National Decentralized Water Resources Capacity Development Project

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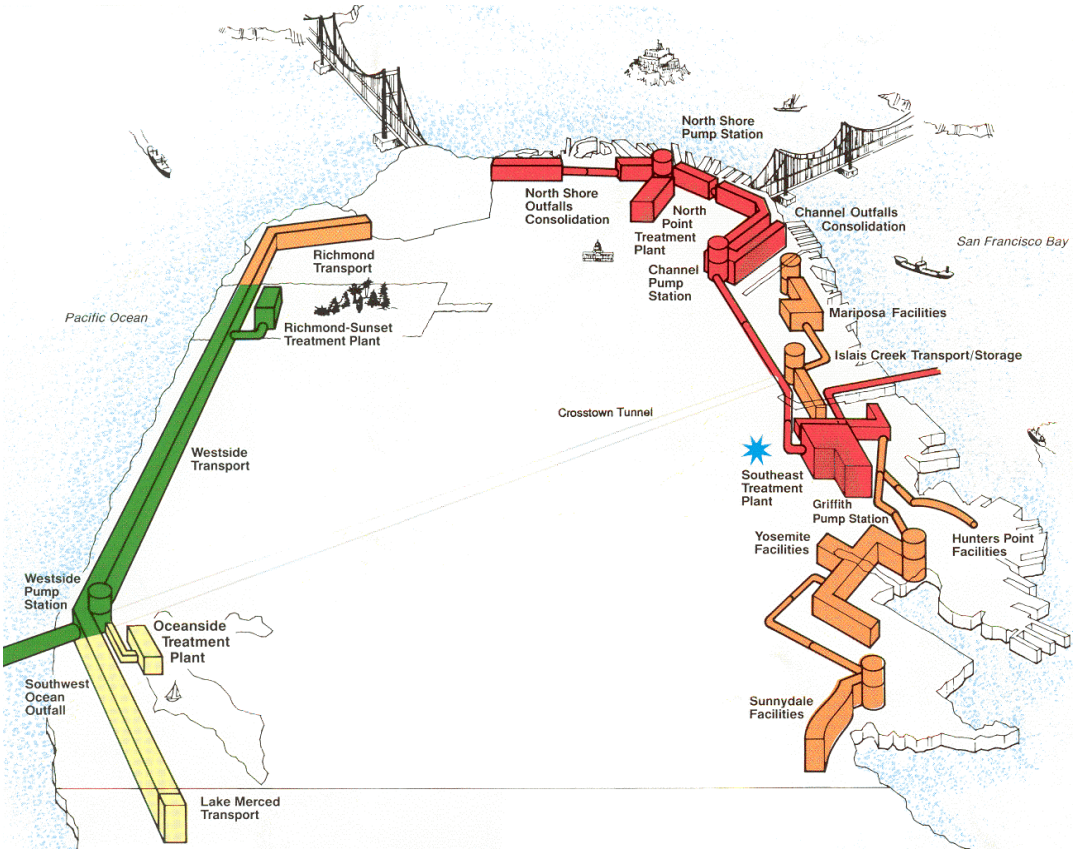
Executive Summary



Hunters Point Shipyard
Decentralized Wastewater Treatment Study

San Francisco Public Utilities Commission
San Francisco, California

October 2004

Hunters Point Shipyard Decentralized Wastewater Treatment Study San Francisco, California

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National Decentralized Water Resources Capacity Development Project (NDWRCDP) Research Project

Final Report, October 2004

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EXECUTIVE SUMMARY

Over the next 20 years, Hunters Point Shipyard (HPS) in San Francisco will be redeveloped according to the 1997 HPS Redevelopment Plan. This significant redevelopment project, which consists of approximately 500 acres of residential, commercial, light industrial, and open space areas, provides an opportunity for new and innovative wastewater and storm water treatment approaches.

Most of the City of San Francisco is served by a combined sewer system, where wastewater and storm water are collected in the same pipes and sent to two wastewater treatment plants for secondary treatment. The Southeast Water Pollution Control Plant (SEWPCP) serves the east side of the city and discharges to San Francisco Bay, and the Oceanside Water Pollution Control Plant (OSWPCP) serves the west side of the city and discharges to the Pacific Ocean.

The HPS Decentralized Wastewater Treatment Study explored a wide range of decentralized treatment alternatives for HPS, with possible benefits that include:

- **Combined Sewer Overflow (CSO) Volume Reduction**—When the flows collected during large storm events exceed the sewer system capacity, partially-treated discharges (typically composed of 6% sanitary sewage and 94% storm water) occur at one or more of the 36 CSO structures along the city shoreline.
- **Environmental Justice**—The SEWPCP treats approximately 80% of the wastewater generated in San Francisco, including most of the commercial (downtown) wastewater and the bulk of all industrial discharges. The Bayview Hunters Point community is impacted by this distribution of the city's treatment burden.
- **Use of Recycled Water**—The ongoing Recycled Water Master Plan has identified a preliminary city-wide recycled water demand of 10 million gallons per day (MGD). Benefits of using recycled water include water conservation and environmental enhancements (such as wetlands).

At the outset of the study, the following assumptions were made:

- Wastewater flow at HPS at full build-out will be 4 MGD (the primary developer has estimated a range of 2 to 5 MGD).
- Decentralized systems will be designed to treat all flow on site (that is, no flow from HPS will be treated at SEWPCP).
- No new outfall for discharge to San Francisco Bay will be created, requiring onsite reuse of all treated wastewater and/or the use of the existing SEWPCP outfall.

- To maximize reuse opportunities, treated effluent must meet the disinfected tertiary treatment level specified for recycled water (treatment level and water quality requirements specified in Title 22).
- Sanitary sewage and storm water collection systems will remain separated.

In addition to the above assumptions, other scenarios were investigated as the study unfolded. Along with the 4-MGD designs, designs based on a 2-MGD buildout scenario were analyzed. The study also assessed a scalping mode of operation, where treatment would match recycled water demands and excess wastewater and all solids would be returned to the sewer system for eventual treatment at SEWPCP.

The study initially screened a total of 24 decentralized wastewater technologies. The 24 technologies were divided into three general approaches. Within each approach, the most promising and representative technology was selected for further analysis. The general approaches and selected technologies are summarized as follows:

Approach	Selected Technology for Detailed Analysis
Advanced Treatment Satellite Plant	Membrane Bioreactor (MBR)
Natural Treatment System	Free Water Surface (FWS) Constructed Wetland
Small Onsite/Cluster Treatment Systems	Large Septic Tanks and Biotextile Filters

Among the three technologies analyzed in detail, the MBR was the most favorable for reuse applications, effluent quality reliability, ease of implementation, land requirements, capital and operation and maintenance (O&M) costs, O&M demands, and community impacts (public health, public safety, and odors).

The primary developer estimates that HPS dry-weather flows could range from 2 MGD to 5 MGD at full build-out (Lennar/CH2M Hill 2002). A recycled water market analysis, conducted as part of this study (see Appendix D, TM4-1, *Water Reuse Alternatives*), found that recycled water could be used to satisfy the following approximate demands at HPS:

- In-building dual plumbing: 0.40 MGD
- Landscape irrigation (60 acres): 0.14 MGD
- Wetland creation/enhancement (40 acres): 0.09 MGD

To avoid San Francisco Bay discharge issues and mosquito-related issues, the wetland would have to have “no discharge” without wetland ponding or wetland flows. Offsite recycled water demands were also assessed. The offsite demands within a 2.5-mile radius of HPS ranged from 1.4 MGD to 4.0 MGD (depending on future demands from Potrero Power Plant).

Two sites for a three-acre MBR facility were identified: 1. A site in the light industrial area of Parcel E; 2. A site near the existing sanitary pump station (Building 819A) of Parcel A.

The most effective mode of operation for a decentralized system was determined to be a scalping mode, which involves treating only wastewater flows equivalent to the water reuse demand and returning all solids to the combined sewer system. This scalping mode of operation eliminated the need for onsite solids handling/treatment that would significantly increase costs, operational demands, and odor generation potential. A scalping mode of operation also avoids the need for onsite discharge of effluent.

Under a scalping scenario, SEWPCP would treat all HPS wastewater in excess of the recycled water demand and all solids generated at HPS. The costs and expected footprints for MBR satellite plants at 0.5-MGD, 2-MGD, and 4-MGD capacities are summarized as follows.

Capacity of MBR Scalping Plant (MGD)	Capital Cost* ($ million)	Annual O&M Cost* ($ million)	Net Present Value Cost 30-year Life Cycle ($ million)	Land Requirement (acres)	Area Served with Recycled Water
0.5	7.1	0.4	14.3	0.5	HPS
2.0	26.0	1.4	53.0	1.5	HPS + offsite
4.0	37.2	2.2	83.9	3.0	HPS + offsite

*Capital cost includes engineering and construction costs for the treatment facility in 2003 dollars. Collection system, recycled water storage, and recycled water distribution are not included. Annual O&M costs are in 2003 dollars.

A 0.5-MGD facility would meet the reuse demands at HPS. The larger options (2 and 4 MGD) could be pursued if the plant was to provide offsite recycled water demands.

The technical and cost information developed in this study will be incorporated in two San Francisco Public Utilities Commission (SFPUC) city-wide master planning efforts: 1. The update of the 1996 Recycled Water Master Plan and 2. The 2004 Clean Water Master Plan. Final decisions on the implementation of a decentralized treatment approach will require:

- Broad system-wide perspective
- Long-term vision and strategy for the management of San Francisco's wastewater and storm water
- Comprehensive analysis of
  - System deficiencies
  - Community impacts
  - Public interests
  - Future needs

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