 14.11)
Construction	360	540	Expert opinion, Past experience (Section 14.12)

5 Recovery capacity of the City of Malibu

The capacity of the City of Malibu to recover depends on the resources available to the owners of destroyed buildings. This recovery analysis considers financial, technical, and administrative capacities.

5.1 Financial capacity

Financial capacity of owners to rebuild is critical for recovery. Multiple sources of financing can be used to rebuild with the primary being insurance, as well as loans, grants, and private savings [25]. Homeowners in Malibu purchase wildfire insurance from private insurers. If the owner cannot obtain coverage in the traditional insurance market, the owner can purchase wildfire insurance from the FAIR plan, the insurer of last resort [10].

Maximal coverage data for Malibu homeowners with traditional insurance depends on owner's choice and the insurance company. FAIR plan maximal coverage is $3 million [7]. Construction cost in Malibu at the time of writing this report is estimated at $1000-1200 per square foot [37, 40] and represents the upper bound of construction cost estimates by the owners affected by the 2025 Palisades fire [44]. By combining the tax assessor data on building area (Figure 21) and adopting 1100 $/sqft as the construction cost, we estimate that the construction cost for at least 40% of destroyed single-family homes are above the FAIR plan limit of $ 3 million (Figure 5). We do not have information on the exact homes which are on FAIR plan or the insurance coverage limit for destroyed homes, but it is clear that a significant number of owners in Malibu might struggle with covering construction cost from insurance alone. Note that the area estimates are retrieved from the tax assessor data as total living area of properties, which might be an underestimation of the total built area, therefore, this is a lower-bound estimate of construction costs. Similar experience of insurance coverage not being adequate to finance post-fire rebuilding is observed after the 2018 Woolsey fire [36].

With an average household income of $192,000, Malibu's income level is substantially higher than the U.S. average [47]. Even in cases where current owners may lack sufficient liquidity to finance reconstruction, the high underlying land values make the resale of damaged parcels likely, with subsequent redevelopment by new owners expected (e.g., [30]). Consequently, scenarios in which a substantial share of destroyed buildings is not rebuilt or in which Malibu experiences a long-term population decline, such as those observed in Paradise following the 2018 Camp Fire [38, 32], are unlikely in this context.

Due to limited data availability, we are unable to directly quantify the share of owners with the financial capacity to rebuild. Accordingly, for the purposes of this analysis, we assume that all destroyed single-family homes are ultimately rebuilt, either by the original owners or by subsequent purchasers.

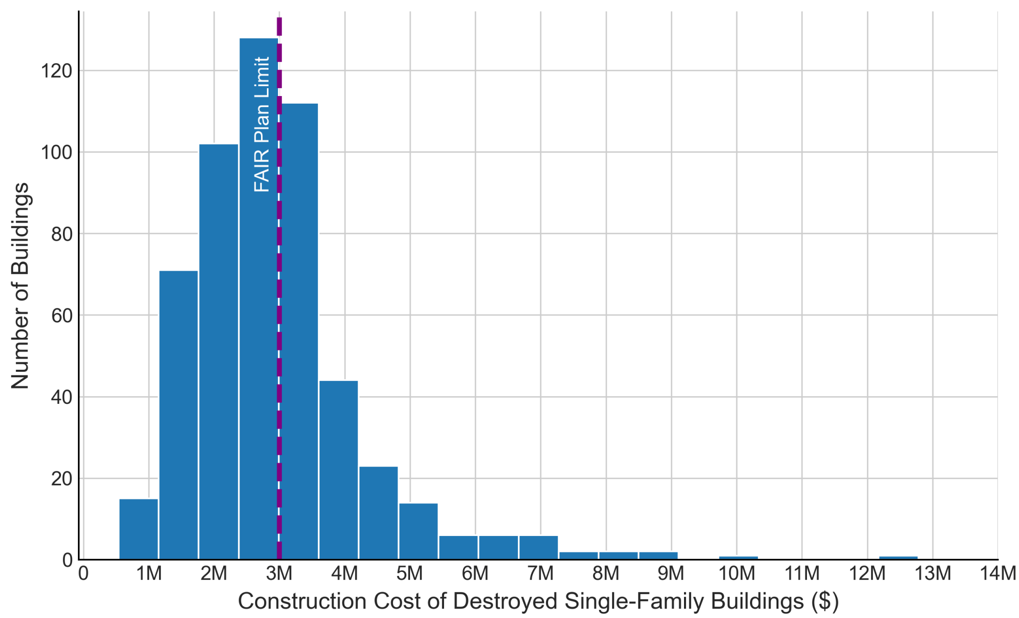

Figure 5: Distribution of estimated lower bound of construction cost for destroyed single-family buildings in Malibu. Red vertical line indicates the FAIR plan coverage limit of $ 3 million. Construction costs are estimated assuming $1100 per square feet and considering the total living area of destroyed single family homes. As market conditions evolve, updates are necessary.

5.2 Technical capacity

Technical capacity considers the availability of qualified professionals, such as engineers and architects, and the construction workforce and machinery. Technical capacity of a region develops to serve the everyday, disaster-free, construction demand. However, damage caused by disasters suddenly increases construction demand, with the technical capacity lagging. Such supply/demand mismatch results in resource constraints leading to longer recovery times and price increases.

We explicitly account for technical capacity constraints in damage inspections, hazardous waste removal, and debris removal by delaying the start of these steps for destroyed single-family homes based on the availability of inspection and clean-up teams. Notably, during the 2025 Palisades Fire, such delays did not have a significant impact on forecasted recovery timelines, as technical capacity for inspections and site clean-up was not a significant bottleneck. Additional details are provided in the Appendix (Section 14).

Issued building permits can be used as an indicator of the regional construction activity and thus the regional technical capacity that developed to serve the everyday construction demand. Building permit analysis for the City of Malibu from January 2023 to January 2025 shows that on average about 4 permits for new single-family homes are issued per month (Figure 1). Building construction trends generally closely follow building permit issuance trends. Rebuilding all 650 buildings destroyed in the wildfire will therefore require involvement of technical capacity from surrounding regions.

It is challenging to assess how much of the surrounding region will participate in the recovery of the City of Malibu, making the estimation of post-disaster technical capacity difficult. As interviews with design professionals from the City of Malibu were conducted several months after the wildfires and considering that 2018 Woolsey fire is a recent event, we asked design professionals for their assessment on the times they will need for construction and design considering the post-disaster context. Therefore, the constraints related to the technical capacity are implicitly included in the execution time of architectural and engineering designs, engineering corrections and construction.

Analysis reported in Project Recovery [43] indicates that the overall scale of rebuilding needed to recover from the 2025 Palisade fire is moderate relative to the baseline pace of construction in Southern California. As a result, there is limited concern regarding regional supply-chain capacity to provide the materials required for reconstruction. Instead, the primary logistical challenge is expected to be transporting materials into affected neighborhoods, where access is constrained by limited road capacity. The report further notes that reconstruction could be completed by 2028 or 2030, but timelines may extend considerably if permitting and approval processes are not streamlined. These findings reinforce the importance of explicitly considering administrative capacity, as done in this study, while representing other resource constraints, such as materials or machinery, in a more aggregated, implicit, manner.

Labor availability is likewise not expected to be a significant constraint, as additional workforce demand can be met by construction workers already residing within the state. However, housing the workers presents a challenge [3], given the region's existing housing shortages and the traffic congestion associated with long-distance commuting.

5.3 Administrative capacity

Administrative capacity is the ability of the city government to process documentation required to enable legal conditions for construction. Three modeled recovery steps require administrative resources: planning approval, first plan check and final plan check (Figure 4, Table 2).

Similarly to the technical capacity, the administrative capacity can be assessed by looking at building permit trends. These provide a baseline for the administrative capacity of the City of Malibu. We explicitly consider the administrative capacity in this recovery analysis by observing the permit trends following the 2018 Woolsey fire and the trends in the first 10 months following the 2025 Palisades fire. This allows us to quantify how many planning approvals and plan checks can be processed considering the specific context of the City of Malibu and the post-fire increase in administrative capacity. The key parameter to assess is the number of planning approvals and plan checks that can be processed in parallel, as it defines the throughput of the city's departments.

By observing the publicly available data on submitted and approved planning applications following the 2025 Palisades Fire [21], we can estimate the planning approval capacity. Earliest information is reported in the City of Malibu's newsletter on March 27, about 2 months following the wildfire. Latest information used in this analysis is reported on November 11th 2025. We estimate the number of issued planning approvals within a 30 day window (Figure 6). From May to September 2025, the approval rate is between 7 to 12 in 30 days. We observe that in September, October and November 2025 there is an increase in the planning approval rate, reaching 23 in 30 days in November 2025.

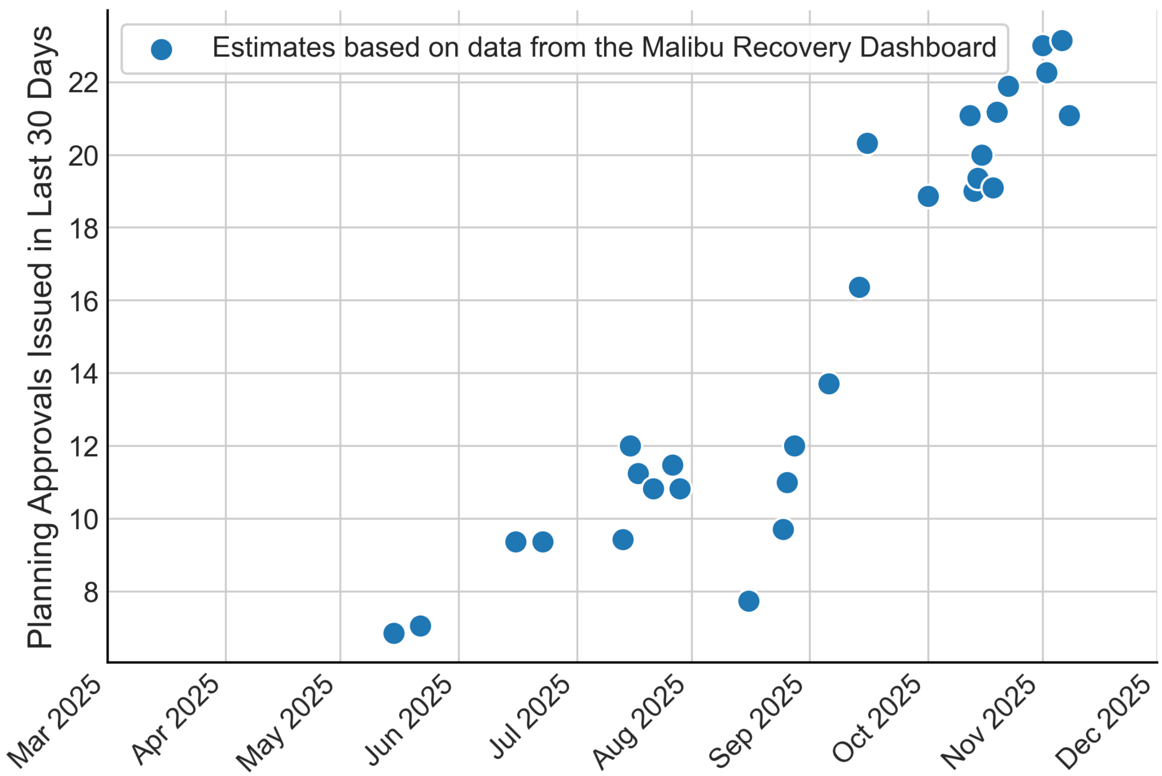

Figure 6: Average number of issued planning approvals in 30 day windows during the first 10 months following Palisades fire. Plotted points refer to the end of the 30 day window. Because issued planning approvals were recorded over varying time spans, counts were adjusted to a 30-day equivalent and may appear as non-integers.

Plan check approval rates following the 2025 Palisades fire are more challenging to estimate, as only 16 building permits have been issued till November 11th 2025. Furthermore, the rates have sharply increased in October and November 2025. From July to September 2025 one plan check is approved per 30 days (Figure 7). However, in October 2025 and November 2025 up to 10 plan checks are approved.

The building permit issuance trend following the Woolsey fire (Figure 1) indicates that the maximal number of issued building permits per month can increase to 20. This is consistent with the post-September trend in planning approval rates. However, it should be noted that the Woolsey fire building permits include non-wildfire related construction.

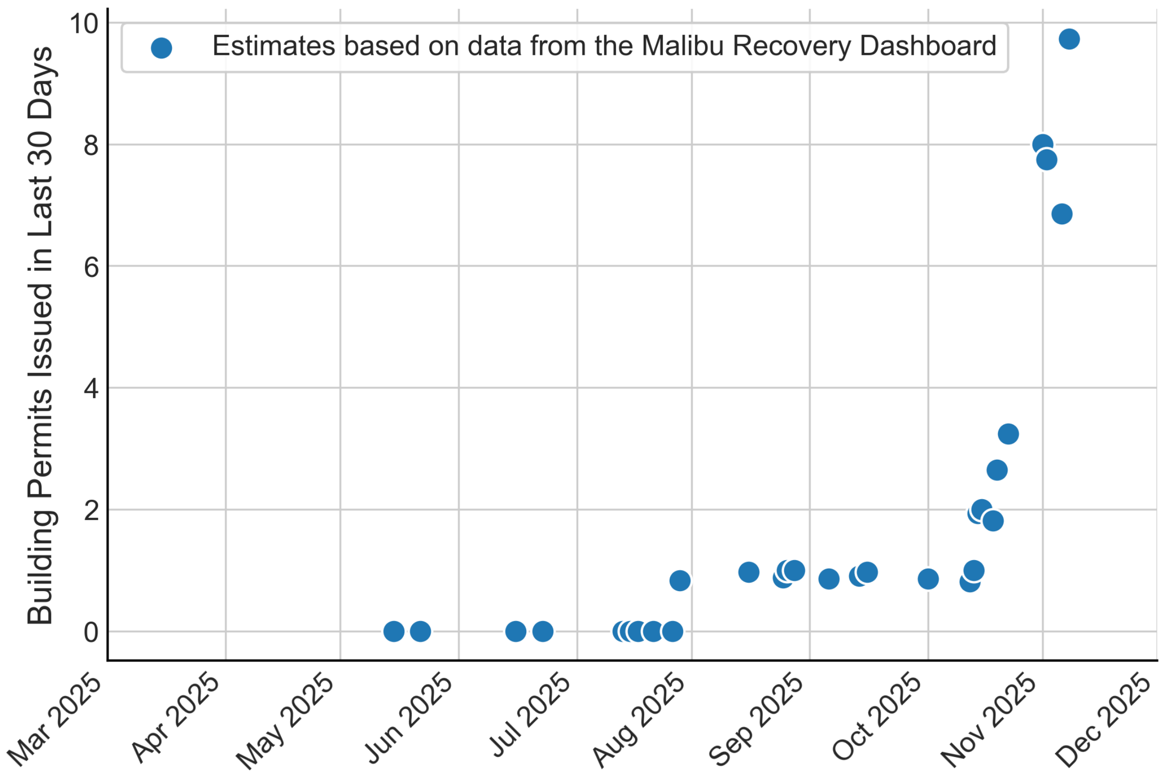

Figure 7: Average number of issued building permits in a 30 day windows during the first 10 months following Palisades fire. Plotted points refer to the end of the 30 day window. Because issued building permits were recorded over varying time spans, counts were adjusted to a 30-day equivalent and may appear as non-integers.

Table 3: Range of planning and plan check approval capacities of the City of Malibu based on data from 2018 Woolsey fire and 2025 Palisades fire

	Planning approval capacity [per 30 days]	Plan check capacity [per 30 days]
Minimum	4	1
Maximum	23	20

City government has undertaken steps to strengthen the administrative capacity. Several meetings with design professionals are organized to clarify the rules regarding planning approval and plan check [14, 12]. Consultants are hired to expedited and support processing [16]. These efforts can explain the recent increase in planning and plan check approval rates observed in the data.

Based on the building permit data following the 2018 Woolsey fire and plan check and planning approval trends following the 2025 Palisades fire, we can estimate the lower and upper bound of the administrative capacity (Table 3). Planning approval rates vary between 4 per month as the average during pre-fire time (Figure 1) to about 23 in 30 days observed in November 2025. Approval rate for plan check varies between 1 in 30 days observed from July to October 2025, 10 observed in November 2025 to 20 per month as the maximum after the Woolsey fire.

6 Recovery forecast scenarios

Based on the information provided above, including data from past disasters, expert opinion, and initial recovery progress, we forecast how recovery will unfold under different scenarios using regional recovery models. This is done by using the analysed information as inputs to a regional recovery model [2] that outputs timeline forecasts, future resource needs, and identifies bottlenecks ahead of time.

The starting point of the model is the recovery step sequence for a single building defined in Section 4. The model scales this single-building sequence to all destroyed buildings and considers their recovery progress. Recovery progress is constrained by administrative, technical, and financial capacities analyzed in Section 5. While the impact of recovery capacities on certain recovery steps is accounted for implicitly by extending their execution times, recovery bottlenecks related to administrative capacities are studied explicitly. Recovery model simulates each day of recovery sequentially, capturing resource constraints by assigning limited resources (i.e., planing approval and plan check teams) to buildings (Figure 8). Those buildings that receive resources, proceed with their recovery, while others wait until the resources are released from other buildings and are assigned to them. Explicit consideration of administrative capacities allows us to estimate the impact of varying administrative capacities on recovery progress.

We make several assumptions when projecting recovery timelines. First, we assume all the homes will be rebuilt as soon as resources are available following the recovery steps outlined in Figure 4. This assumption results in the highest demand for administrative capacity, as delays in rebuilding caused by the owners are expected to relieve the pressure on the city's administrative capacity, by spreading out the demand for plan checks and planning approvals over time. Second, we assume that no future extreme event (e.g., a future wildfire) will impact the recovery timeline. This assumption stems from the unpredictability of future events. If such an event is to occur, we can update our forecasts depending on the event intensity. Third assumption is that adopted range of administrative capacities are constant during recovery. As seen from the first 10 months of recovery, administrative capacity varies over time. However, the exact future dynamics of this variation is

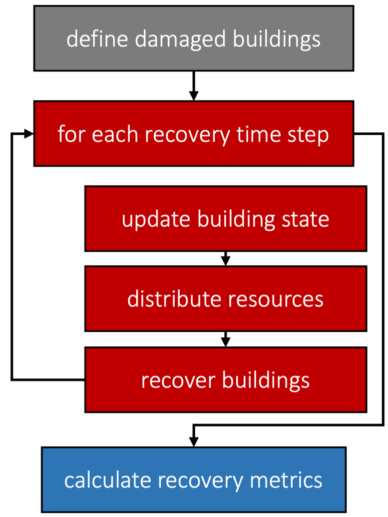

Figure 8: Regional recovery modeling algorithm. First step is to define properties of damaged buildings, such as location, area, or occupancy class. Then, a time-stepping loop is initiated to simulate the recovery process. At each time step (e.g., a day), buildings' recovery resource demands are updated based on their current recovery state, resources (e.g., plan check teams) are assigned to buildings, and buildings proceed with their recovery conditioned on resources they have access to at the time step. Simulation continues looping through time steps until all buildings recover and summarizes the simulated recovery process using recovery metrics (e.g., percent of buildings repaired, average time to rebuild).

challenging to estimate. Therefore, we provide a range of capacities reflecting this uncertainty and quantify its impact on recovery timeline forecasts. We also consider three scenarios with varying administrative capacity. The aim is to show the impact of different capacities on the recovery timeline and inform owners and the city government on what they can expect from the recovery process.

6.1 Scenario 1 - Baseline

Baseline recovery scenario considers the most likely administrative capacity to be seen in the future recovery progress based on information available so far and is defined as the average of the capacity observed in the initial recovery progress following the 2025 Palisades fire and the recovery following the 2018 Woolsey fire. Planning capacity is assumed to vary between 10 and 20 issued planning approvals in 30 days. This capacity covers most of the planning approval capacity observed in the first 10 months of current recovery (Figure 6). The bounds of the baseline plan check capacity are taken as the lower bound of the peak observed after the 2018 Woolsey fire at 7 plan checks approved in 30 days (Figure 1) and the maximum plan check capacity observed in the first 10 months of the current recovery as the upper bound at 10 plan checks approved in 30 days (Figure 7).

6.2 Scenario 2 - Optimistic

Optimistic recovery scenario assumes that the maximal administrative capacities observed after the 2018 Woolsey fire and the initial recovery progress following the 2025 Palisades fire will be achieved throughout future recovery efforts. Figure 6 indicates that the maximum planing capacity is between 20 to 23 planning approvals in 30 days. This is observed in October and November 2025.

Table 4: Range of planning and plan check approval capacities adopted for three recovery forecast scenarios

Scenario	Average planning approval capacity [per 30 days]	Average plan check capacity [per 30 days]
Optimistic	20 to 23	18 to 20
Baseline	10 to 20	7 to 10
Pessimistic	7 to 10	4 to 6

Maximum plan check capacity observed after the 2025 Palisades fire is 10 plan checks approved in 30 days. However, the building permit trend following the 2018 Woolsey fire shows that the plan check capacity can reach up to 18 to 20 plan checks approved per month. The maximum plan check capacity observed after the 2018 Woolsey fire is assumed to be mantained throughout the recovery process in the optimistic scenario.

6.3 Scenario 3 - Pessimistic

Pessimistic recovery scenario adopts the lower end of the observed administrative capacity and assumes that it will persist throughout the recovery process. From May to September 2025 between 7 and 12 planning approvals were issued in 30 days. We adopt this range as the lower end of the planning capacity. Plan check capacity remained at 1 per 30 days for most of the first 10 months following the 2025 Palisades fire. However, plan check capacity is most likely higher as we often observe higher plan check capacities during pre-fire times and following the 2018 Woolsey fire. Based on the average pre-fire and post-Woolsey fire plan check capacities, we adopt 4 to 6 plan checks in 30 days as the lower end of the plan check capacity.

7 Comparing observed and forecasted recovery progress

Understanding the extent to which model forecasts diverge from observed outcomes is essential for interpreting their results and using them effectively in decision-making. In this section, we evaluate model performance by comparing forecasted recovery trends with observed recovery progress during the first ten months following the fire. Specifically, we compare forecasted and observed trends in the submission and issuance of planning approvals and plan checks, using outputs from the baseline recovery scenario.

Observed recovery data are drawn from the City of Malibu Rebuild Dashboard, which reports counts of submitted and issued planning approvals and plan checks [21]. These data are treated as ground truth for assessing forecast accuracy. The uncertainty bands shown in the forecasted trends reflect uncertainty in administrative capacity assumptions for planning approvals and plan checks (Table 4), as well as uncertainty in the execution times of individual recovery steps (Table 2).

7.1 Planning approval trends

Figure 9 compares the observed and forecasted trends in submissions for planning review. Forecast aligns well with the observed trend until September 2025, when there is a slight increase in the number of submissions not captured within the forecasted range. In October and November 2025 the submission trend restores to pre-September 2025 value as evidenced by the parallel slopes of the observed data and forecasted range.

The planning review submission trend is primarily governed by owner's decision making as that is the most lengthy and uncertain recovery step preceding submissions for planning review. Owners are assumed to be equally likely to make a decision any time between a week and 3 years after the fire. The discrepancy between the observed and forecasted trends points to owners making decisions faster and potentially indicating that the owners are not equally likely to make a decision anytime between a week and 3 years, but might skew towards shorter times. This is observed in some past fire recoveries by Lee et al. (Figure 17).

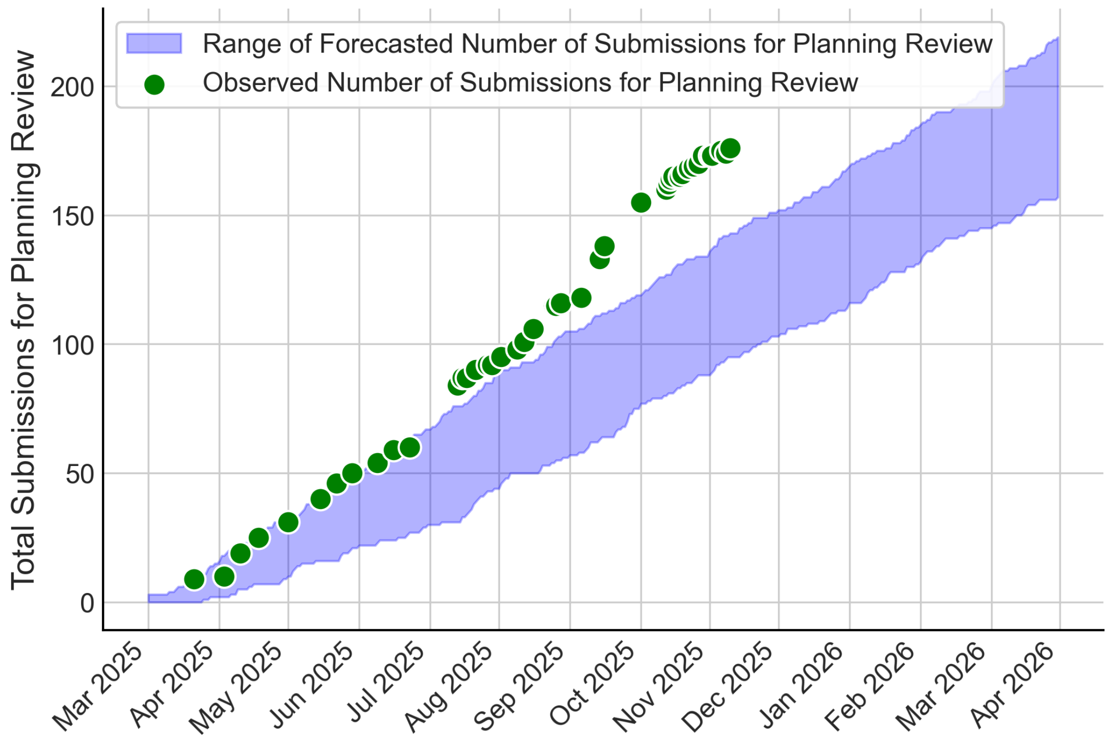

Figure 9: Observed and forecasted cumulative number of submissions for planning review in the first 10 months of recovery. Observed data retrieved from Malibu Rebuilds Dashboard [21].

The observed and forecasted number of issued planning approvals is shown in Figure 10. The observed trend is within the forecasted range. The discrepancy between the observed and forecasted number of submissions for planning review is reduced as the assumed planning approval capacity governs the trend of issued planning approvals, correcting the previous discrepancy between the observations and the forecasts.

7.2 Plan check trends

The comparison between the number of submissions for plan check review shows good agreement (Figure 11). Note that the forecast overestimated the time to submit the first few plan check reviews. The most likely reason is a slight overestimation of the time to complete engineering design: engineering design is the only step in between the issued planning approvals, forecasted with good accuracy, and plan check review submissions.

Figure 12 presents observed and forecasted building permit trends. Although the forecast captures most of the observed trend well, forecast does overestimate the time to approve the

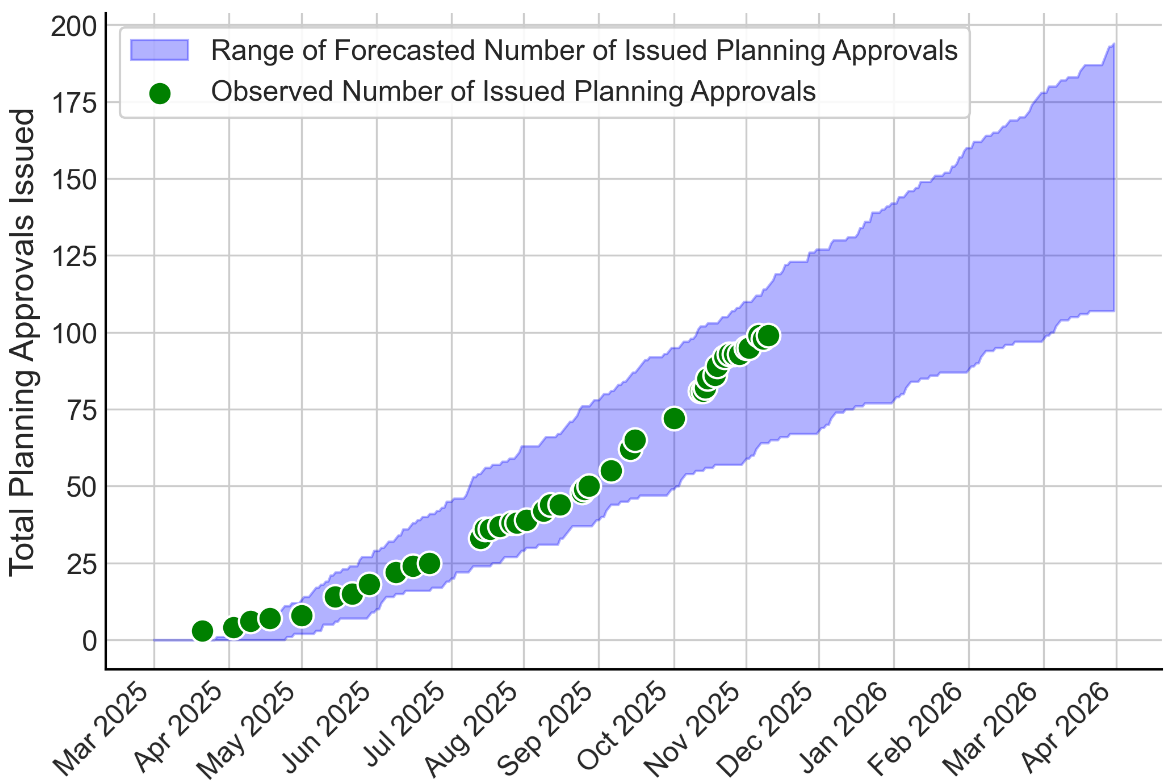

Figure 10: Observed versus forecasted cumulative number of issued planning approvals in the first 10 months of recovery. Observed data retrieved from Malibu Rebuilds Dashboard [21].

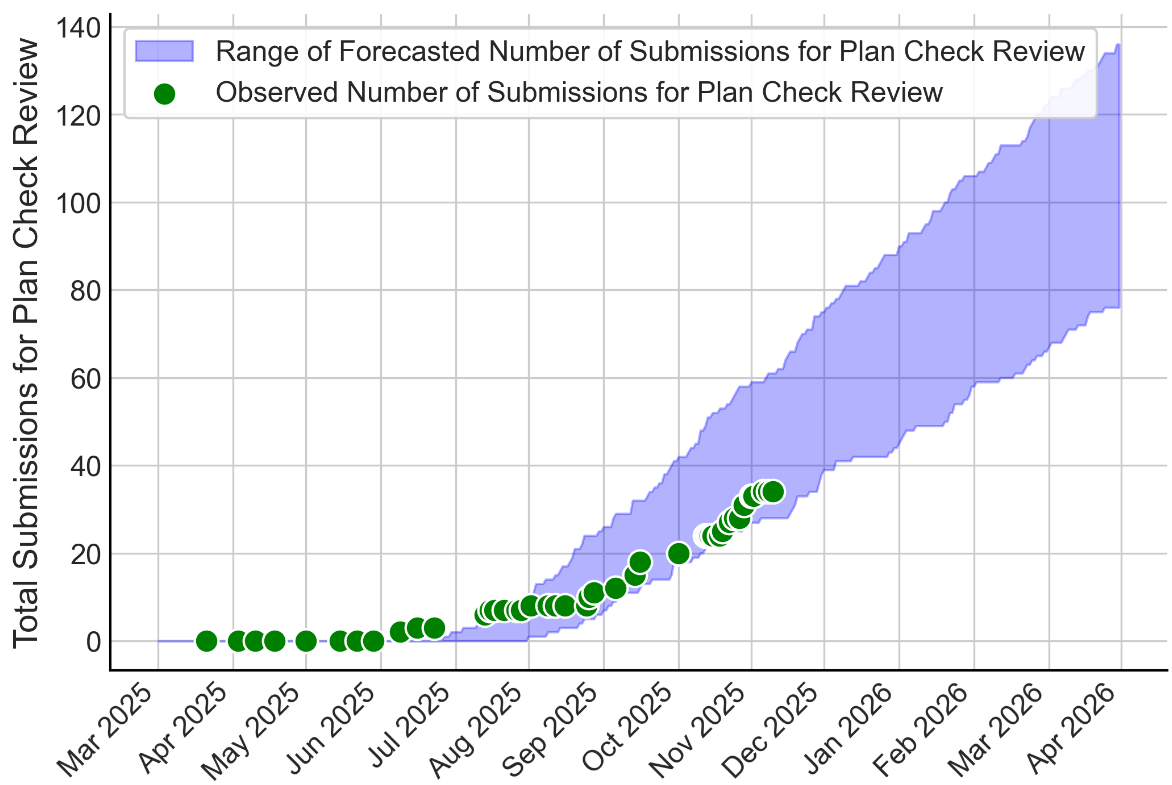

Figure 11: Observed versus forecasted cumulative number of submissions for plan check review in the first 10 months of recovery. Note that the number of submissions includes the number of issued building permits. Observed data retrieved from Malibu Rebuilds Dashboard [21].

first few building permits by a month. This overestimate is most likely caused by the previous overestimate in the time to submit plan check reviews (Figure 11). In both cases, we believe that the forecasts align well enough with observed data to reliably provide future timeline forecasts and support decision-making.

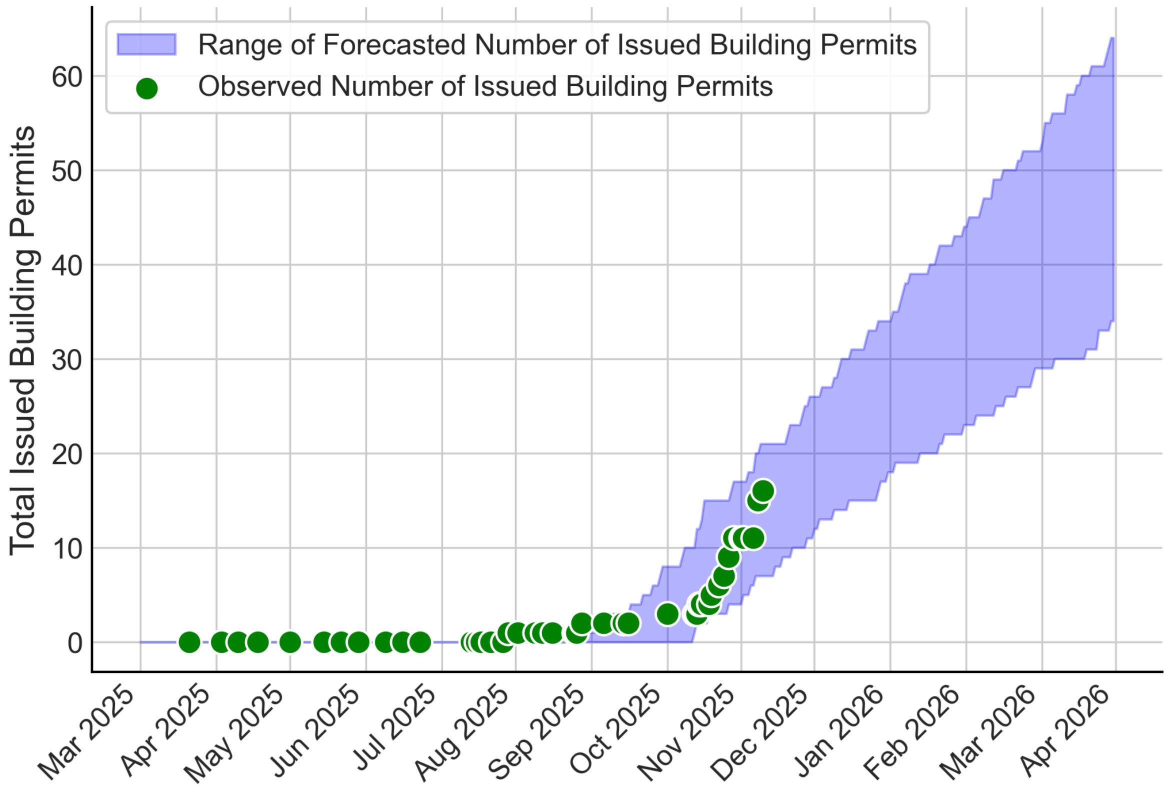

Figure 12: Observed versus forecasted cumulative number of issued building permits in the first 10 months of recovery. Observed data retrieved from Malibu Rebuilds Dashboard [21].

8 Future recovery forecasts

Building damage, modeled recovery steps and their execution times and the recovery capacity of the City of Malibu serve as inputs to the predictive, regional recovery, model that outputs recovery timeline forecasts. We checked the accuracy of the recovery model in Section 7. In this section we provide recovery timeline forecasts for the future of the City of Malibu. Regional recovery models are probabilistic, meaning that they can measure the uncertainty range of forecasts stemming from the uncertainty in our estimates of input parameters, such as recovery step execution times (Table 2) and recovery capacities (Table 3). The uncertainty range is quantified by running 100 Monte Carlo samples of the regional recovery models and plotting the upper and the lower bounds of the forecasted timelines.

8.1 Forecasting city-level rebuilding trends

Figure 13 presents forecasted recovery timelines for three recovery scenarios, including uncertainty bounds. The horizontal axis represents time in years, while the vertical axis shows the cumulative percentage of single-family homes rebuilt in the City of Malibu. Across all three scenarios, the first homes are expected to complete construction in late 2026, followed by a ramp-up in construction activity beginning in early 2027. Under the optimistic scenario, reconstruction is expected to be completed by approximately 2030. Completion occurs later under the baseline scenario, between mid-2031 and 2033, and substantially later under the pessimistic scenario, between 2035 and 2037.

In this analysis, reconstruction is considered complete once all 535 destroyed single-family homes have been rebuilt. The forecasts assume that all property owners initiate reconstruction as soon as building permits are issued; voluntary delays or decisions not to rebuild are not explicitly modeled.

Comparing the three scenarios illustrates the extent to which increased administrative capacity can reduce overall recovery time. The pessimistic scenario assumes a capacity of 7–10 planning approvals and 4–6 plan checks completed every 30 days, resulting in an estimated recovery duration of 10–12 years. Increasing capacity to 10–20 planning approvals and 7–10 plan checks per 30 days, as assumed in the baseline scenario, reduces the estimated recovery time to complete all construction to approximately 6–8 years. This increase in administrative capacity corresponds to a reduction of roughly four years in total recovery time. Further increases in capacity, as defined under the optimistic scenario (Table 3), can reduce recovery time by an additional two to three years.

Notably, the separation between the optimistic, baseline, and pessimistic recovery trajectories increases substantially after the second year. This pattern indicates that policy decisions and capacity constraints compound over time: improvements implemented early in the recovery process can lead to large reductions in long-term recovery duration.

Finally, the analysis suggests diminishing returns to further increases in administrative capacity beyond the levels assumed in the optimistic scenario. Additional reductions in recovery time would likely require interventions targeting other stages of the recovery process, such as owner decision-making.

8.2 Forecasting the time needed to rebuild a single-family home

While section 8.1 presents the recovery timeline forecasts for the entire portfolio of destroyed single-family homes, Figure 14 provides a different perspective: it presents the time that a single homeowner will need to rebuild a destroyed single-family home.

Assuming a pessimistic scenario, a homeowner will need on average 7 years to rebuild, finishing the construction in 2032. However, the time to rebuild will depend on how much time owner needs to decide and engage with rebuilding and the complexity of the rebuild. The range of rebuilding time is broad, from 2 years for those that start the rebuilding process early, to up to 12 years, counting from the date of the 2025 Palisades fire, January 2025, for those that take more time to start with the rebuilding process (i.e., closer to the assumed 3 years for owner decision-making) and face more complex rebuilding issues (e.g., home on a slope, complex construction due to demanding design). The reason for the delay is the queue for planning approvals and plan checks which forms before the owner submits the design.

In the baseline scenario, a homeowner will need about 5 years on average to rebuild. Owners that start the rebuilding process early can expect to rebuild in 2027, while those that postpone the start of the rebuilding process can expect to rebuild in about 8 years, by 2033.

Further increase in administrative capacity to the one defined in the optimistic scenario can reduce the average time to rebuild to 3.5 years, with homeowners that start the rebuild process later rebuilding in 5 years, 3 years less than in the baseline scenario and 7 years less than in the pessimistic scenario.

Palisades and Eaton Fire Resident Survey [44] found that half of the surveyed residents are unwilling to wait more than 3 years to return to their neighborhood. We can estimate what per-

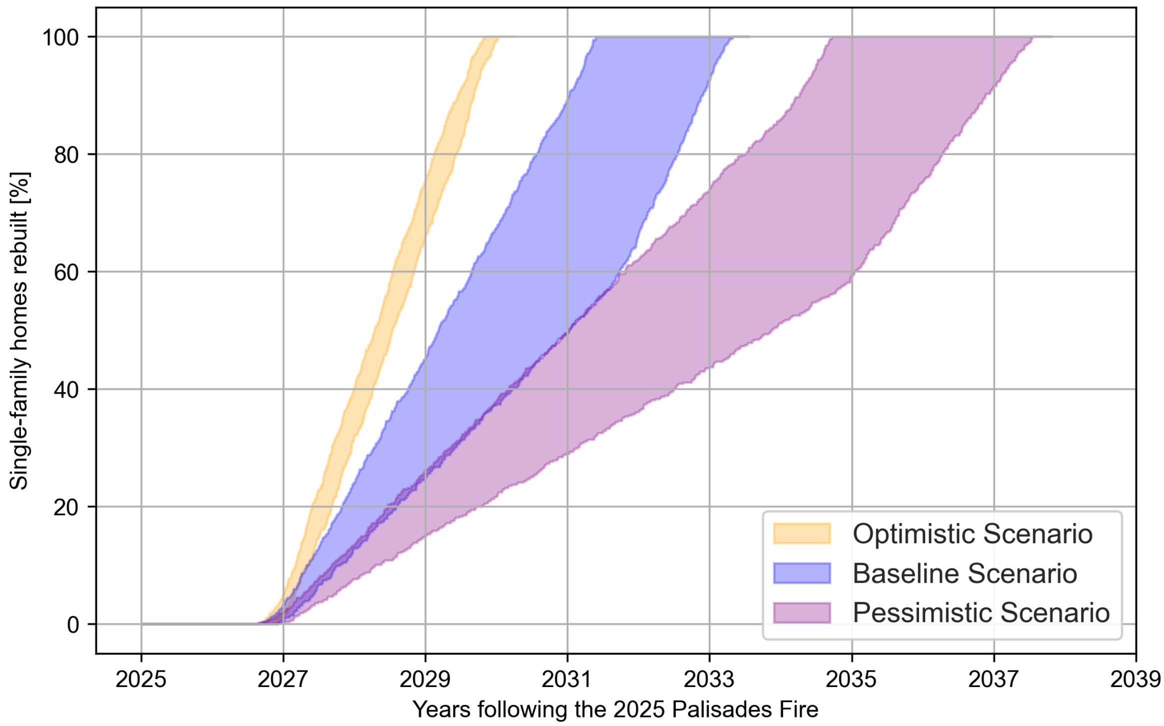

Figure 13: Forecasted timeline to rebuild all destroyed single-family homes in Malibu following the 2025 Palisades under three different recovery scenarios.

centage of homeowners will need more than 3 years to rebuild for each recovery scenario. Assuming that the 3 year threshold obtained from the survey applies to the City of Malibu we can provide estimates on the percent of homeowners that will be unwilling to return to their neighborhood. We first estimate the percent of 535 single-family homes that will take more than 3 years to rebuild and, based on the survey, assume half of those household won't be willing to return to their neighborhood (Table 5). According to the survey, shorter time to rebuild leads to higher number of households returning to their neighborhoods. Therefore, increasing the administrative capacity can increase the number of household that return to the City of Malibu.

Table 5: Estimated number of households unwilling to return to their neighborhoods in the City of Malibu based on recovery timeline forecasts and the Palisades and Eaton Fire Resident Survey [44].

Recovery Scenario	Percent of destroyed single-family homes rebuilt in more than 3 years		Number of households unwilling to return	
	Lower bound	Upper bound	Lower bound	Upper bound
Pessimistic	87%	92%	233	246
Baseline	78%	87%	208	232
Optimistic	61%	68%	164	181

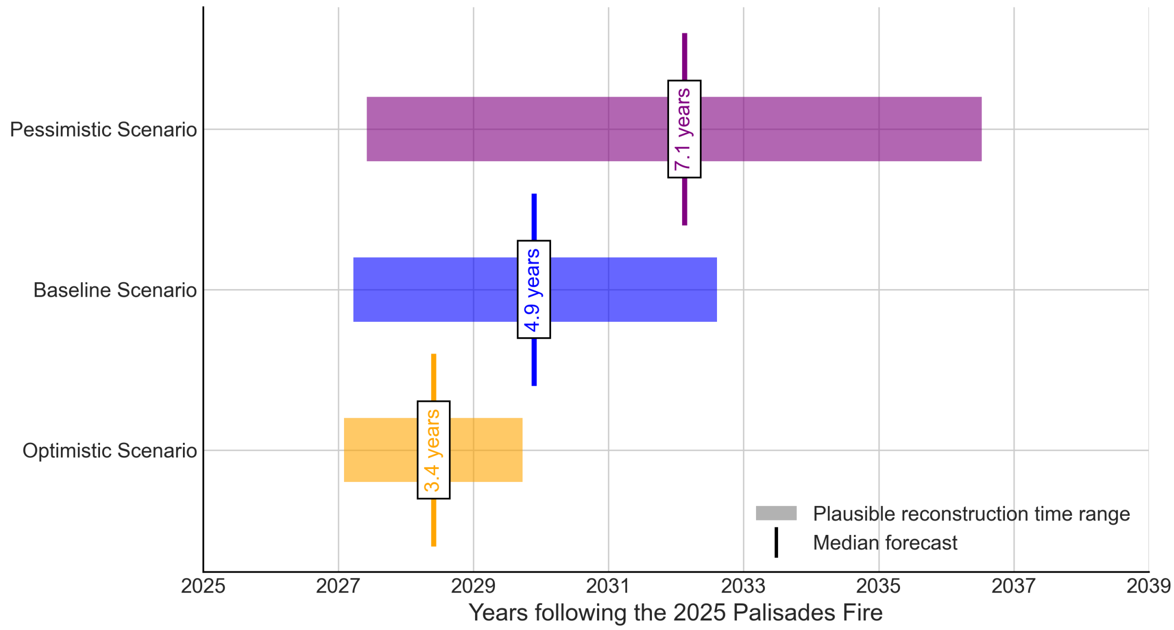

Figure 14: Forecasted time to finish rebuilding a destroyed single-family home in Malibu following the 2025 Palisades fire under different recovery scenarios. Reconstruction time range indicates the 90% quantile range.

8.3 Comparing Malibu recovery forecasts with past fire recoveries

Figure 15 compares forecasted reconstruction timelines for the City of Malibu following the 2025 Palisades Fire with observed recovery progress from recent major wildfire events in California and Colorado. Observed recovery data from the 2018 Woolsey Fire [36, 20], the 2021 Marshall Fire [31], the 2017 Tubbs Fire [24], and the 2018 Camp Fire [32] are included to assess whether the forecasted timelines for the City of Malibu fall within a plausible range based on past experience. Because detailed recovery data are only available for selected points in time for these historical events, the comparison uses those discrete observations rather than complete recovery trajectories. Note that single-family homes represent the majority of destroyed and rebuilt buildings in past wildfires. However, the rebuilding trajectories may include a smaller percent of buildings with other occupancy types as some datasets report parcel-level while others report building-level data not differentiating between different occupancy types.

The comparison shows that the forecasted recovery timelines for the City of Malibu are broadly consistent with observed post-fire recoveries in other communities. Across multiple past fires, no reconstruction occurred during the first year following the event. This pattern is reflected in both the historical data and the forecasted timelines. The recovery progress following the 2018 Woolsey Fire in Malibu closely aligns with the pessimistic forecast scenario for the 2025 Palisades Fire, suggesting that this scenario represents a realistic lower-bound outcome. Recovery following the 2018 Camp Fire in Paradise was substantially slower than the pessimistic scenario for Malibu. However, this difference is likely explained by the scale of destruction: more than 90% of buildings in Paradise were destroyed, which far exceeds the proportion of homes damaged or destroyed in Malibu following the 2025 Palisades Fire. The recovery of unincorporated Sonoma County after the 2017 Tubbs Fire is broadly consistent with the baseline scenario for Malibu, while recovery in Santa Rosa after the Tubbs Fire and recovery following the 2021 Marshall Fire more closely resemble the optimistic scenario.

It should be noted that wildfire recoveries can differ substantially based on numerous factors, such as the extent of damage, geography, regional capacities to rebuild, and the political context. Our primary aim is to show that the forecasted recovery timelines for the City of Malibu span a realistic range of outcomes observed in past wildfire recoveries and provide a credible basis for planning and policy evaluation.

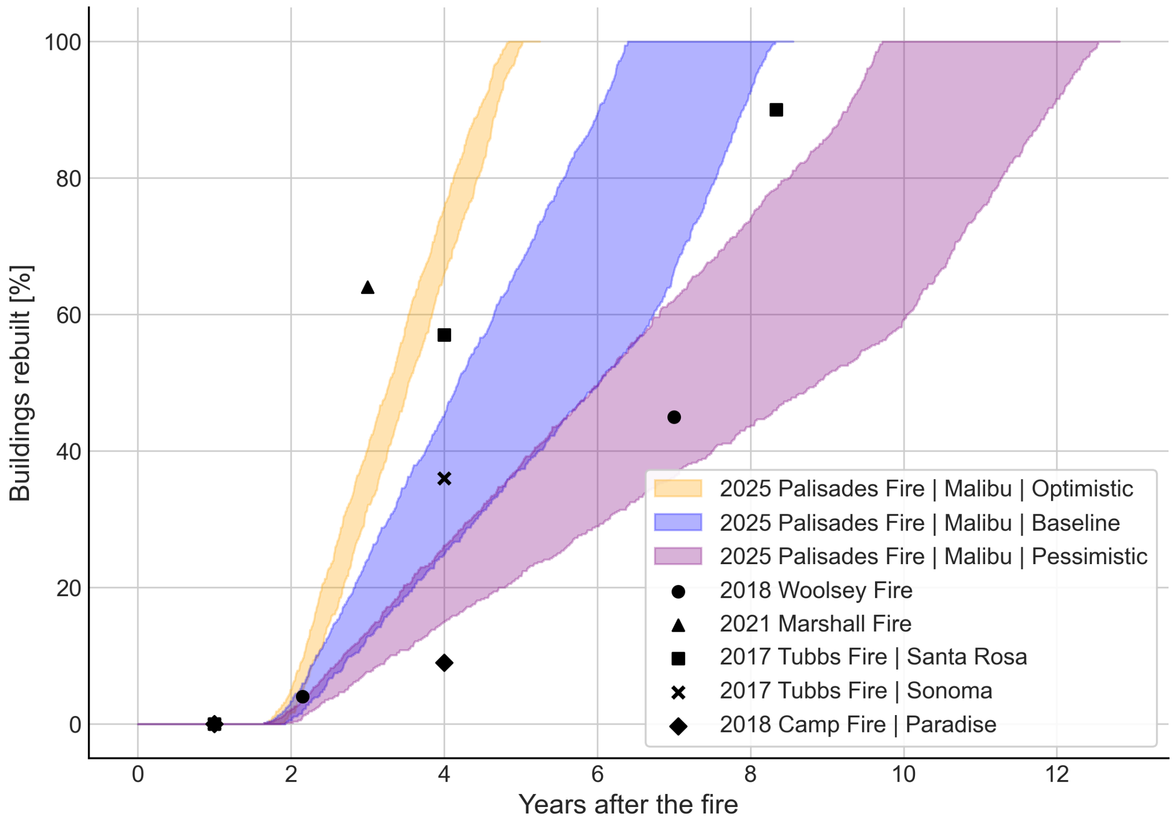

Figure 15: Comparing forecasted recovery timelines for Malibu with recovery progress from past wildfires.

9 Forecasted recovery milestones

In this section, we present forecasts for the time required to achieve recovery milestones over the coming years. These forecasts are intended to support ongoing monitoring of recovery progress, assess which of the three recovery scenarios, optimistic, baseline, or pessimistic, is unfolding, and identify when updates to model assumptions or parameters may be needed to ensure the forecasts remain reliable over time.

Figure 16 summarize the forecasted timeline of recovery milestones under the optimistic, baseline, and pessimistic scenarios, respectively. For each milestone, the earliest and latest dates correspond to the 5% and 95% forecast quantiles, representing plausible lower and upper bounds on the timing of milestone achievement.

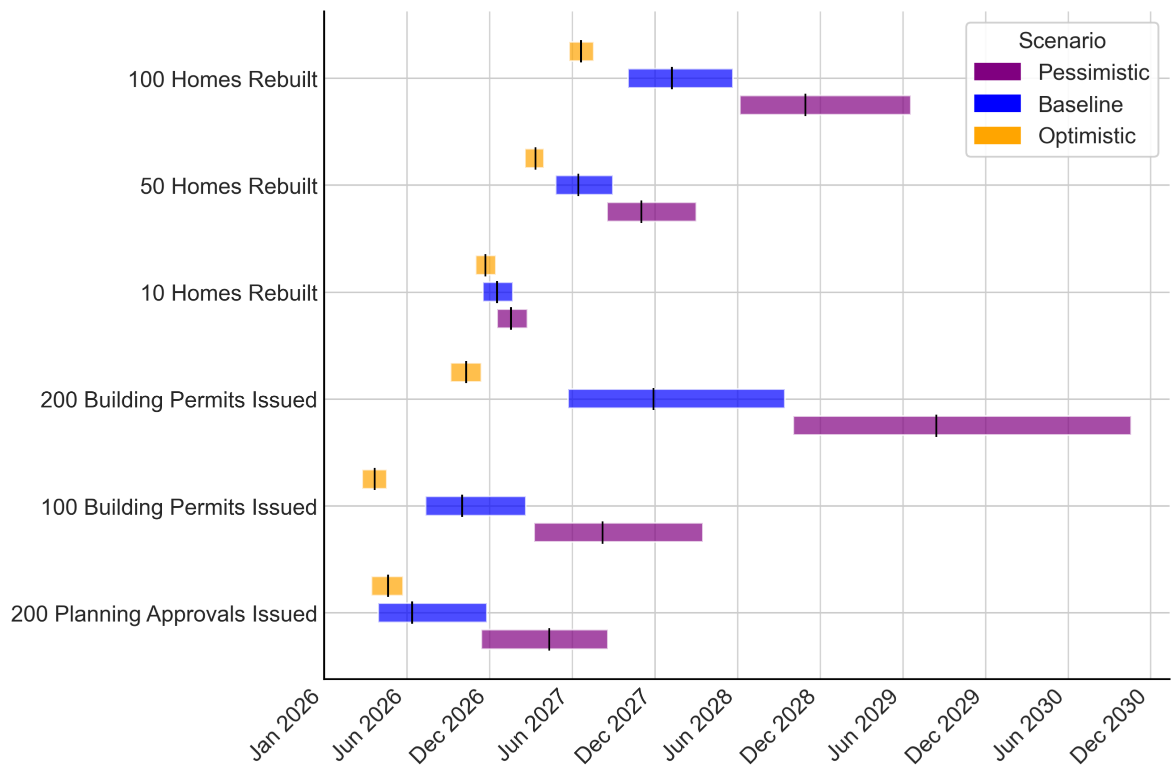

Figure 16: Forecasted recovery milestone timeline for the pessmistic, baseline and optimistic recovery scenario.

10 Modeling limitations

All models are wrong, but some are useful [4]. Although the recovery analysis presents our best efforts to understand and forecast recovery of the City of Malibu following the 2025 Palisades fire, there are important aspects that can influence the recovery process we cannot capture. While some of the aspects can be considered in future analysis if more information is available, others are too uncertain and unpredictable to be included at this time. The advantage of our modeling approach is that model parameters can be updated over time as more information is available, resulting in updated forecasts and thus reducing the uncertainty in future outcomes.

Some model parameters are informed by expert opinion and past experiences (Table 2). This introduces an implicit assumption that historical recovery processes are representative of the recovery of the City of Malibu. Expert opinion also entails a degree of subjectivity, which may influence parameter values. To mitigate this effect, we consulted multiple sources and perspectives when defining the model parameters, wherever possible.

Plan check capacity is represented in a simplified manner, as a single aggregated plan check team. In practice, plan checks involve multiple specialized review teams (e.g., geotechnical, environmental, fire safety), each with its own staffing levels, workflows, and constraints. Capacity estimates are therefore inferred from observed aggregate outcomes rather than internal operational data. Improved understanding of internal review processes and access to administrative data or practitioner insight would allow for a more detailed representation of plan check capacity.

The forecasts assume that no future major wildfire events affect the City of Malibu during the recovery period. A subsequent wildfire could disrupt reconstruction activity, divert administrative and construction resources, and alter homeowner decision-making. Should such an event occur, the recovery forecasts would need to be revised to reflect the new conditions.

The analysis does not account for large-scale economic disruptions that could affect labor availability, material supply chains, or construction costs. Events such as pandemics, trade disruptions, or tariff changes could significantly alter reconstruction timelines. If such conditions emerge, model parameters related to construction capacity and execution times would require updating.

Delays associated with legal actions are not explicitly represented in the model. These processes can introduce delays for individual properties and, in some cases, affect overall recovery trajectories. Their exclusion may lead to optimistic estimates for some households.

Delays related to prolonged lot sales are not explicitly modeled. While homeowner decision-making time partially captures post-fire property transactions, calibrated in part using observed lot sales trends following the Woolsey Fire, future lot sale behavior may differ depending on housing market conditions, interest rates, and demand. The model does not currently account for variability in real estate market dynamics, which could influence both the timing and likelihood of rebuilding.

11 Concluding Remarks

Recovery of the City of Malibu following the 2025 Palisades Fire will take years. Whether the homeowners will need 2, 5, 7 or 12 years to rebuild their homes depends on numerous factors, some of which the city and the homeowners have a control over and some of which they do not. What is certain is that the administrative capacity of the city and homeowners decisions will have a significant impact on the recovery timeline. We forecast what this impact will be and assess the extent to which the city can expedite recovery by increasing its administrative capacity.

Assuming homeowners take up to 3 years to engage in the rebuilding process and once engaged proceed with rebuilding without voluntary delays, the most the city can do to expedite recovery in terms of administrative capacity is achieve and maintain the planning approval and plan check throughput defined in the optimistic scenario: issue about 20 planning approvals and plan checks per month. This would minimize administrative delays with further increase to this capacity having no significant impact on recovery. Based on data observed as of November 2025, the planning approval throughput has already reached approximately 20 approvals per 30 days, whereas plan check throughput remains below that level. We can monitor the recovery progress and adjust the required upper bound of administrative capacity of the city as conditions on the ground change.

Our aim is to make an impact. We wish to see the technology developed in the academic setting move into the real world and improve people's lives. Having City of Malibu make more informed decisions that eventually lead to people getting back in their homes sooner as a result of our analysis would be the desired outcome of this project.

12 Future Steps

There are several ways to further enhance and extend the recovery analysis presented in this report. The direction and prioritization of these efforts should be guided by the feedback from stakeholders. In this section we outline potential future steps.

Closer collaboration with the City of Malibu would enable access to additional information and a deeper understanding of both operational constraints and decision-making needs. One extension would be a more detailed representation of the plan checking process, which could be decomposed into smaller, department-specific steps. By explicitly modeling the roles and capacities of different teams involved in plan checking, the analysis could identify specific bottlenecks and quantify where targeted support would be most effective in increasing overall capacity. City officials are already implementing policies aimed at accelerating plan check issuance [13]. With closer collaboration, we could estimate the time savings associated with individual policy measures, thereby supporting policy evaluation and prioritization.

Administrative capacity can be increased in several ways: by expanding staffing levels to process more submissions in parallel, and/or by optimizing existing administrative processes to reduce the time required per submission. With additional information on these processes, we can estimate the potential time savings associated with each option, or a combination of both.

Assuming the data on building-level recovery progress would be available, we could forecast when individual buildings will need various construction resources and identify nearby buildings that might benefit from economies of scale, reducing the construction costs. This would require expert inputs to divide the modeled construction step into several smaller steps, each requiring different materials, machinery and labor.

The analytical framework presented in this report enables ongoing monitoring of recovery policy effectiveness. As policies are put in place, we can monitor recovery progress to assess whether implemented policies are achieving their intended outcomes and to recalibrate forecasts accordingly.

The model can be extended to forecast future change in the demand for recovery resources, such as planning staff, plan check teams, and construction crews, over time. Such forecasts would support proactive resource planning and help anticipate capacity shortfalls before they become critical constraints.

The regional recovery modeling framework applied to the City of Malibu can be applied to other fire-affected communities, such as Pacific Palisades and Altadena, with appropriate adjustments to reflect local conditions, damage patterns, and administrative capacities.

Finally, while this analysis focuses on post-fire recovery, the methodology can also be used as a preparedness tool. Recovery scenarios can be developed in advance of future wildfires to ensure that recovery plans are in place before disasters occur. Moreover, the framework is not hazard-specific and can be adapted to other events, such as earthquakes, enabling a more comprehensive approach to long-term community resilience.

13 Acknowledgments

We would like to acknowledge the individuals who shared their time and expertise with us. First, we thank Luis Tena for his support, valuable experience, and thoughtful advice. We also extend our gratitude to Abe Roy, the City of Malibu's former Rebuild Ambassador, for sharing his perspective on Malibu's recovery progress. We are grateful to Mayor Marianne Riggins and Malibu City Council members Haylynn Conrad and Doug Stewart for their time and for highlighting key challenges the city is facing, which helped inform the scope of our analysis. Finally, we thank the Malibu Rebuild Task Force, Tolga Yaprak, Professor Ertugrul Taciroglu, and Laurie Johnson, for their time and insights that helped us define input parameters and refine the focus of the recovery analysis.

14 Appendix

The appendix presents detailed information on each modeled recovery step (Figure 4) and the sources used to estimate execution times (Table 2).

14.1 Damage Assessment

The recovery process starts with damage assessment. Buildings in neighborhoods affected by the fires are assessed by damage inspection teams consisting of two inspectors. Based on the news reports and public announcements tracking the damage assessment process [11], we estimate that a single team can assess at least 20 buildings per day, implying an execution time of half an hour assuming a 10 hour workday. Buildings affected by the 2025 Palisades fire were inspected by 26 teams, while those affected by the Eaton fire were inspected by at least 20 teams [11]. No information is available on the number of teams specifically inspecting buildings in Malibu. For the purpose of the analysis we assume that 3 teams inspected buildings in Malibu, proportional to the percent of buildings destroyed in Malibu compared to all buildings destroyed in the 2025 Palisades and Eaton fires. Damage assessment was finished within weeks and thus deeper analysis was not necessary as it won't have a significant impact on recovery timeline forecasts presented later in our analysis that are measured in years.

14.2 Hazardous Waste Removal

Once damage assessment of a building is completed, clean up starts. Phase 1 of the clean up involves removing hazardous waste from the building site. The Environmental Protection Agency (EPA) was tasked to remove hazardous waste and the progress was reported every 3 days [26]. The time needed to remove hazardous waste from a lot varies depending on the lot size and accessibility. It is reported that 60 to 88 teams were involved in clearing the hazardous waste [50, 49] and that 9000 lots were cleared in less than 30 days [35]. Based on the reported information, an EPA team cleared between about 3 to 5 lots per day on average, implying that with a 10 hour workday, hazardous waste removal took 2 to 3 hours per lot per team on average. The EPA finished hazardous waste removal on February 26th [48]. However, some buildings were declared unsafe and deferred to Phase 2, thus the hazardous waste was not removed from all lots containing destroyed buildings by February 26th. Number of teams involved in hazardous waste removal in Malibu was not reported.

Similar to the damage assessment, hazardous waste removal did not take significant time compared to recovery forecasts presented later and thus approximate assumptions are sufficient to estimate its completion time in this analysis. For the purpose of the analysis we conservatively assume that 3 EPA teams removed hazardous waste in Malibu, proportional to the percent of buildings destroyed in Malibu compared to about 13500 properties requiring hazardous waste removal in the 2025 Palisades and Eaton fires.

14.3 Debris Removal

Following the removal of hazardous waste from a building site, the removal of debris began. Owners had a choice of hiring a private contractor to remove debris or opting in to the debris removal led by the US Army Corps of Engineers (USACE). Each property is unique, and timelines vary depending on site conditions, permitting requirements, and nearby recovery operations. USACE aims for debris removal to be completed in 2 to 3 days per property once the crew is on site [45]. However, execution time can be longer for more complex properties. It was reported that the debris removal rate in Malibu was 30 parcels per day [15]. At least 700 crews were employed to remove debris [46]. We estimate 30 were employed in Malibu. Debris removal in Malibu performed by USACE was nearly completed by mid July 2025 [19].

The issue of whether building foundations can be reused or should be removed was a major concern at this stage. The standard procedure for removal of debris at a property with a severely damaged or destroyed structure is to remove the foundation. Existing footings, slabs, and foundation systems in fire-destroyed buildings are typically compromised and are not permitted to be re-used [17]. If foundations remain in place, the owner needs to retain an engineering consultant to evaluate the foundation and determine whether or not it can be reused for the rebuild and receive an approval from the City Community Development Department.

14.4 Owner Decision-Making

Owners of destroyed buildings face a choice between rebuilding and selling their property. Numerous factors go into this decision, from financial (e.g., insurance coverage) and personal (e.g., age, family composition) to the perception of the ongoing recovery. Making this decision can take time and can impact the recovery of the property and the community.

An additional difficulty is some homeowners' lack of experience with the construction process. The City of Malibu has invested efforts in disseminating information regarding the recovery process through the rebuilding center [34] and workshops.

Although it is difficult to assess how long a single owner would need to make a decision, aggregated data from past wildfires point to a trend. Lee et al. [32] analyzed the first 4 years of recovery following the 2017 Tubbs fire and the 2018 Camp fire. Owners of single-family homes destroyed in the fire needed up to 3 years to apply for a building permit (Figure 17). This time includes the time they needed to make a decision and prepare the documentation for the building permit application. As presented later in the report, preparing the documentation for a building permit application can take weeks to months and thus constitutes only a small portion of the 3 years needed to apply for a permit. 2018 Woolsey fire analysis points to a similar trend: about 3 to 4 years until the building permit (Figure 1) and lot sales (Figure 2) trends return to pre-fire values. Therefore, past experience indicates about 3 years as the upper bound for the time owners need to decide whether to rebuild or sell their property. In the absence of more information, we estimate that the decision-making process for owners takes between a week and 3 years. While this is a wide range, bottlenecks occurring later in the recovery process (e.g., plan check processing constraints) reduce the influence of this uncertainty on the overall recovery time.

Some owners of destroyed buildings will sell their lots. The rebuilding of sold lots might be delayed as time is needed to prepare the listing, find a buyer, and finalize the sale. Based on the conversations with local experts, it is assumed that most owners will remove debris before trying to sell the lot, as it increases the value of the lot (e.g., [33]). Due to the high variability in the time to sell a lot and the challenges in estimating the percent of owners that might sell the lot considering the changing market conditions, we do not explicitly consider the delays related to lot sale in our recovery analysis. At the time of writing this report, the time needed to sell a lot is not identified as a significant delay. However, if that changes and as more information is available, we can consider the impact of lot sales on the recovery timeline.

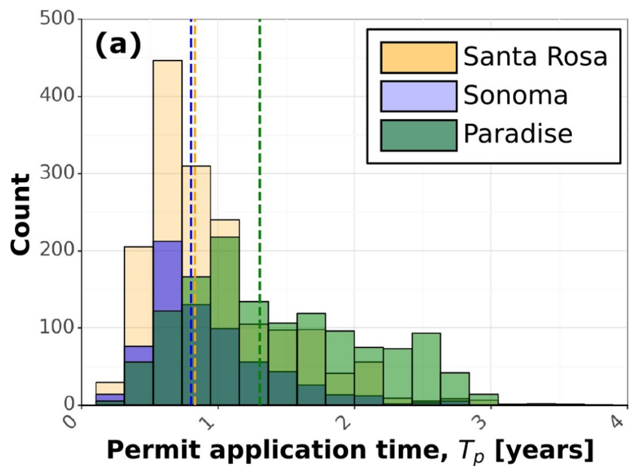

Figure 17: Statistics of the time single-family house owners needed to apply for a permit in the first 4 years of recovery following the 2017 Tubbs fire and 2018 Camp fire. Dashed vertical lines indicate the median values. From [32].

14.5 Claims Processing

Owners who rely on insurance payouts to rebuild will need to wait until their claims are settled. In this analysis, we assume that all owners rely on insurance payouts to rebuild. In terms of the time needed to receive the funds to rebuild, this is a conservative assumption, as some owners might use private funds immediately accessible and thus not face any delay due to the claim settlement duration, while others might sell the lot.

California Department of Insurance defines strict timelines for claim settlement [6]. The insurer must acknowledge receipt of a claim within 15 days and provide necessary claim forms, instructions, and assistance. Once the insurer receives a completed proof of loss, they have 40 days to accept or deny the claim. If the insurer accepts a claim, it must make payment within 30 days of the settlement agreement. In total, it the process goes smoothly, the owner should receive the payment in 85 days from submitting the claim.

Biswas et al. [1] analysed the mortgage prepayment trends following wildfires in California. Some homeowners whose property was destroyed in a wildfire choose to prepay the mortgage using the insurance funds. Therefore, time during which mortgage prepayment is higher than usual following the wildfire can be used as an indicator for how long the homeowners needed to receive insurance payment. Based on the analysis by Biswas et al., most of the prepayment occurs between two and six months after the wildfire, with the elevated trend persisting for 24 months. ARUP's

REDi guideline to estimate earthquake downtime [28] provides an estimate on the time to settle a claim. Duration is defined as a lognormal distribution with 10% and 90% quantile ranging from 1 week to 25 weeks, or about 6 months. FAIR Plan projects to payout 75% of claim amounts in the first 3 months [8].

Based on the available data, we estimate that a reasonable time for most homeowners to settle a claim following the 2025 Palisades fire is between 8 weeks and 25 weeks, or about 2 to 6 months.

14.6 Architectural Design

Following the decision to rebuild, the next step is designing the new building. Based on input from architects practicing in Malibu, the architectural design required for submission to the Planning Division for a typical single-family home can be completed within approximately 4 to 10 weeks [41, 27], accounting for the increased demand resulting from the 2025 Palisades fire.

14.7 Planning Approval

Architectural design needs to receive a planning approval from the City of Malibu's Planning Division to ensure it conforms to City's Zoning Regulations. Two rebuilding options are available to owners: like for like + 10% or Coastal Development Permit [22]. Like for like + 10% is for those owners rebuilding legally permitted structures in substantially the same footprint, with an increase up to 10% in height, square footage, and volume. Coastal Development Permit is for those choosing to rebuild a structure more than 10% larger or in a new location on their lot. The like for like + 10% option is designed to speed up the planning approval process and is expected to take less time than obtaining the coastal development permit. Based on the interviews with local experts, current sentiment of affected homeowners [44], experience from the 2018 Woolsey fire, and the current recovery progress, it is assumed that the majority of owners will opt for like for like + 10% [21].

Depending on the complexity of the design, the capacity of the Planning Division to process planning approvals and the length of the queue, planning approval times can vary significantly. The recovery analysis will explicitly account for the capacity of the Planning Division and the length of the queue. However, an estimate of the execution time is necessary to forecast recovery timelines. Execution time is defined as the time to process a planning approval from the start of processing (not submission) till issuing the approval, including resubmission if any. City official have reported that it takes 7 to 10 days to process a like for like planning approval [12]. An analysis of the planning approval submission and issuance trends points to a longer time (Figure 18). On average, a submission for planning review submitted in April 2025 took 38 days to process. As the number of submissions increased, the execution time increased to about 90 days on average for submissions made from June 2025. Note that these are average values inferred from the reported submission and approval trends; individual experiences may vary. For the purpose of the recovery analysis, we estimate the execution time to be 30 days. This is in accordance with the execution time seen early in the recovery (i.e., 38 days) when submissions were not as high and thus the impact of queue length was not as pronounced. As more information is available, we will update the estimated execution time. Note that the planning approval capacity is calibrated considering the 30 day execution time, as shown later in the analysis. Therefore, we do not expect any future changes to the execution time assumed in the analysis for modeling purposes to significantly impact forecasted recovery timelines as we will adjust the planning capacity estimates used in the analysis accordingly.

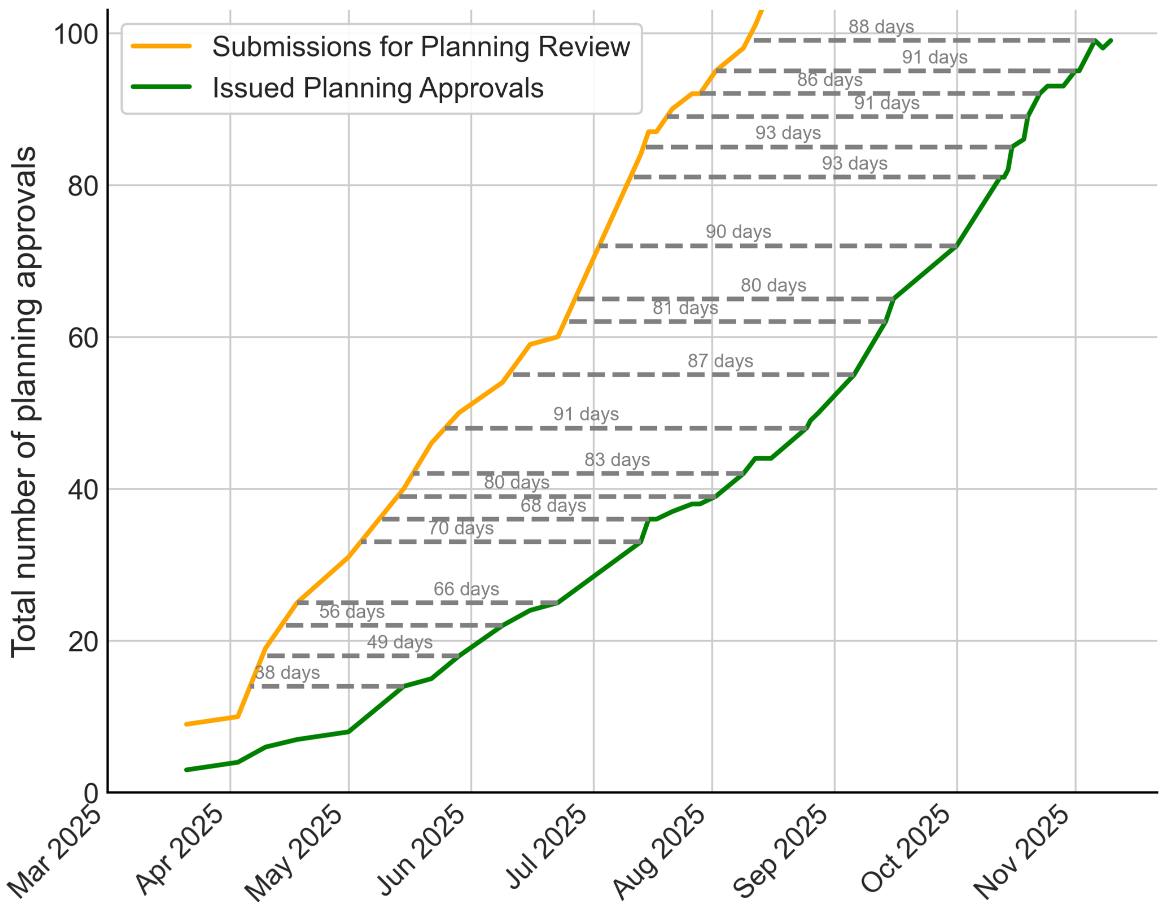

Figure 18: Cumulative counts of the number of submissions for planning review and issued planning approvals in the City of Malibu following the 2025 Palisades in the first 10 months following the fire. Average time to issue a planning approval is inferred based on submission and completion trends. Data retrieved from the Malibu Rebuilds dashboard [21].

14.8 Engineering Design

Following the approval of the architectural design, engineering professionals need to provide an engineering design for the building. Once engineering design is finished, it is submitted for a plan check. Based on expert opinion, engineering design should take 4 to 6 weeks [41]. By comparing the issued planning approval and submitted plan check trends, we notice that the time lag between the two is longer than 4 to 6 weeks and is between 12 to 17 weeks (i.e., 87 and 119 days, Figure 19). The discrepancy can be explained either by an underestimation of experts on how long it takes to finish an engineering design and/or by the limited availability of engineers due to the surge in the demand. Without further analysis, for the purpose of this recovery analysis we adopt the observed 12 to 17 weeks as the time needed for engineering design that implicitly includes the demand surge effect. Although the difference between the observed trend and expert opinion is significant relative to the time needed for an engineering design and impacts the comparison between observed and forecasted recovery progress in the first 10 months of recovery (Section 7), the difference of 8 to 11 weeks does not have a significant impact on forecasted recovery timelines presented later, measured in years.

14.9 First Plan Check

Similar to architectural design being approved by the City's Planning Division, engineering design needs to be approved by various City departments. Plan check involves revision of the architectural and engineering design from professionals working for the City. Like for Like + 10% plan checks need to be reviewed by the Building Official (Building Safety Plan Check Review), City Engineer, City Biologist, City Geologist, City Archaeologist (if new or previously undistributed areas are proposed), City Coastal Engineer (if beachfront), City Environmental Health and Los Angeles County Fire Department. Based on expert opinion, we assume that the first plan check takes 2 to 3 weeks [41]. Local expert opinion points to geology checks as most time consuming in the plan check process. Execution time for plan checks can vary significantly based on the complexity of the engineering design and the location (e.g., is it beachfront, is the house on a slope).

14.10 Engineering Corrections

It is common that the design requires corrections, leading to a back and forth between design professionals and city staff. This is captured in the recovery step sequence by including the step "Design Corrections" that follows the first plan check (Figure 4). Although there might be multiple rounds of back and forth between design professionals and city staff, we assumed that future exchanges are not common or time-consuming enough to be included in the recovery sequences for a typical recovery process. Based on local expert opinion, we estimate that design corrections take 3 to 4 weeks [41].

14.11 Final Plan Check

Once design corrections are submitted, city staff evaluates the resubmitted designs and issues a Building Plan Check Approval. Based on city staff opinion, recheck reviews take 5 to 7 business days and issuing fees takes 2 to 3 weeks [18]. The Final Plan Check step considered in this analysis includes both the reviews and the time to issue fees, leading to 3 to 4 weeks.

Considering all elements of the plan check process (i.e., first plan check, corrections and final plan check), the total time needed for a plan check once the processing starts is 8 to 11 weeks based on the estimates provided by local experts. Comparison of the submission for plan check review

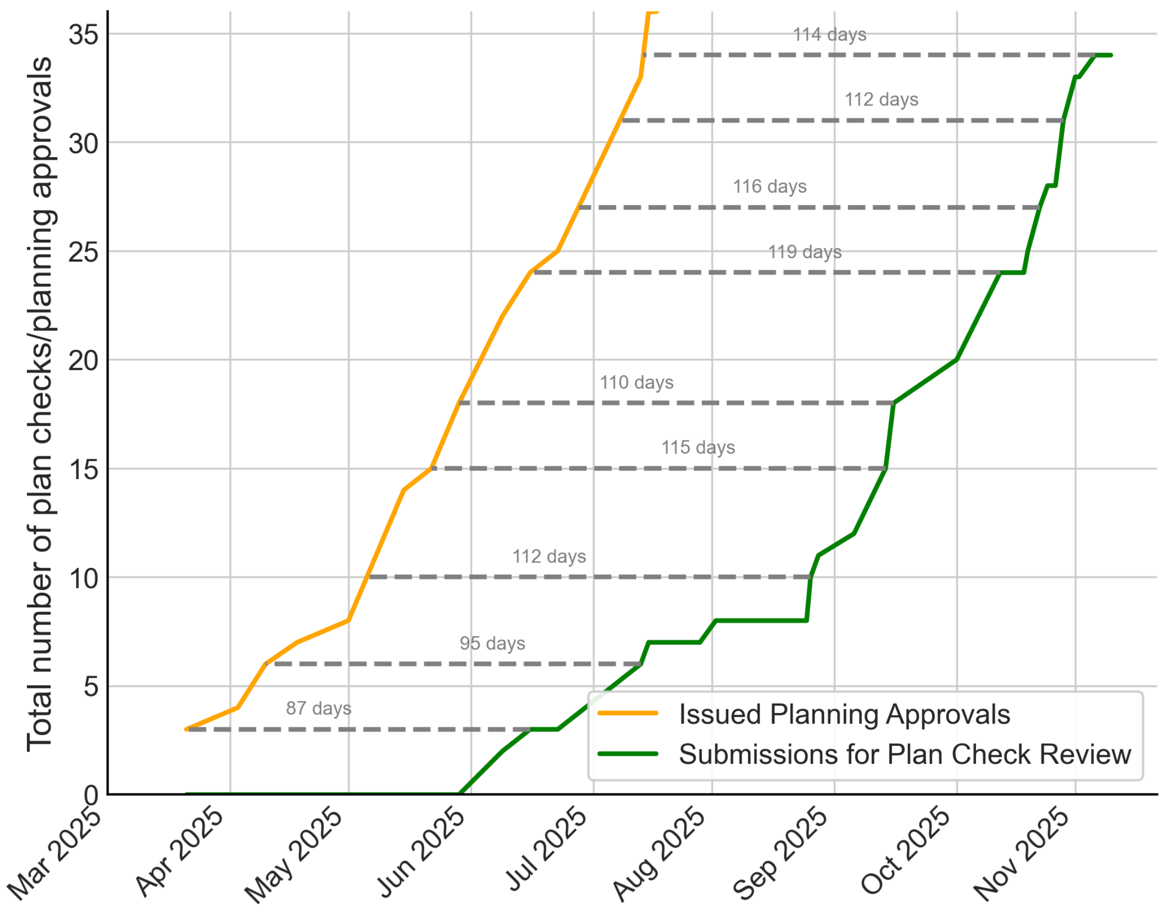

Figure 19: Cumulative counts of the number of issued planning approvals and submission for plan check review in the City of Malibu following the 2025 Palisades in the first 10 months following the fire. Average time to submit an engineering design for a plan check following an issued planning approval is inferred based on submission and completion trends. Data retrieved from the Malibu Rebuilds dashboard [21]

and completion of building permits in the first 10 months following the fire shows that the time needed to issue a building permit following a submission for plan check review varies between 8 and 15 weeks (i.e., 55 to 107 days) (Figure 20). The execution time estimated based on expert opinion and the recovery trajectory is in good agreement. The slightly longer processing time observed from the submission and completion trends compared to expert opinion might be a consequence of exceeding the capacity of the city departments to process plan checks.

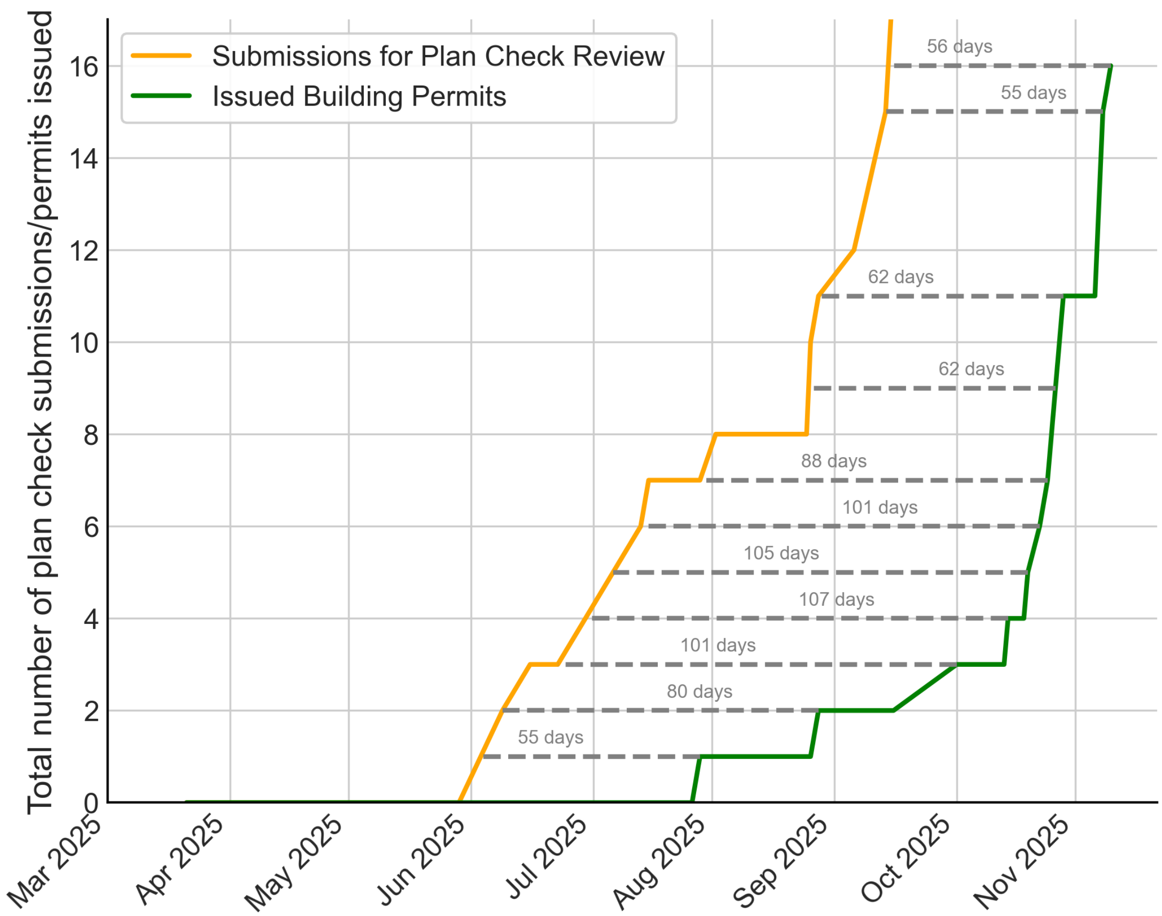

Figure 20: Cumulative counts of the number of submissions for plan check review and issued building permits in the City of Malibu following the 2025 Palisades in the first 10 months following the fire. Average time to issue a building permit following a submission for plan check review is inferred based on submission and completion trends. Data retrieved from the Malibu Rebuilds dashboard [21]

14.12 Construction

Once the design is approved and funds are available, owners can start with the construction of their new home. Due to the high demand for construction caused by fire damage, we expect the construction time to increase compared to the pre-disaster time.

We assume that most homes in the City of Malibu will be custom homes, which take longer to build than production homes [31].

An analysis of construction times following the December 2021 Marshall Fire in Boulder County, Colorado, shows that construction times for custom homes are about 15 months [31]. This time includes the period from the moment that the building permit was issued till the certificate of occupancy was issued. Although it could be argued that custom homes in Boulder County, Colorado, might differ from those built in the City of Malibu, expert from the LA area estimates the construction time at about 14 months [51].

Project Recovery [43] provides similar estimates: the construction time for homes following the 2025 Palisades and Eaton fire is expected to be 10 to 12 months for buildings with an area below 2000 square feet, 12 to 18 months for buildings between 2000 and 5000 square feet, and 24 to 48 months for buildings above 5000 square feet. Analysis of destroyed single-family buildings shows that 95% of buildings have a total living area below 5000 square feet, as retrieved from tax assessor data (Figure 21). We adopt the typical construction time to be 12 to 18 months.

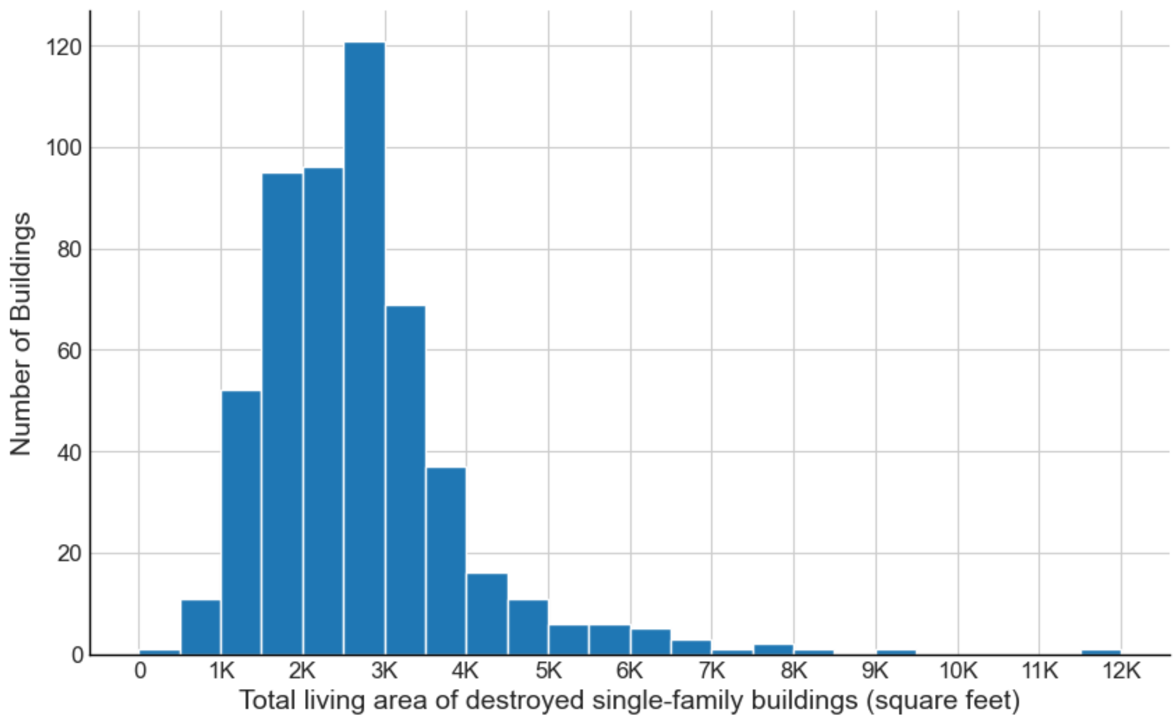

Figure 21: Distribution of total living area of destroyed single-family buildings in Malibu. Data retrieved from [39].

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