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## **A CONCEPT TO REDUCE FRESH WATER CONSUMPTION IN SAN FRANCISCO**

A Look at Fresh Water Use, Recycled Water, and the Fire Fighting Water Distribution System

One Simple Option to Quickly Create Significant Change

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As the residents and local authorities of the State of California and City of San Francisco struggle to find ways to solve water issues, there are numerous options being considered. I have spent a considerable amount of time looking at water issues in San Francisco and outline a very simple option to make a significant difference by implementing one relatively simple solution.

San Francisco has two parallel water distribution systems: the first one is for water consumption as well as conventional fire hydrants, while a second system distributed water is solely for fire-fighting in a high-pressure piping system. After the 1906 earthquake and the loss of water pressure in what was a single system, a second system was installed and called the "Auxiliary Water Supply System" or AWSS. A schematic and map are appended for reference.

This AWSS has many unique aspects, but one issue related to our current challenges with water supply is that the AWSS leaks an amazing amount of water each and every year. On average it leaks about 72,000,000 gallons of fresh, clean water into the ground because of the condition of the now antiquated piping. About 200,000 gallons a day are fed into hill top reservoirs that keep the system under pressure. While fixing these leaks might appear to be a solution, the extent of the piping is measured in miles, and hence, prohibitively expensive to excavate and repair or replace.

One potential solution would be to use an alternate source of water; use re-claimed water to feed the system. In two recent reports to the PUC on the AWSS system, specialist engineering firms proposed this option but it was very briefly outlined and quickly dismissed because of a concept that water would have to be supplied in a conventional configuration: very long runs of piping all the way to the reservoirs.

What has not been considered, to the best of my knowledge, is a way to feed re-claimed water into the system from locations much closer to sites that can treat water.

The South Side Water Treatment Plant has been considered as a major location for generating reclaimed water to supply new buildings in the CBD and South of Market Districts. It appears that this idea, first proposed in the 1990's has been shelved or at least stalled in a "planning phase". It is not clear why, but one guess is that it was not economic to install a new piping distribution system.

The AWSS piping system runs past the South Side Water Treatment Plant in Hunter's Point. As the AWSS piping network needs a continuous regular supply due to continuous leaks into the ground, the concept to supply water at one distant end of the piping is considered conceptually viable. The pipe diameter required to fill the entire system is smaller than the local AWSS piping. A small treatment system, added to the SSWTP plant could supply all of the water that currently leaks into the ground. 72MG per year equates to about 140 gallons per minute. A water treatment system that produces this rate of flow, would be relatively small, economic and supervised by the same staff that runs the current plant. The device would have a discharge/supply pipe of about 3-4" in diameter. A buried pipe of this size could be installed from the existing plant to the AWSS in the same city block as the plant. This suggests the infrastructure cost (in-street piping) would be exceptionally low, and the treatment element would be highly cost efficient due to such closely matched demand and supply figures.

In summary:

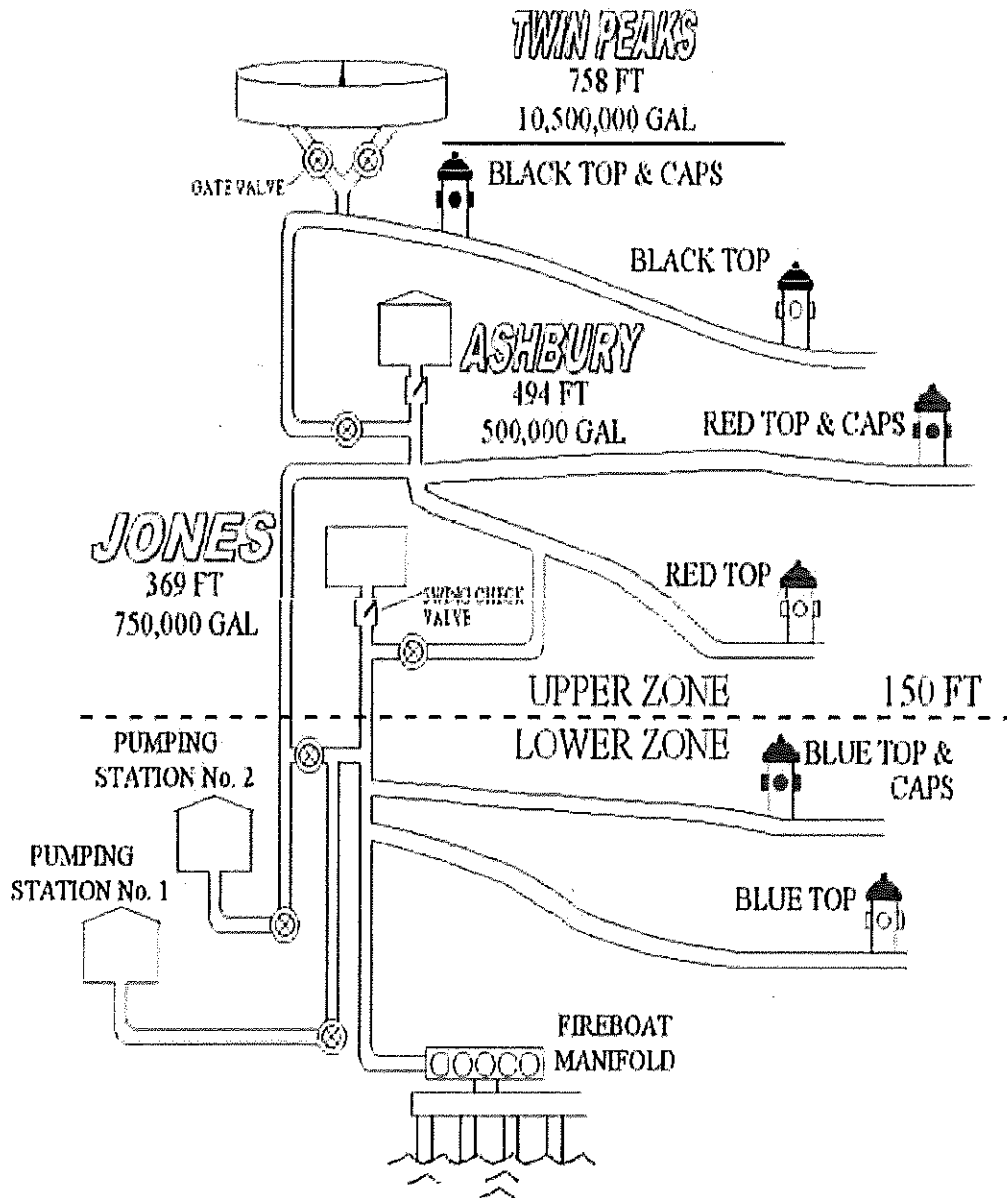
- 1) Detailed reports by AECOM dated June 2009 and Feb 2014 do not consider feeding the AWSS network at the end or lower section, they appear to consider only adding water at the reservoirs and tanks on the top of hills. For this reason they appear to have discounted the concept of recycled water supply to the AWSS because of a high infrastructure cost. The option detailed here has very low infrastructure cost.
- 2) If this system could be financed and built, would save the equivalent of the lavatory fixture consumption of about 32,000 individuals in housing, or 90,000 individuals in office buildings.
- 3) This savings of fresh water would be created from the first day of completion of the project: about 200,000 gallons per day of use of recycled water created while San Francisco would save 200,000 gallons of fresh water from Hetch Hetchy.
- 4) I am not aware of any other potential projects that create this scale of water savings this quickly, nor at this scale.

This concept has been discussed with numerous other individuals that are aware of the overall engineering and water quality issues. There appear to be no fundamental errors in concept.

I believe this idea should be considered in concept as soon as possible.

## SAN FRANCISCO'S AWSS IN CONCEPT

(from a report to the PUC dated Feb 2014 by AECOM)

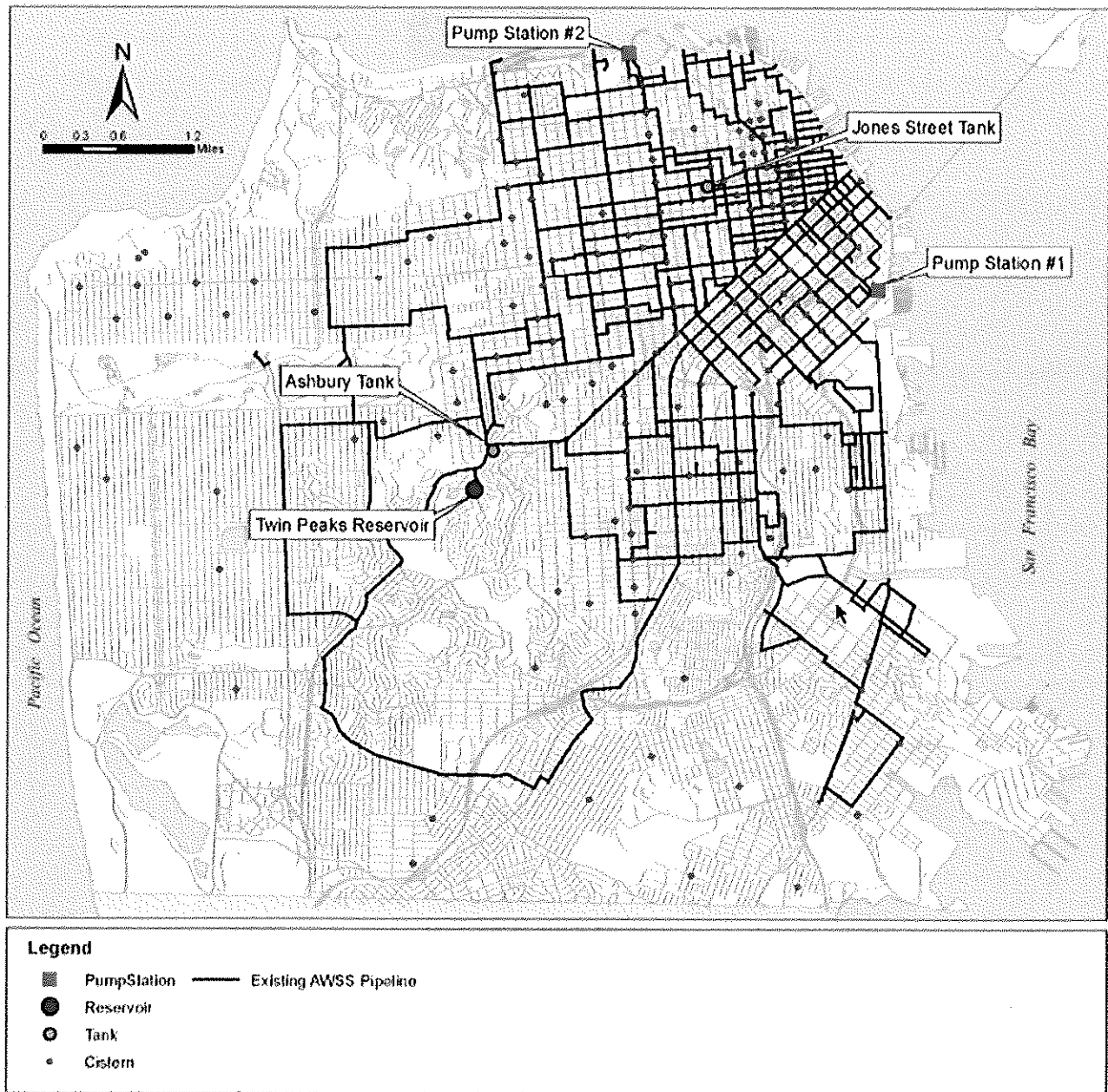


### Note:

- 1) Fresh water is fed into the system at the main reservoir on Twin Peaks and the Jones St and Ashbury Tanks.
- 2) In the proposed solution, recycled water would be fed into the system in the lower right corner near the "blue top" hydrant. The fresh water feeds would remain in place, but limited to supplying water during either fire events or periods the recycled water source is taken out of service.

## MAP OF SAN FRANCISCO'S AWSS

(From SFGov report on the Auxiliary Water Supply System Study, January 23, 2009)



### Note:

The South Side Water Treatment Plant is approximately at the "arrow pointer" in the SE section of this map.