Memo: Palisades Fire and Water Supply Analysis

Date: November 20, 2025

To: Governor's Office

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1. Introduction

This report, prepared by CalEPA, CNRA, Cal OES, State Water Board, CAL FIRE, and DWR (collectively, the State Agencies), provides findings regarding the Palisades Fire and corresponding water supply based on publicly available information and state agency subject matter expertise and identifies measures local agencies can take to provide for adequate water supply during catastrophic events. To prepare this report, state officials used the best available information, but documents or information not available to the State may reveal additional facts that could lead to additional information or different findings. This does not supplant or replace the need for the comprehensive State After Action Report coordinated by Cal OES as directed by the California Emergency Services Act, which may also include a water system analysis.

This report includes the following findings:

a. Southern California water supplies were robust.

b. Draining the Santa Ynez reservoir was necessary to protect public health while repairing the tear in its cover and required by both federal and state regulations.

c. The Santa Ynez reservoir was empty during the Palisades Fire. Even if the reservoir was full, the flowrate to the system would have been a limiting factor in maintaining pressure and the system would have been quickly overwhelmed.

d. Water systems are designed to meet their primary purpose of providing clean drinking water, which limits the types of engineering considerations that would likely be needed for a water system capable of combatting large conflagrations engulfing hundreds of structures such as the one in Palisades.

e. Prepositioning and a multi-pronged approach to firefighting are essential to combatting wildfires under extreme conditions.

2. **Background**

a. **Los Angeles Site Conditions on January 7, 2025**

The National Weather Service issued a Red Flag Warning described as a "Particularly Dangerous Situation" (PDS) Red Flag Warning for January 7 and 8, 2025, in the Los Angeles area and other parts of Southern California. This warning was described as "an expected destructive, widespread, and potentially life-threatening windstorm," with expected wind gusts of 50-80 mph and reaching 80-100 mph in certain areas. Since early May 2024, Los Angeles received minimal rain, making the brushy hillsides in and around the city particularly dry and highly susceptible to ignition. From October through December 2024, Los Angeles County received only 0.19 inches of rainfall compared to the average for that period of 4.35 inches. The Los Angeles Airport only recorded .03 inches of rain since October 1, 2024. Combined with a record warm summer, these extremes combined with extreme Santa Ana winds making for exceptional wildfire conditions.

In these conditions, a spark can quickly turn into a wildfire. Homes are more likely to be destroyed by embers flying ahead of a fire front than from direct flames. When winds are upwards of 80-100 mph, embers from even a small blaze can become airborne very quickly, landing on and near homes that are fuel for a wildfire.

b. **Firefighting Efforts**

State and local governments regularly work together to mitigate dangerous conditions by prepositioning critical personnel and equipment. In addition to the immense effort to prepare and staff at the local level, on January 6, 2025, Governor Gavin Newsom announced that the state was deploying resources and prepositioning assets in advance of a "life threatening and destructive" windstorm and extreme fire risk due to low humidity. Specifically, the state coordinated with local agencies to preposition 65 fire engines, 8 water tenders, 8 helicopters, 9 dozers and more than 105 specialized personnel in Los Angeles, Riverside, Orange, San Bernardino, San Diego, Santa Barbara, and Ventura counties through the state's Fire and Rescue Mutual Aid System managed by Cal OES. CAL FIRE increased its firefighting across its Southern California Units, in addition to mobilizing 45 additional fire engines and six additional hand crews from Northern and Central California into the LA Basin. As the events unfolded, the prepositioned assets mobilized to the event to assist local government resources. CAL FIRE Incident Management Teams 2 and 3 were activated and assigned to the Los Angeles January 2025 wind and fire event.

On January 7, 2025, around 10:30 a.m., ALERTCalifornia, a disaster condition monitoring system based out of UC San Diego, first detected smoke rising above the Pacific Palisades neighborhood in northern Santa Monica, California. The fire ignited southeast of Palisades Drive in Pacific Palisades. Aerial firefighting resources responded just before 10:50 a.m. and radio dispatch transmissions suggest the first local engines arrived near the same time. Due to the extreme winds and dry conditions, the Palisades Fire spread rapidly. Mandatory evacuations began shortly before 12:00 p.m. By 2:30 p.m., the Palisades Fire had grown to more than 700 acres. Aerial crews continued to operate dropping water and fire retardant into the mid-afternoon. Prepositioned resources mobilized to the event.

As of 5:00 p.m., the fire had consumed nearly 1,300 acres, and shortly thereafter Governor Gavin Newsom declared a state of emergency. The state also secured a Fire Management Assistance Grant to help ensure the availability of federal funding for resources to suppress the fire.

Shortly after 6:00 p.m., near the edge of Pasadena, California at the base of the San Gabriel Mountains, a resident reported a second fire. Aerial resources responded but quickly determined that the violent wind conditions prevented water and retardant drops. The Eaton Fire's rapid spread prompted widespread evacuations in Altadena, California.

Meanwhile, around 6:30 p.m., first responders battling the Palisades Fire first reported over radio chatter that they were experiencing low water pressure in the hydrant system. Around 10:00 p.m., the Hurst Fire was reported north of the Santa Monica mountains, the Palisades fire neared 3,000 acres, and the Eaton Fire had descended into the populated areas of Altadena impacting homes and other structures.

The following morning, on January 8, 2025, Governor Newsom submitted, and President Biden quickly approved, a request for a Presidential Major Disaster Declaration to support ongoing efforts related to the major fires. As of that evening, there were several active fires in the Los Angeles area.

By January 9, 2025, the Los Angeles Fire Department reported firefighters had stopped tapping into hydrants all together.

c. **Water System Overview: Federal, State, and Local Responsibility**

Los Angeles imports water supplies from Northern California via the State Water Project, the Sierra Nevada mountains via the Los Angeles Aqueduct, and the Colorado River via the Colorado River Aqueduct. Water purchased from Metropolitan Water District (MWD) is the primary source of water supply for the City of Los Angeles (City). Of the 29 public agencies and local water districts that use State Water Project water to supplement their local or other imported supplies, the largest purchaser of State Water Project supplies is MWD. MWD receives State Water Project water at three locations: Castaic Lake in Los Angeles County, Devil Canyon Afterbay in San Bernardino County, and Box Springs Turnout at Lake Perris in Riverside County. The water from MWD is delivered through the Colorado River Aqueduct and the State Water Project's California Aqueduct.

Los Angeles Department of Water and Power (LADWP) maintains a vast water system of over 7,300 miles of mainlines and trunk lines, along with related infrastructure and storage facilities that deliver water to individual households and businesses in the affected areas of the Los Angeles basin. LADWP reported that there are three tanks, each with a capacity of 1 million gallons of water, plus the Santa Ynez reservoir to keep water pressure in homes and hydrants within the Pacific Palisades neighborhood. This water is used for both potable public consumption (primary role) and firefighting (secondary role). The primary supply of water to the Pacific Palisades neighborhood is a 36-inch pipe that delivers water from the Los Angeles Aqueduct Filtration Plant and the Van Norman Reservoir to the neighborhood. This supply can be supplemented with water from other reservoirs, including Castaic Lake. Both the federal and state governments regulate such uses as described further below.

3. **Findings**

a. **Southern California water supplies were robust.**

Southern California did not have a water supply shortage when the fires erupted in Los Angeles. Large Southern California reservoirs that provide water to local systems were between 81-97 percent of capacity. Such levels were at or above average levels for that time of year, despite the lack of winter rain in Southern California. Major reservoirs in Southern California had abundant supplies, counter to misinformation suggesting that the movement of water from Northern California to Southern California impacted fire response.

Reservoir	Capacity	January 8, 2025 Storage	Storage as % of Capacity	% of Average Storage for This Day
Pyramid	180,000 AF	152,858 AF	85	94
Castaic	325,000 AF	249,504 AF	77	99
Perris	131,452 AF	106,053 AF	81	115
Diamond Valley	810,000 AF	787,472	97	135

(An acre-foot is approximately enough water to supply three California households' indoor and outdoor water needs for a year.)

On January 8, 2025, MWD requested, and the State released, an additional 220 cubic feet per second of flow from the State Water Project Castaic Lake facility in order to increase water pressure within the LADWP water system through one of the LADWP/MWD interties. Across the state, many of DWR's largest reservoirs were at or above their historic average storage for this time of year. That means adequate water supply for millions of Californians, businesses, agriculture, and the environment -- including water resources for local communities battling wildfires.

b. **Draining the Santa Ynez reservoir was necessary to protect public health while repairing the tear in its cover and required by both federal and state regulations.**

The Santa Ynez Reservoir was empty at the time the Palisades Fire ignited because repairs were necessary to maintain safe drinking water. The Santa Ynez Reservoir is a drinking water reservoir that holds 117 million gallons of water. It operates as a terminal supply reservoir, which stores "finished" drinking water after treatment and before distribution into the system. It is primarily used to balance water demands that change during the day, as well as provide some extra supply to maintain water deliveries to customers during a pumping outage or breakage in a main supply line, essentially preventing a water outage while repairs are made.

Finished water reservoirs such as Santa Ynez, while being necessary, present several management issues. One is that they are at atmospheric pressure, unlike the rest of the distribution system which operates at above atmospheric pressure. For this reason, reservoirs are sites through which contamination can easily enter water systems since no back-pressure exists to prevent contaminants from entering the water supply held in the reservoir. To ensure safe drinking water, reservoirs must be covered and their vents specially designed and screened to prevent any contamination from entering and being introduced into the distribution system. U.S. EPA recognized the need for this protection beginning in 1988 with changes in federal regulations.

Santa Ynez Reservoir was put into service in 1970, before covers for finished water reservoirs were federally required. At that time, there was no requirement to cover what the federal government refers to as "uncovered finished water storage facilities." Revisions to the federal Safe Drinking Water Act ultimately mandated reservoirs like Santa Ynez to be covered to maintain safe drinking water quality and to protect public health and U.S. EPA changed federal regulations in 1988 to require this protection.[1] To maintain public safety and preclude pathways for pathogens, public water systems must not only install covers but maintain and repair them, as necessary.

The Santa Ynez reservoir feeds water directly into the water system serving the Palisades area and serves homes and businesses potable water. LADWP adopted a plan to cover the reservoir in 1989, initiated the cover in early 2000s, and completed installation in 2012.

In early 2024, LADWP discovered a tear in the floating cover on the Santa Ynez Reservoir during a routine inspection and notified the State Water Board. LADWP and the State Water Board discussed the appropriate path forward, which was to repair the tear to protect public health.[2] To repair a tear in a floating cover, a reservoir must be drained. LADWP proposed draining the reservoir to comply with its obligations under the state and federal safe drinking water regulations. The State Water Board concurred and noted that any drained water could not be served as drinking water. The three tanks and the Santa Ynez reservoir in the Pacific Palisades neighborhood were not the primary water supply for the area since that comes from outside of the Pacific Palisades neighborhood through a main pipeline from the Los Angeles Aqueduct Filter Plant and Van Norman Reservoir. The repairs to the cover were put out to competitive bid pursuant to

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[1] In addition to federal law, California has had a drinking water regulatory structure for over 100 years - long before the enactment of the federal Safe Drinking Water Act (SDWA) in 1974. Since that time, it has followed or exceeded federal regulations. The SDWA is mainly known for setting maximum contaminant levels for drinking water, but it also sets up multiple barriers against pollution of drinking water. These barriers include: source water protection, treatment requirements based on source water type and quality, distribution system integrity like maintenance of pressure and requirements for protection of storage tanks, and public notification about the status and quality of water provided by a water system.

[2] The repairs were not related to dam safety. In addition to being required to meet drinking water quality regulations, Santa Ynez Dam and Reservoir is required to meet dam safety regulations under DWR's Division of Safety of Dams (DSOD). Due to the downstream hazard potential posed by the Santa Ynez Canyon Dam, DSOD inspects this dam at least once a year. (See Wat. Code, § 6102.5, subd. (a)(1).) At DSOD's inspection on November 15, 2024, DSOD determined that Santa Ynez Canyon Dam maintains its "satisfactory" rating, which is the highest possible condition assessment. A dam with a "satisfactory" assessment does not have any existing or potential dam safety deficiencies recognized. DSOD has not imposed any reservoir restrictions for this dam.

public contracting laws. LADWP selected a contractor and executed a repair contract with repairs completed in June 2025. During the repairs another hole developed and was repaired as well. LADWP has decided to replace the cover and the tentative schedule for the replacement project is:

- Design Completion: January 23, 2026
- Construction Start: June 23, 2026
- Construction Completion: May 31, 2027

c. **The Santa Ynez reservoir was empty during the Palisades Fire. Even if the reservoir was full, the flowrate to the system would have been a limiting factor in maintaining pressure and the system would have been quickly overwhelmed.**

Fire hydrants require not only a sufficient water supply, but also sufficient pressure in the system. A system must be able to supply water at a flow rate (measured in gallons per minute) above the flow rate of the demand on the system. When the supply flow rate is less than the demand flow rate, the system loses pressure.

In the Palisades Fire, the water system lost pressure, not due to a lack of water supply in the system, but because of an insufficient flow rate. LADWP reported that it pumped 37,000 gallons per minute through the main water line, towards the Palisades Fire. This was the maximum flow rate capacity for this pipe and four times the flows it delivered normally. Even though there was plenty of water available in the system, it was not possible to pump enough water to the fire area all at once to meet the flow rate demand created by the leaking water from already destroyed structures and high water use from hydrants. Water supply can be a limiting factor to flow rate, but in this case, it was the pipes and pumps in the system reaching capacity and unable to provide a sufficient flow rate to meet the unprecedented demand.

Based on the state's operational understanding, LADWP pumps water from the Santa Ynez Reservoir into the upper pressure tanks of the Palisades system to pressurize the upper zones. Water can be pumped into the pressure tanks from Santa Ynez at a flow rate of 5,500 gallons per minute. As stated above, the main water line has a maximum capacity of 37,000 gallons per minute pumped to the fire area. Santa Ynez could have only supplemented an additional 5,500 gallons per minute to the system or an increase of 15 percent to that flow rate, resulting in a total area flow rate of 42,500 gallons per minute between the main pipe and the pressure tank supplemental water. Therefore, even if Santa Ynez was full, once the flow rate demanded by use of fire hydrants and leakage from destroyed homes exceeded this maximum flow rate of 42,500 gallons per minute into the system, the hydrants could not have maintained pressure.

The state does not have data regarding the precise demand on the system at this time. Without additional data and a modeling effort by LADWP, it is not clear exactly how much time the 15 percent extra flow would have extended water availability. However, based on experiences with prior fires, the demand on the system would have been so high that it would have quickly exceeded the 42,500 gallons per minute making it unlikely that it could have helped maintain pressure for very long.

d. **Water systems are designed to meet their primary purpose of providing clean drinking water, which limits the types of engineering considerations that would likely be needed for a water system capable of combatting large conflagrations engulfing hundreds of structures such as the one in Palisades.**

The primary purpose for constructing community water systems since the late 19th century has been to provide a reliable source of potable water for communities to use for drinking and other household needs. As the understanding of waterborne diseases increased, water supplies were treated before being delivered to the community. The biggest public health benefit of the 20th century is often cited as the addition of chlorination treatment to disinfect drinking water. Before chlorination became widespread, a successful water system in the U.S. was one that was expected to cause 37 or fewer deaths per 100,000 population per year. Today, that same number is zero.

Supplementary purposes for community water systems include fire suppression, sanitation, and irrigation.

Community water systems facing a large-scale fire are bound by their physical limitations. Catastrophic fires place immense demands on a water system, the first of which is the outgoing flowrate. Regardless of the water supply available, a water system can only deliver to a fire what its piping and pumping infrastructure will provide. In most cases this will be the main limitation on the amount of firefighting water provided to hydrants. Sizing water systems networks is complex, with redundant piping and looping of pipes often utilized to increase resiliency of the network. This allows line breaks to be isolated to small areas and prevents large scale outages while repairs are made. Sizing also has to consider normal and maximum usage scenarios. Maintaining a reasonable water velocity inside pipes is necessary to prevent the accumulation of debris. This means that pipes cannot just be oversized to anticipate a potential future maximum needed flowrate, like firefighting during a major wildfire.

Under extended extreme usage, a water system may face a supply limitation. Water systems usually maintain their largest supplies as untreated raw water. While supply has not been identified as a problem during any of the recent large-scale urban fires, even creating storage of finished or treated water in too large a volume can lead to problems. Tanks and reservoirs that are too large will hold water too long and water age will become an issue. The longer water is stored after it is treated it will begin to lose its chlorination which can allow pathogens to grow. A common water age pathogen is legionella bacteria, which can cause legionnaire disease. Water in tanks could be re-chlorinated; however, the longer water is chlorinated the more likely it is to produce undesirable chemical reactions within the water that lead to what are called disinfection byproducts, which are also harmful contaminants. This means although tanks and reservoirs must be large enough to have buffer volume to provide for a steady flowrate of water production at the treatment facility, their size must be balanced against regular demand to prevent water aging.

Some water systems can bypass their water treatment and put untreated water into their piping networks to overcome a flow limitation in treatment, but the flowrate will still be limited by the pumping capacity and piping network.

Loss of power to pumping facilities can also reduce flowrates within a system. Most critical pumping facilities will have backup power to address this situation.

Another limitation of community water systems when faced with large scale fire impacts, beyond the heavy usage of water via hydrants by fire crews, is the loss of water through burned structures and open piping connections that result. As a fire destroys homes and other structures, the internal water piping of those structures is also destroyed, creating an open connection that leaks water and lowers pressure within the pipe network. This cascading loss of water through burned structures can be even more pronounced for communities on a hillside or with sloping ground since this will facilitate water loss out of the system to the lowest open connections at the lowest elevation. This can result in very low or no pressure in the water system.

Prior large wildfires causing widespread structure damage have also led to pressure loss within a water system. Pressure loss has been observed in previous wildfires including the 2017 Tubbs Fire in Santa Rosa, the 2018 fires in Paradise and Redding, the 2021 Marshall Fire in Colorado, and the 2023 Lahaina Fire in Maui.

Local fire hydrants are built into the same water system that provides household water supply and sized to provide water flow needed to address fires that threaten a few properties involved in a localized structure fire. Local water systems and hydrants are not designed to suppress firestorm conditions impacting an entire neighborhood of homes at the same time. Under National Fire Protection Association (NFPA) standards, the Fire Safe Regulations within title 14 of the California Code of Regulations, and the California Fire Code within title 24 of the California Code of Regulations, the amount of water required to be available is based on construction type and square footage of a building. The standard is based on the assumption of providing adequate water pressure to suppress a structure fire within a reasonable time period, which can vary from two to four hours.

e. **Prepositioning and a multi-pronged approach to firefighting are essential to combatting wildfires under extreme conditions.**

In the wildland, firefighters rely heavily on engines, hand crews, air resources, and heavy equipment to create fire lines. Removing vegetation with hand crews and heavy equipment helps control the spread of a fire by creating barriers that limit the ability of a fire to spread by igniting other vegetation and structures. Hand crews and heavy equipment are more difficult to use at the head of a fire in extreme fire conditions with wind and long-range spotting, as the fire may outpace line construction and change direction in unpredictable ways and can more easily jump containment lines. Extreme fire conditions can put firefighters and heavy equipment operators in harm's way with limited escape routes. Additionally, in urban and suburban areas with limited open vegetation and significant other combustible material that is more difficult to remove (including fences, gardens, shingle roofs, and homes), hand tools and heavy equipment may not be as effective with wildfire containment as they are in a more traditional wildland environment.

Water tenders are also often part of initial and extended attack orders of firefighting resources in more rural areas to support engines, but usually firefighting in urbanized and suburban areas can rely entirely on fire hydrants if they are available. Local water systems and hydrants are usually designed to serve a more typical fire of a few buildings; they are not designed to suppress firestorm conditions impacting an entire neighborhood of homes at the same time. Here, environmental factors like low humidity, high winds, and very low fuel moistures exacerbated conditions of a fast-moving fire in a heavily populated residential area.

Finally, firefighting aircraft are an effective tool that can be deployed to slow fire spread. However, severe wind conditions like those faced on January 7 and 8 make the use of firefighting aircraft both ineffective and potentially dangerous, and accordingly high winds grounded aircraft during the initial response to these fires.

4. **Recommendations**

In light of the Findings above, the State Agencies make the following recommendations:

a. California should continue to implement, and redouble efforts to support locals in implementing, the key actions of California Wildfire and Forest Resilience Action Plan to prepare communities for year-round wildfires.

b. California faces a fire year rather than a fire season and catastrophic wildfires affecting communities in the wildland urban interface can be driven and exacerbated by extreme weather events. These weather-driven fires require extraordinary efforts to suppress and manage, and prepositioning is fundamental to that effort. As the risk of these events increase, firefighting and first responder organizations should continue to strategize on the most effective ways to prepare for and respond to them. Consistent with the above findings and Paragraph 3 of Executive Order N-18-25, this includes but is not limited to continued utilization of essential prepositioning strategies, including the deployment of water tenders to ensure access to water if a local water district's fire hydrants cease functioning, analysis of the means and methods necessary to quickly assign and scale-up resources, and consideration and support of effective prevention activities.