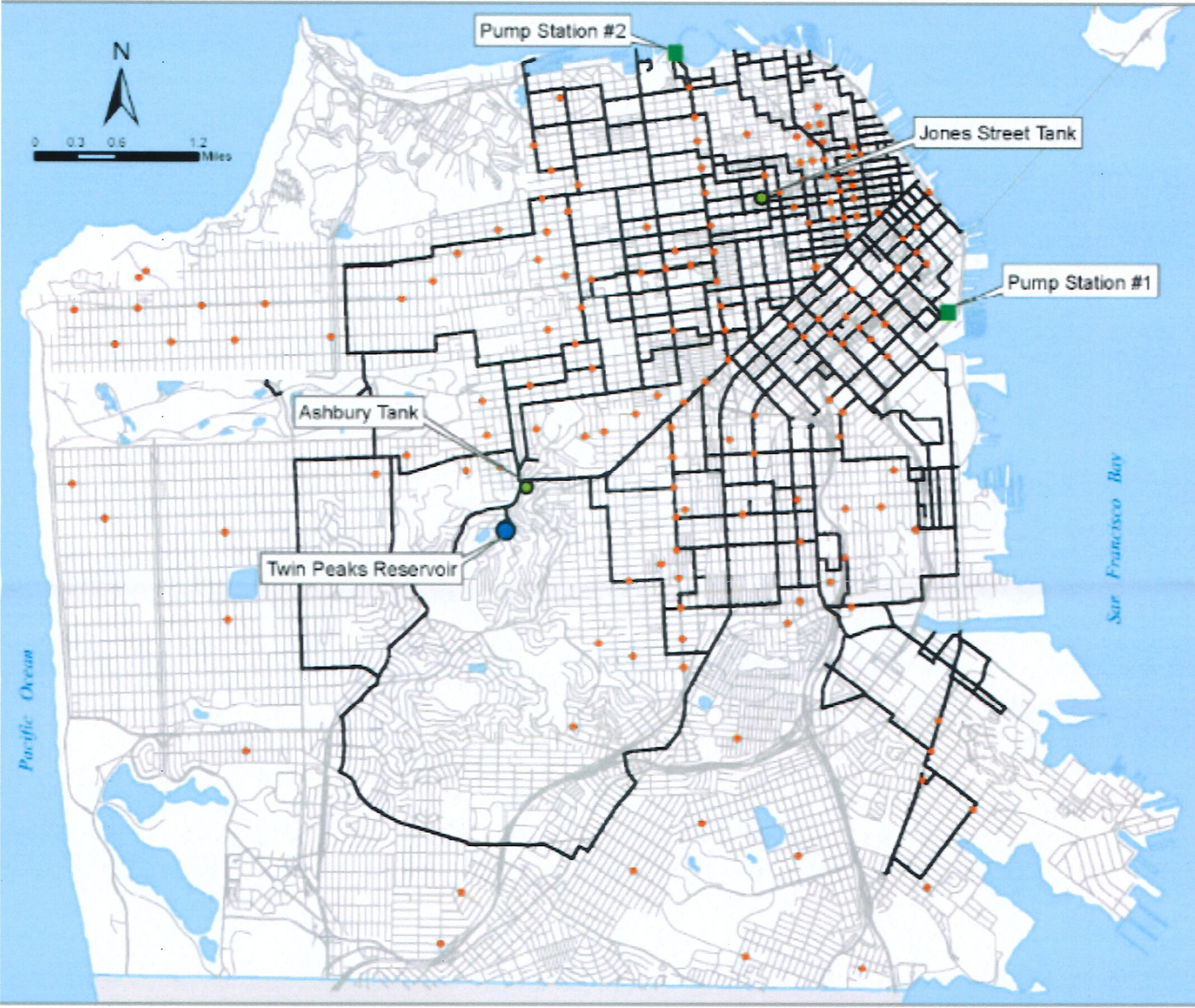


FIGURE ES-1: EXISTING AUXILIARY WATER SUPPLY SYSTEM

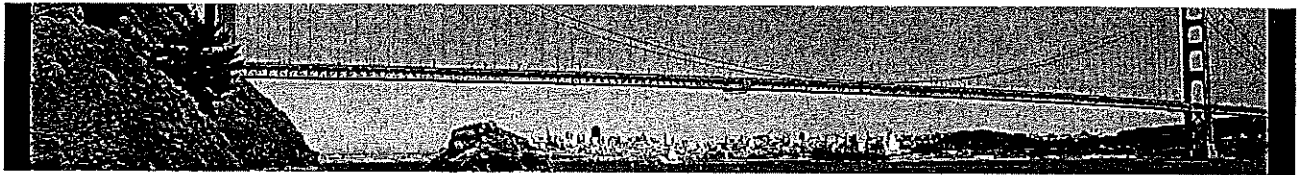


- Legend**
- Pump Station
 - Reservoir
 - Tank
 - Cistern
 - Existing AWSS Pipeline

Richmond Review/Sunset Beacon

NEWS FOR SAN FRANCISCO'S RICHMOND AND SUNSET DISTRICTS

TUESDAY, OCTOBER 29TH, 2019



FIREFIGHTING

Civil Grand Jury Urges City to Enact Firefighting Measures

ON OCTOBER 5, 2019 • (1 COMMENT)

By Thomas K. Pendergast

A recent Civil Grand Jury (CGJ) report has raised questions about post-earthquake fire protection after the next major temblor and whether firefighters will have enough water pressure to fight the resulting conflagrations. If not, neighborhoods in supervisorial districts 1, 4, 7, 8, 9 and 11 could burn to the ground.

The report titled "Act Now Before It Is Too Late: Aggressively Expand and Enhance Our High-Pressure Emergency Firefighting Water System" (EFWS) was made public in June and has come to the attention of the SF Board of Supervisors' Government Audit and Oversight Committee (GAOC).

A \$628 million bond measure is being proposed for the March 2020 ballot to improve fire stations and emergency facilities across the City. More than \$154 million of that is slated to expand the EFWS – formerly known as the Auxiliary Water Supply System (AWSS) – into the Richmond and Sunset districts. Not only would this system of earthquake-resistant pipelines cover large swaths of the western areas, a pump station at Lake Merced which would join the Sunset Reservoir as a firefighting source, would provide water after a catastrophe like the 1906 earthquake will also be included in the bond proposal.

If, however, the demand for water in the Sunset District is too high or the southern basin of the Sunset Reservoir fails and there is not enough water pressure for the Richmond District, there is no money in the bond set aside for a salt-water pump near Ocean Beach in District 1 as a backup. Funding for that option would have to be provided at a later date.

Also conspicuously absent is any expansion of the EFWS into the southernmost areas of the City, leaving the south end of districts 7, 8, 9 and 11 far more vulnerable to fire than anywhere else in San Francisco.

The 1906 shaker killed thousands, many of whom were incinerated while trapped in rubble due to hundreds of broken water mains and thousands of broken service connections, which eliminated the water pressure needed to fight the ensuing firestorm.

In the years immediately following that devastating tragedy, the City built the AWSS, a separate high-pressure water system composed of pipelines and seawater pumps designed to withstand a massive earthquake and deliver enough water pressure to fight large fires.

At the time, most of the City's residents lived on the east side, so the original system was only built out, with some expansions, as far west as 12th Avenue in the Richmond District and eventually 19th Avenue in the Sunset District.

In the decades that followed, as the City expanded westward, the AWSS system did not follow, leaving more than a dozen neighborhoods in the western and southern areas vulnerable to a devastating firestorm.

Two bonds have been passed to modernize the city's water distribution system. A great deal of that money went into refurbishing and strengthening the transmission pipelines coming from the Hetch Hetchy Reservoir and some of the money was used to upgrade and maintain the existing system in the City.

Meanwhile, experts studying the AWSS expansion learned that the current water sources for the system were not enough to supply adequate water pressure for a comprehensive system to cover the entire City. So, last year the SF Public Utilities Commission (SFPUC) proposed constructing a "co-benefits" pipeline to carry water from the Sunset Reservoir to connect to both the domestic water pipelines and proposed high-pressure earthquake-resistant pipelines for use to fight fires after a disaster. This plan depends on a series of automated, mechanized valves designed to cut the pipelines off from domestic water pipelines, which could be broken and, like in 1906, be unable to deliver an adequate supply for firefighting.

Charles Scawthorn, professor of engineering at the University of California, Berkeley and an authority on emergency water systems, was asked by District 1 Supervisor Sandra Lee Fewer during a meeting of the supervisors' GAOC if the Sunset Reservoir could supply enough water to fight fires after a catastrophe. He said that if the reservoir holds (which has been re-enforced for earthquakes on the northern basin but not the southern basin) then it should have an adequate supply. If it does not hold, then a redundant supply infrastructure, like a pump station at Lake Merced and also a seawater pump drawing from Ocean Beach, would be required to make the system more reliable.

"The issue of emergency water supply in San Francisco neighborhoods is very important to me as the supervisor in District 1," Fewer said at a GAOC meeting on Sept. 19. "I represent the Richmond District, where there are thousands of wooden homes built very close together, that would be vulnerable to fire in case of a major earthquake. Between the Richmond and the Sunset, we're talking about 42,000 structures that are not currently covered by a high-pressure emergency water system.

"In the almost three years that I have been on the board, this has been among my top priorities, ensuring that we are building a robust emergency water system for the west side of San Francisco," she said. "It is critical that all neighborhoods in San Francisco are protected in case of an emergency."

The chair of the GOAC, Supervisor Gordon Mar, also expressed his concern about the issue.

"Since I stepped into my role as the District 4 supervisor this year, it's also become a high priority for me and my constituents as well, given the fact that the entire Sunset District is currently unprotected in the case of an earthquake and major fire as a result of an earthquake," Mar said.

But the report also emphasizes that neighborhoods along the southern end of the City, the southern portions of districts 7, 8, 9 and 11, are not included in the proposed bond. At this time, no expansion is being considered for those areas.

The report says that six of San Francisco's districts have fewer than 10 miles each of EFWS water mains. Districts 8 and 9 each have nine miles of them, District 7 has seven miles and District 11 has only one. As for the high-pressure hydrants needed to handle that water, districts 8 and 9 each have 110 and District 7 has 79.

These areas do have water cisterns, however, with district 8 having 12 cisterns, 9 with 21 cisterns and 7 with 12. District 4 also has 12 cisterns, while District 1 has 17. The problem with cisterns, however, is that they run out of water in less than an hour and cannot be refilled quickly. The report says the City has a total of 229 cisterns.

For comparison, the report notes that in the 1995 Kobe earthquake in Japan, 968 water cisterns ran out of water in 10 minutes. Since the average SF cistern contains 75,000 gallons, they will probably last at least half an hour, perhaps up to an hour, but that still might not be long enough to extinguish blazes.

According to the CGJ report, the most vulnerable area by far is District 11 (which includes Ingleside, Excelsior, Outer Mission and Crocker Amazon, among other neighborhoods). Not only does it have only one mile of EFWS pipeline, it also has only 24 high-pressure hydrants on that system and five cisterns to cover that part of the district.

District 10, (which includes Potrero Hill, Bayview, Balboa Park, Sunnydale and other neighborhoods) comes out in the middle of the pack, with 18 miles of EFWS water mains, 222 high-pressure hydrants and 20 cisterns. That section of the system has been prone to relatively low pressure because of its location at the end of the line, but a pipeline from the University Mound Reservoir down to that section is now under consideration for inclusion in the bond proposal, with the expectation that it would solve the "dead end loop."

A detailed list of questions about the lack of EFWS infrastructure and their ideas for dealing with this situation was emailed to supervisors Norman Yee of District 7, Rafael Mandelman of District 8, Hillary Ronen of District 9 and Ahsha Safai of District 11, but no responses were received by press time.

For the time being, the report suggests a stop-gap solution to help these underserved areas: the Portable Water Supply System.

These are "hose tender" pumps on wheels that can substitute for a fire engine to pump water from a cistern or other water source. Currently the City has only five antiquated models, the youngest being 27 years old. The SF Fire Department has requested money for 20 more modern hose tenders, but the 2019/20 budget proposal from the mayor only includes four, with a price tag of \$1 million each.

They could be in service within two years, the report says.

The CGJ report further recommends “a major acceleration of these efforts such that all areas of the City are protected by a seismically sound, multi-sourced, high pressure emergency fire-fighting water system within 15 years, by no later than 2034.

“As an interim measure, by no later than June 30, 2021, the City should purchase 20 new PWSS hose tenders. These tenders should be strategically located in areas that only have low-pressure water pipelines and cisterns.”

Visit RichmondSunsetNews.com for comprehensive coverage of San Francisco's firefighting infrastructure challenges.



CITY AND COUNTY OF SAN FRANCISCO 2018-2019 CIVIL GRAND JURY

**ACT NOW BEFORE IT IS TOO LATE:
AGGRESSIVELY EXPAND AND ENHANCE
OUR HIGH-PRESSURE EMERGENCY
FIREFIGHTING WATER SYSTEM**

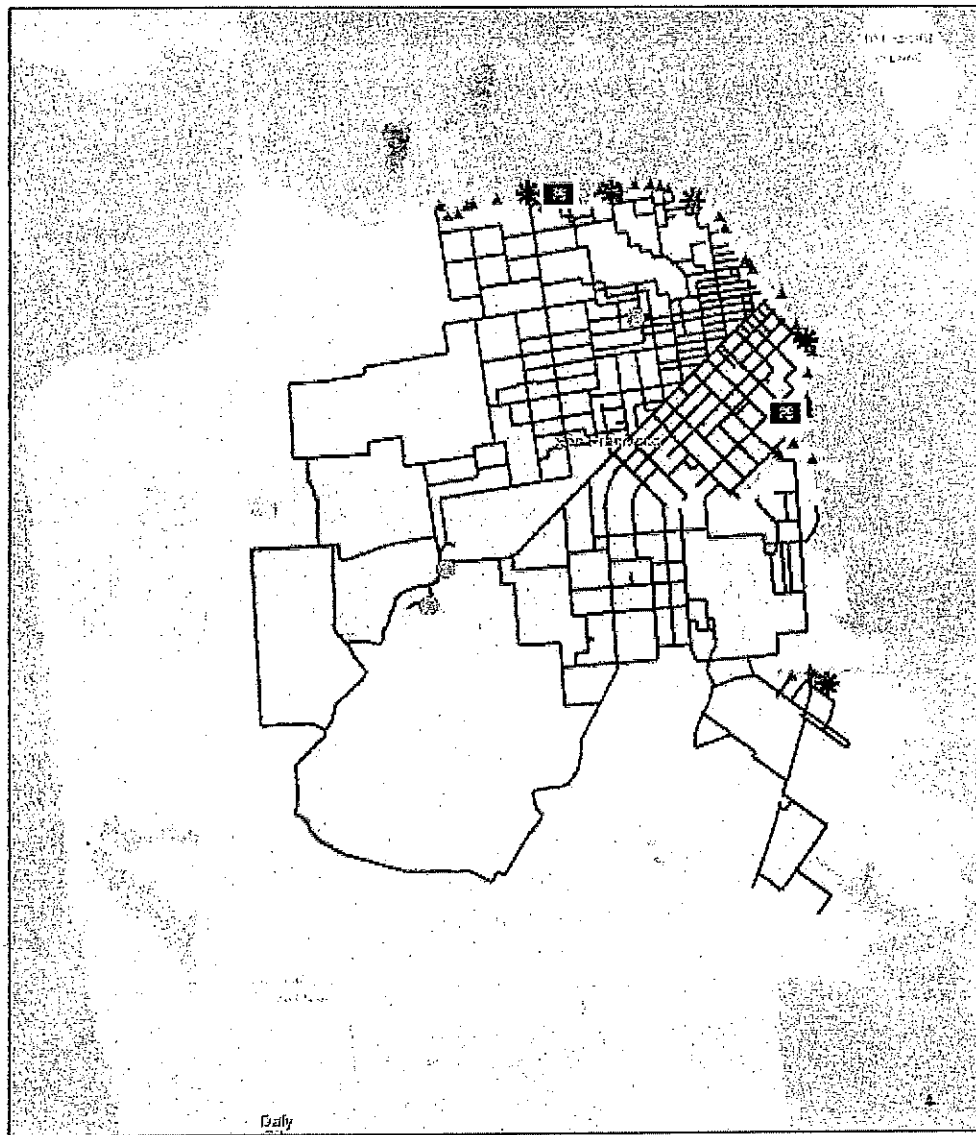
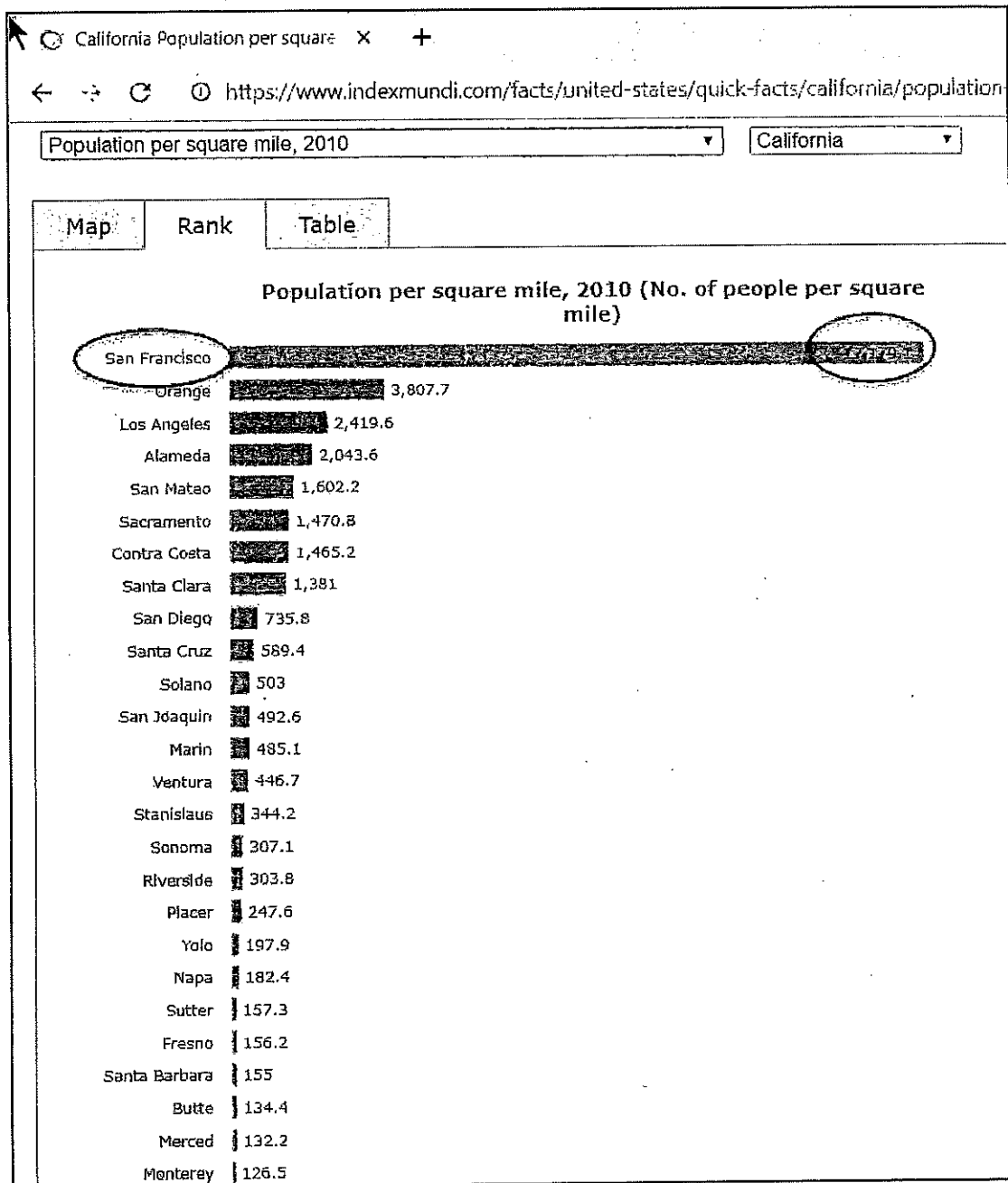


Figure 1
Population Density By County



On a district by district basis, Supervisorial Districts 1, 4, 7 and 11 are not nearly as well protected by the HP AWSS as, for example, Districts 3 or 6:⁵⁰ See Table 3 below.

Table 3
HP AWSS Hydrants and Miles of Main by District

Supervisorial District	# of AWSS Fire Hydrants	Miles of AWSS Mains
1	42	5
2	170	14
3	327	23
4	3	0
5	188	16
6	366	27
7	79	7
8	110	9
9	110	9
10	222	18
11	24	1
TOTAL	1641	130

In fact, six of the eleven Supervisorial Districts, Districts 1, 4, 7, 8, 9 and 11, each have less than ten miles of AWSS mains. Districts 1, 4, and 11 each have less than 50 AWSS fire hydrants.

The areas not protected by the HP AWSS would need to rely primarily on getting emergency firefighting water supplies from the City's MWSS through its low-pressure hydrants or from cisterns. For a number of reasons detailed below, these resources are unlikely to provide adequate water to protect residents from fires after a major earthquake.

⁵⁰ Data provided by SFPUC on March 13, 2019.

By Supervisorial District, the breakdown of cistern locations is listed in Table 4 below.

Table 4
Cisterns by Supervisorial District

Supervisorial District	Cisterns
1	17
2	23
3	46
4	12
5	20
6	26
7	12
8	27
9	21
10	20
11	5
TOTAL	229

Notably, Districts 1, 4, 7 and 11, which currently have the fewest miles of HP AWSS pipelines, also have the fewest cisterns. This is especially true of District 11, with only one mile of AWSS main pipeline and only five cisterns.⁷⁴

Cisterns provide a valuable backup or “last resort” in the event of damage to the MWSS and AWSS. In the 1994 6.7-magnitude Northridge earthquake, the MWSS suffered over 1,000 water main breaks.⁷⁵ Firefighters used backyard swimming pools as water supply sources. In the 1906 earthquake, San Francisco’s 23 cisterns were credited with saving a major building in the Financial District when the water mains broke.⁷⁶

Cisterns, however, have limited capacity⁷⁷ and are therefore unlikely to be effective against serious fires following a major earthquake. In the 1995 6.9-magnitude Kobe earthquake,

⁷⁴ In recent years, the SFPUC has built 30 additional cisterns, funded by the 2010 and 2014 ESER bonds. These 30 new cisterns are included in the totals in the above table. Half of these new cisterns were strategically located in the Richmond and Sunset districts, which now have 17 and 12 cisterns, respectively, to begin to address concerns that those areas of the City were inadequately protected. SFPUC 2017 FAQ, Question 4, <https://sfwater.org/modules/showdocument.aspx?documentid=11507>.

⁷⁵ PEER 2011, Water Supply Following Earthquake, https://peer.berkeley.edu/sites/default/files/webpeer-2011-08-charles_scawthorn.pdf, at pp. 12-17.

⁷⁶ Scawthorn 1987, <http://www.sparisk.com/documents/AIRACFFEs.pdf>, at p. S140.

⁷⁷ SFFD Water Supplies Manual, http://ufsw.org/pdfs/water_supplies_manual.pdf, at pp. 4.1, 5.6-5.7.