



Services of the San Francisco
Public Utilities Commission

BAIRWMP Regional Concept Submission: Lower Cherry Aqueduct Emergency Rehabilitation Project

Applicant Information

Lead Applicant Organization: San Francisco Public Utilities Commission (SFPUC)

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Summary

Name of Project: Lower Cherry Aqueduct Emergency Rehabilitation (LCAER) Project

Proposed grant request: \$9 Million (Total project cost is \$14 Million, including \$5 Million local match.)

This regional project will provide immediate, cost-effective, regional drought relief for 2.6 million residents across four Bay Area counties and preparedness for future droughts by accessing over 200,000+ acre feet of previously un-tapped supply in Cherry Reservoir and Lake Eleanor, part of the Hetch Hetchy Regional Water System. Notably, it will provide that drought relief in calendar year 2014. The Lower Cherry Aqueduct Emergency Rehabilitation (LCAER) Project aligns with regional priority needs in the BAIRWMP as follows:

Reinforce/Enhance Water Supply Capacity:

The LCAER Project will directly and immediately increase water supply for the region by over 200,000+ acre feet, and provide ongoing access to 273,500 acre feet of storage for potable water.

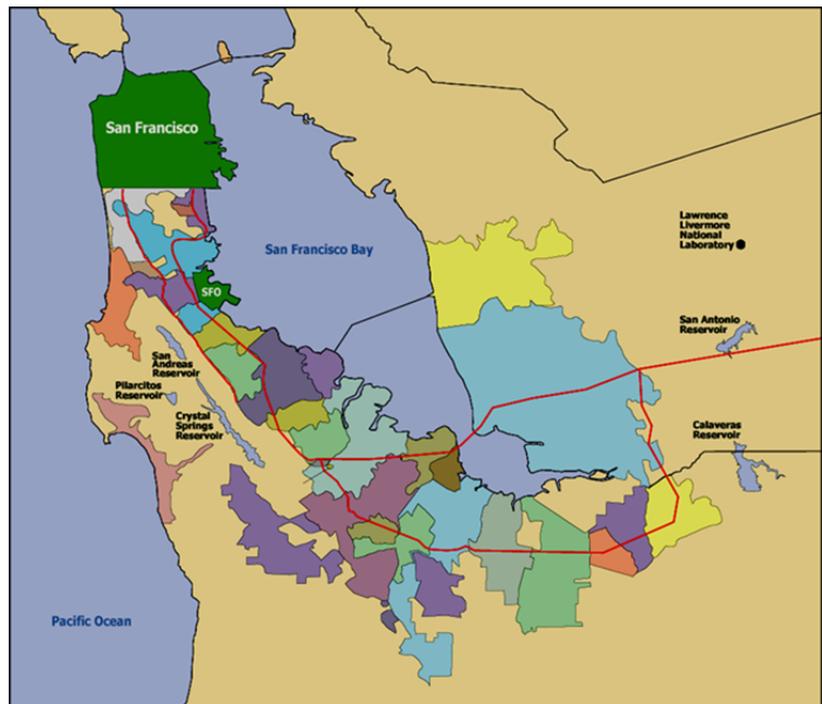
Regional Water Reliability/Long-term sustainability:

In addition to the supply and storage benefits listed above, the LCAER project will enhance water operations flexibility over the long term.

Climate Change:

The project will allow SFPUC to more adaptively manage water supplies under changing climate conditions. Additionally, the water will be delivered to the Bay Area primarily by gravity, resulting in very low energy costs per million gallons delivered.

Figure 1: SFPUC Service Area



Background and Overview

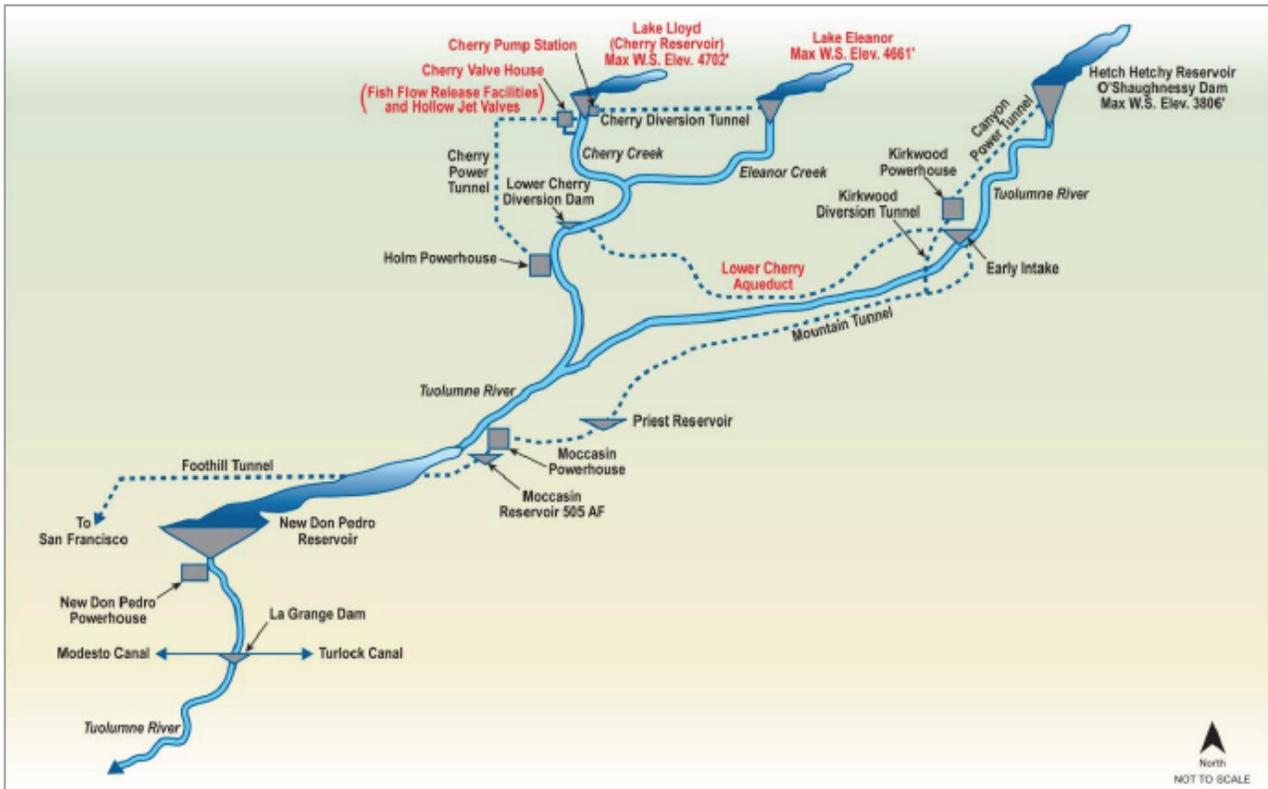
The San Francisco Public Utilities Commission owns and operates the Hetch Hetchy Regional Water System, which provides water supply to approximately 2.6 million residents in San Francisco, San Mateo, Santa Clara, and Alameda counties, as shown in Figure 1.

The Regional Water System draws approximately 85% of its water from the Upper Tuolumne River Watershed, collected in Hetch Hetchy Reservoir in Yosemite National Park, feeding an aqueduct system that delivers water 167 miles by gravity to Bay Area reservoirs and customers. The remaining water supply is drawn from local surface waters in the Alameda and Peninsula watersheds.

Normally, only Hetch Hetchy Reservoir water supplies are exported to the Bay Area for municipal and industrial uses, and releases from Lake Eleanor and Cherry Reservoir are used to satisfy instream flow requirements, satisfy Raker Act entitlements to the Districts downstream, and produce hydroelectric power. Water released from Cherry Reservoir or Lake Eleanor and stored in New Don Pedro Reservoir is credited to the SFPUC’s water bank account, which allows San Francisco to meet its Raker Act water obligations to the Districts.

During dry years, it has historically been possible to divert water from Cherry Reservoir and Lake Eleanor through the Lower Cherry Aqueduct (LCA) to supplement supplies to the Bay Area when Hetch Hetchy Reservoir storage is low. The primary purpose of the LCA system is to convey water supply from Cherry Creek that can supplement the primary Hetch Hetchy Reservoir supply during a drought year (see Figure 2, below). The last time SFPUC used the LCA system to supplement Hetch Hetchy supply was in 1988. Due to its age and the damage caused by the 2013 Rim Fire, the LCA system is currently unable to reliably convey the supplemental water supply from Cherry Creek to the SFPUC’s primary water delivery system.

Figure 2: Tuolumne River System Showing LCA



Current Hydrologic Conditions and Need for the Project

Hydrologic conditions in Water Year 2013/14 have been dry, with precipitation at 55% of normal to date as of March 26, 2014. SFPUC’s total reservoir storage is at 998,088 acre feet, 68% of maximum. However, only

315,000 acre feet are directly available for water supply. As shown by Figure 3, the remainder is primarily in Water Bank and Cherry Reservoir. Since the LCA system is not operational, SFPUC cannot currently access the water in Cherry Reservoir for potable supply.

In response to dry conditions, on January 31, 2014 SFPUC issued a request for 10% voluntary rationing throughout its service area. Several of SFPUC's Wholesale Customers are faced with further shortages because of the lack of allocation from the State Water Project and other sources, and are relying more heavily than normal on SFPUC supplies.

Despite ongoing conservation efforts, SFPUC and the Regional Water System could experience further shortages if precipitation continues to be below normal over the course of the next water year. In an effort to prepare for the possibility of ongoing dry conditions, SFPUC has undertaken the LCAER Project to repair and upgrade the LCA system in order to access over 200,000 acre feet of supply currently stored in Cherry Reservoir. Rehabilitation of the Lower Cherry Aqueduct will provide reliable access to the entire Tuolumne System water supply for the 2.6 million residents served by the SFPUC before the end of calendar year 2014, providing immediate drought relief.

Figure 3: SFPUC System Storage as of 03/23/14

Reservoir	Current Storage ^{1,2,3} (AF)	Maximum Storage ^{3,4} (AF)	Available Capacity (AF)	Percent of Maximum Storage
Tuolumne System				
Hetch Hetchy	185,350	360,360	175,010	51.4%
Cherry	219,600	273,500	53,900	80.3%
Eleanor	22,350	27,113	4,763	82.4%
Water Bank	441,161	570,000	128,839	77.4%
Total Tuolumne Storage	868,461	1,230,973	362,512	70.6%
Local System				
Calaveras	16,892	96,670	79,778	17.5%
San Antonio	41,121	50,637	9,515	81.2%
Crystal Springs	52,530	58,309	5,778	90.1%
San Andreas	16,827	19,027	2,200	88.4%
Pilarcitos	2,256	3,069	813	73.5%
Total Local Storage	129,627	227,711	98,085	56.9%
Total System Storage	998,088	1,458,684	460,597	68.4%
Total without water bank	556,927	888,684	331,758	62.7%

¹ Upcountry storage is average of previous day's storage from USGS website

² Water bank storage reported by HHWP for 3/23/2014

³ Local data from Daily Water Report

⁴ Upcountry maximum storage is with flashboards, taken from rating curve

Condition of LCA Following the Rim Fire

The LCA system consists of a low head, gated inlet structure with four 2-foot x 4-foot manually operated head gates, a diversion dam with two 2-foot x 4-foot hydraulically operated sluice gates in Cherry Creek, seven tunnels totaling 9,500 linear feet, 5,500 linear feet of open aqueduct and 4,700 linear feet of enclosed pipes varying in diameter from 36 inches to 75 inches.

The 2013 Rim Fire heavily damaged many of the elements of the LCA system. Some of the notable damage included:

- The gate house and controls structure for the diversion dam were damaged beyond repair.
- The headgate locks for the diversion dam were damaged and are locked in the closed position, and the headgates themselves were damaged.
- The hydraulic system for the dam sluice gates was damaged beyond repair, rendering the sluice gates inoperable.
- Fire has exposed potentially hazardous conditions, such as fallen trees and rocks. The canal is littered with debris, rocks, tree trunks and tree limbs. The trail to the diversion dam experienced fire damage, including a burned pedestrian bridge, damage to safety cables, eroded slopes, and trail blockage from

fallen debris. The accumulation of debris can lead to plugging of the spillway gates and/or the tunnel entrances and exits.

- The catchment chute along portions of LCA is burned and filled with rocks and debris.
- A large boulder likely set loose by the fire has dented a piece of the exposed pipe portion of the LCA.
- The entrance to the LCA tunnel is plugged with debris from the abandoned turbidity monitoring shed destroyed by the fire.
- The wooden operator access stairs and platform for the LCA Spillway Gates were severely burned in the fire, impairing safe access to the gate controls.
- The wood cover to the drainage gate valve is burned, impairing access to the controls.
- Burned trees and erosion upslope of the LCA structures pose safety hazards to the facility/operators.

Proposed Project Scope

Several actions are needed in order to restore the functionality of the LCA system. The proposed scope of work is:

1) Pipe Installation & Replacement

- a. The existing LCA currently includes approximately 5,600 feet of open aqueduct. The LCAER project will include converting the entire open aqueduct to an enclosed pipeline. This will safeguard the quality of the water diverted from Cherry Reservoir.
- b. In order to facilitate the installation of a new pipeline in the existing aqueduct, the project will remove the accumulated debris in the aqueduct, estimated to be approximately 500 CY.
- c. The existing LCA system includes a section of steel and corrugated metal pipe that is approximately 400-feet long that will likely be replaced with a new steel pipe.

2) Tunnels

- a. The existing LCA currently includes approximately 9,500 feet of tunnel. Overall, the condition of the tunnels is satisfactory; however, there are locations that have been identified for repair. The anticipated tunnel repairs will likely include rock bolting, grouting, and reinforced concrete placement. The scope of work associated with the tunnels also includes the removal of large rocks, muck and sand resulting from erosion due to the Rim Fire. The total volume of debris inside the tunnels is estimated to be approximately 750 cubic yards.

3) Connection to the Primary Water Supply System

- a. The existing LCA system does not provide SFPUC with the operational capability to discharge water from the LCA directly into the primary water supply system; therefore the project will include constructing a new pipeline and associated valves that will allow SFPUC to discharge water from the LCA directly into the primary water supply system. The connection will require the installation of new valves or gates that are anticipated to have diameters between 36 and 60 inches. The number of new valves or gates that will be required is estimated to be between 2 and 6. A flowmeter and a turbidimeter will be required at this location with tie-in to SFPUC's SCADA system.

4) Cherry Creek Diversion Dam Facility

- a. The existing Cherry Creek Diversion Dam (CCDD) is currently non-operational as a result of Rim Fire damage. The scope of the work would include:
 - i. *Timber Structures*: The scope will include the reconstruction of the Gate House and Control Room with a new timber framed structure.
 - ii. *Access Trail*: The access trail to the CCDD consists of a foot trail that is approximately 1 mile long. Restoration work to include:
 1. Demolition of existing safety cables and installation of new safety cables. The total length of new safety cables is estimated to be approximately 4,000 linear feet.
 2. Trail widening.

3. Mitigation of geotechnical hazards, potentially including retaining walls, rock scaling and erosion control.
4. Constructing a new pedestrian bridge that spans approximately 18 linear feet over a drainage culvert.

Environmental Review and Permitting

SFPUC is managing the environmental review process, acquisition of resource agency permits, and completion of environmental requirements for FEMA grant applications for the Project. The LCAER project has already received a statutory exemption from CEQA. However, no construction work may proceed until all permits and resource agency clearances are received, including but not limited to, coordination with the U.S. Forest Service, State Historic Preservation Office Section 106 consultation (for work to be eligible for FEMA grant funding), U.S. Army Corps of Engineers Section 404 permitting, Regional Water Quality Control Board Section 401 permitting, and a California Department of Fish and Wildlife Service 1600 Agreement. SFPUC anticipates having the necessary permits in hand by late spring 2014.

Cost/Benefit Analysis:

The cost of the project is approximately \$14 Million, which translates to \$70 per acre foot of raw water. Since SFPUC does not have a filtration avoidance permit for water from Cherry Reservoir, the water will be filtered at the Sunol Valley Water Treatment Plant. That will add additional costs to the end product, but it is possible to compare the cost of raw water to the cost of SFPUC water to its Wholesale Customers, which is \$1,420 per acre foot in FY 2013/14. This is a conservative comparison, since a premium cost would be put on obtaining water in a dry year. Even with these conservative assumptions, the project clearly has a strong cost/benefit ratio. To further flesh out the cost benefit ratio, SFPUC would compare this supply with the purchase of dry year raw water supplies or the next available dry year water supply, such as recycled water and/or desalination.

Timeline

SFPUC has already engaged a firm to design the project, has received proposals from construction contractors, and is pursuing an aggressive schedule to complete work in calendar year 2014. See further timeline details in Appendix A.

Budget and Match

A preliminary budget with key project elements and funding sources is included in Appendix B. SFPUC is committed to providing at least a 25% match that can be spent in advance of receiving grant reimbursement from DWR.

Alignment with BAIRWMP

The LCAER Project is not yet included in the 2013 Bay Area Integrated Regional Water Management Plan, since it was developed in early 2014. SFPUC will submit the project as a new submittal to the Plan. This project directly relates to the second goal of the Plan to improve water supply reliability and quality. Specifically, this project will provide adequate water supplies to meet demands, (goal 2.1,) and minimize vulnerability of infrastructure to catastrophes and security breaches, (goal 2.3).

Conclusion

The Lower Cherry Aqueduct Emergency Rehabilitation Project will provide immediate, cost-effective, regional drought relief for 2.6 million residents of the San Francisco Bay Area. The access to 200,000+ acre feet of high quality water in a dry year represents a unique opportunity. We appreciate consideration of this project for funding through the Bay Area Integrated Regional Water Management Plan.

Appendix A: LCAER Project Timeline

Anticipated NTP for Pre-Construction Services.....	April 7, 2014
Regulatory permits obtained.....	Late Spring, 2014
Anticipated NTP for Construction Services.....	June 2, 2014
Construction.....	June through October, 2014
Project Completion.....	October/November 2014

Appendix B: LCAER Project Budget

Project Element	Associated Cost
Project Design	\$1,150,000
Construction Costs	
Pipe Installation & Replacement	\$6,100,000
Tunnels	\$400,000
Connection to the Primary Water Supply System	\$1,400,000
Cherry Creek Diversion Dam	\$500,000
Forebay	\$50,000
General Site Work	\$400,000
Total Construction Costs	\$8,850,000
Project Subtotal	\$10,000,000
Soft Costs (Design, construction management support, etc. - 40% total)	\$4,000,000
Total Project Cost	\$14,000,000
SFPUC match	\$5,000,000
Proposed BAIRWMP Grant Request	\$9,000,000