

North Bay Regional Water Recycling Feasibility Study EXECUTIVE SUMMARY DOCUMENT

The NBWA

Mission:

To facilitate partnerships across political boundaries to promote stewardship of North Bay watershed resources.



The North Bay Watershed Association (NBWA) was created to promote stewardship of the North Bay watershed by helping local and regional public agencies work cooperatively on water resources issues that impact areas beyond traditional boundaries.

The NBWA Member Agencies

- Central Marin Sanitation Agency
- County of Marin
- Las Gallinas Valley Sanitary District
- Marin County Sanitary District #5
- Marin County Stormwater Pollution Prevention Program
- Marin Municipal Water District
- Napa Sanitation District
- North Marin Water District
- Novato Sanitary District
- City of Petaluma
- City of San Rafael
- City of Sonoma
- Sonoma County
- Sonoma County Water Agency
- Sonoma Valley County Sanitary District

Agencies participate in the NBWA to discuss issues of common interest, explore ways to work collaboratively on water resources projects of regional concern, and share information about projects, regulations, and technical issues.

The San Pablo Bay watershed is part of the San Francisco-Bay Delta estuary. Although portions of the San Pablo Bay watershed are relatively pristine, the watershed also faces many water quality and water resources challenges. For example, San Pablo Bay and many of its tributaries have been listed as impaired for a variety of pollutants. Because of the impairment of these water bodies, the San Francisco Bay estuary has some of the

most stringent regulatory discharge standards in California.

As a result, discharge constraints prohibit sanitary districts from discharging wastewater into streams or the San Pablo Bay between May and October. These discharge limitations have been a driving force for many NBWA member agencies to consider recycled water projects as a way to eliminate pollutant loadings into the North Bay during the summer months.

Why Should Regional Recycling Be Evaluated?

Most agencies within the NBWA study area have evaluated local recycling options to help meet the prohibition on summer discharge to San Pablo Bay. However, the lack of

potential demand for recycled water and/or the high cost to serve identified users has limited the implementation of local water recycling projects. As a result, the NBWA believes that there is a need to examine the potential to recycle water on a regional basis. Looking ahead, future regulatory directions may prohibit discharges to San Pablo Bay not just during the summer months, but also on a year-round basis. Achieving a “zero discharge” goal would be difficult for the agencies acting alone. This study therefore asks the question:

If the North Bay agencies were to act together on a regional recycling project, would it be possible to go to zero discharge, i.e. to eliminate both summer and winter discharges to the Bay?

The North Bay Regional Water Recycling Feasibility Study is a preliminary analysis of the following issues:

- *What is the quantity and quality of water supply available for a regional project?*
- *What are the potential uses of recycled water in the North Bay region?*
- *What would a regional recycling project look like in terms of treatment, distribution, and storage?*
- *What are the costs and the potential benefits of a regional recycling program?*

The Study Area

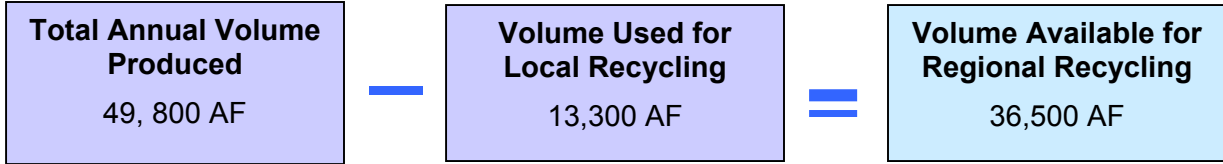


The North Bay Regional Water Recycling Feasibility Study examines potential regional recycling options in eastern Marin and southern Sonoma counties, the portions of Marin and Sonoma that drain to San Pablo Bay and northern San Francisco Bay. Eight sanitary districts operate wastewater treatment plants in the study area:

- Sausalito-Marín City Sanitary District (SMCSD)
- Marin County Sanitary District #5 (MCSD5)
- Sewerage Agency of Southern Marin (SASM)
- Central Marin Sanitation Agency (CMSA)
- Las Gallinas Valley Sanitary District (LGVSD)
- Novato Sanitary District (NSD)
- City of Petaluma (Petaluma)
- Sonoma Valley County Sanitation District (SVCSA).

Water Quantity and Quality

The volume of water available for a regional recycling project equals the total annual volume discharged by the eight agencies in the study area, less the water that is already used for local recycling during the summer. The total volume available is therefore:



Three of the agencies have high rates of infiltration of Bay water into their collection systems. The Bay water infiltration makes the recycled water from these three agencies so high in total dissolved solids (TDS) that it is problematic to use the water as an irrigation supply. For the high TDS water, additional treatment would be required to reduce the TDS to a concentration of no more than 1,000 mg/l.

The 36,500 acre-feet per year (AF/y) of water available for a regional recycling program can therefore be divided into two broad water quality categories.

Low TDS water = 18,300 AF/y
High TDS water = 18,200 AF/y

Market Assessment

There are three general uses for recycled water in the study area; local urban recycling, agricultural irrigation, and restoration of the Napa River salt marsh.



Local Recycling: Implementing feasible local recycled water projects is the first step towards a regional system. The North Bay has been a leader in developing innovative uses for recycled water including golf course and landscape irrigation, commercial laundries, air conditioning cooling towers, and car washes.

The North Bay already recycles approximately 12 million gallons per day (mgd) locally during the summer time to augment the potable water supply and to meet the prohibition on summer discharges to the Bay. The NBWA agencies have identified an additional 3 mgd of local recycling opportunities consisting primarily of golf course and landscape irrigation.

Agricultural Irrigation: The study area includes a large and dynamic agricultural sector consisting of dairies, general agricultural, pastures, and, increasingly, vineyards.

Serving the agricultural needs for water with recycled water was investigated as one of the primary components of regional recycled water program. The feasibility study analyzed the amount and types of agricultural land uses within the study and determined that the majority of the agricultural demands are located in the Sonoma Valley region. Since the uses were concentrated in the Sonoma Valley, the analysis of regional recycled water distribution options was focused on that area.

Within the Sonoma Valley, some of the land is so remote that it would not be feasible to construct a recycled water distribution system to serve it. Some of the land is currently non-irrigated pasture, although it is likely that if water were available some of the pasture would be converted to vineyards. With these factors in mind, a “serviceable demand” was calculated to determine a realistic estimate of the potential demand for recycled water for agricultural uses. This calculation showed that there is almost 35,000 AF/y of serviceable demand for recycled water within the Sonoma Valley.



The Sonoma Valley has about 35,000 AF/y of potential demand for agricultural uses of recycled water.

Napa-Sonoma Salt Marsh Restoration: The 8,000 acre Napa-Sonoma Marsh Wildlife Area is located along San Pablo Bay, between the Napa River and Sonoma Creek. The marshes were first diked for hay production and cattle grazing in the 1850’s.



Recycled water may provide a feasible source of dilution water for the bittern ponds of the Napa-Sonoma Salt Marsh.

In the 1950’s much of the land was converted to salt production by solar evaporation of bay water. Salt production has now ceased however the salt ponds, pasture and cropland remain diked to prevent tidal and fluvial inundation. As part of the salt production process, an estimated 2.5 billion gallons of residual liquid called “bittern”, containing extremely high concentration of seawater compounds, was pumped into three bittern ponds to be stored indefinitely.

In 1994, the State of California acquired all of the salt and bittern ponds in the North Bay and began a program, led by the California Department of Fish and Game, to restore the marsh for habitat and other benefits.

Restoring the ponds through levee breaching is not a feasible option because the bittern would be toxic if discharged into

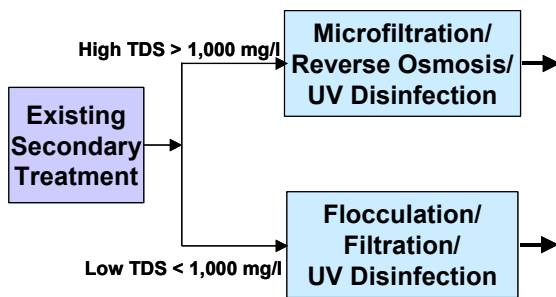
San Pablo Bay. One of the options being considered in the Napa Salt Marsh Restoration EIR/EIS for the bittern is to dilute it using recycled water. The demand for recycled water as dilution water is currently estimated at approximately 14 mgd or 15,700 AF/y. Because there is a great potential for recycled water use at the Napa-Sonoma salt ponds, providing recycled water to the ponds is one of the cornerstones for two of the regional recycling alternatives.

The Regional Alternatives

Four regional alternatives were developed to serve the identified markets. The alternatives were variations on the recycled water supply, i.e. with or without the high TDS flows, and the recycled water demands, i.e. with or without delivery to the salt ponds. In all cases, the first alternative would be expanded local recycling before delivery to a regional system. The four regional alternatives are summarized as follows:

Description	Recycled Water Source		Delivery to Salt Ponds		Flows		Total Annual Supply (AF/y)
	All Plants	Low TDS Plants	Yes	No	Peak (mgd)	Total Annual (AF/y)	
2 - All Flows, No Salt Ponds	X			X	91	36,500	36,500
3 - Low TDS, No Salt Ponds		X		X	56	18,300	18,300
4 - All Flows, With Salt Ponds	X		X		91	36,500	21,700
5 - Low TDS, With Salt Ponds		X	X		56	18,300	10,800

Each alternative has four components; treatment, transmission, storage, and distribution. The first component is tertiary treatment to ensure that the recycled water meets the California Department of Health standards for recycled water. For agencies with high TDS, additional treatment steps are required to lower the TDS below 1,000 mg/l.



Additional treatment ensures that the recycled water meets stringent state health standards for recycled water.

For agencies with high TDS, additional treatment steps are required to lower the TDS below 1,000 mg/l.

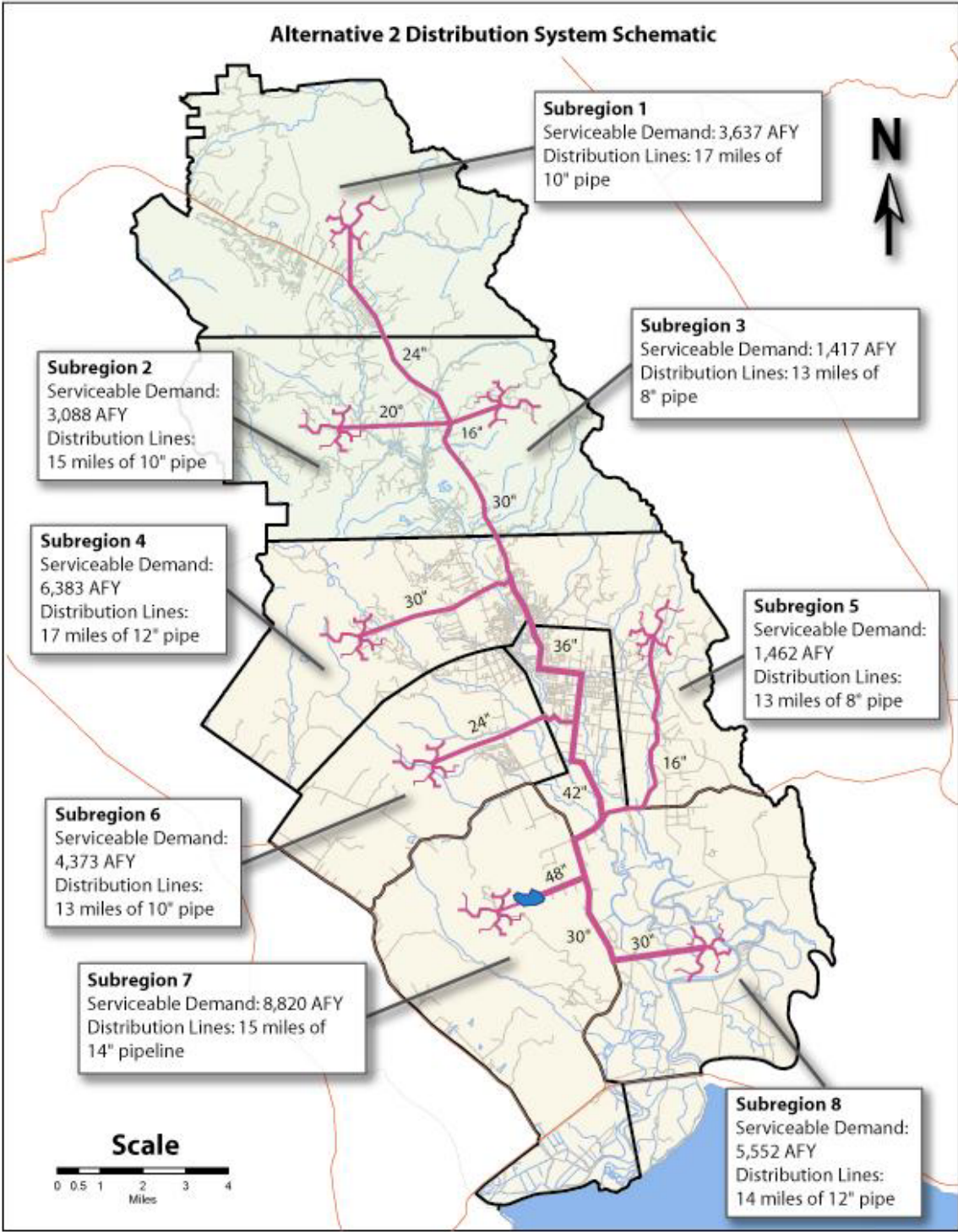
For the transmission component, the treated water is pumped through pipelines that are assumed to run along major roadways and highway corridors to a storage point near Sears Point Raceway in Sonoma.

The third component, storage, includes a reservoir that would store the water produced in the wintertime until it is used for dry weather irrigation.

The final component consists of a distribution system to convey the water

from the storage reservoir to the points of use for each alternative.

The figure on the following page is an example of one of the regional alternatives. In this case the figure illustrates the distribution system for Alternative 2, which would distribute all of the flow to agricultural uses within Sonoma Valley. Technical memorandum No. 2 provides the details of the regional alternatives and the market assessment.



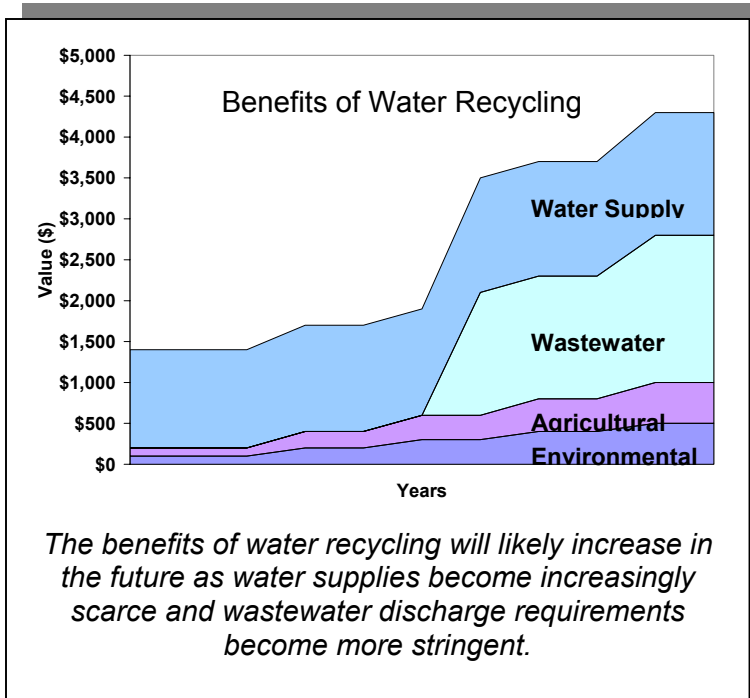
Recycled Water Costs

The capital cost to implement each alternative was estimated using information from recent Bay Area recycled water studies and construction bids. The capital costs included allowances for contingencies, engineering, legal, and administrative expenses. The annual operating and maintenance costs for each alternative were also estimated. The capital costs were annualized assuming a 30-year financing period and a 6 percent interest rate. The annualized capital costs and annual operating costs were added together and divided by the annual total volume delivered for each alternative to develop a cost per acre-foot. Details of the cost estimates are contained in Technical Memorandum No. 3 and are summarized below.

Alternative	Total Capital Cost (\$ million)	Annual O&M Costs (\$ million)	Annualized Cost (\$/AF)
2 – All flows, No Salt Ponds	1,184	58.2	3,952
3 – Low TDS Flows, No Salt Ponds	473	11.1	2,484
4 – All Flows, With Salt Ponds	1,051	57.0	6,654
5 – Low TDS Flows, With Salt Ponds	372	9.8	2,015

The Benefits of Recycling

Water recycling offers several benefits related to water supply, ecosystem enhancement, and reduced wastewater discharge to the Bay.



Water Supply Benefits:

Water recycling provides several advantages over other water supply options. It is drought-resistant and, by maximizing use of recycled water, water agencies can reduce the demands on their current high quality water supplies and limit the need for new supplies in the future. Using recycled water for irrigation could replace groundwater in those areas where it is used for agricultural supply. There also is a potential that the freed-up groundwater could be used to augment the potable supply. The estimated value of replacing

potable water is \$1,200 to 1,800/AF, based upon the current cost of potable water supplied by Marin and Sonoma County water agencies. The estimated value of replacing agricultural supply is \$200 to \$500/AF, based upon the current cost of water supplied to agricultural irrigation customers.

Ecosystem Enhancement Benefits: The public acquisition of the salt ponds system in the Napa marsh provides an opportunity to restore tidal salt marshes and related habitats on an unprecedented scale in the San Francisco Bay area. Recycled water is one of the few sources of water with adequate supply to meet the dilution volume needs for the bittern ponds and restore the salt ponds to valuable habitat. The estimated value of water for the marsh restoration is \$200 to \$800/AF, the approximate range of costs for other assumed potential sources of water for dilution of bittern.

Wastewater Discharge Benefits: One of the benefits of water recycling, particularly recycling for irrigation uses, is that it will improve the water quality of the Bay by diverting flows and mass discharges to the Bay. Implementation of the Total Maximum Daily Load (TMDL) program by the San Francisco Regional Water Quality Control Board could impose stricter new winter discharge requirements requiring construction of reverse osmosis facilities before discharge to the Bay. A zero discharge regional recycling program would eliminate the need for full reverse osmosis facilities for Bay discharges. The value of deferred reverse osmosis facilities for Bay discharge is estimated at about \$1,800/AF without brine disposal and \$2,800/AF with brine disposal, based upon cost estimating assumptions described in the cost estimating technical memorandum (TM#3).

Next Steps

The regional recycling feasibility study has completed a preliminary market assessment of recycled water demands, developed regional recycling alternatives, estimated the costs of implementation of the alternatives, and identified potential benefits of regional recycling. The feasibility study has also identified issues that warrant additional study in subsequent, more detailed, phases of evaluation of regional alternatives. The issues warranting further study include the following:

- Evaluation of expanded local recycling in the Kentfield and Novato areas of Marin County and the City of Sonoma in Sonoma County.
- Further evaluation of the need for RO treatment of recycled water and the associated costs of RO treatment and brine disposal.
- Evaluation of candidate sites for winter storage of recycled water.
- Feasibility of utilizing groundwater, freed up by the use of recycled water, as a source of potable water.
- Long-term options for discharge of wastewater (i.e the need for zero discharge).
- Assessment of the pending EIR/EIS for the Napa-Sonoma Salt Marsh Restoration Project and its assumptions for use of recycled water for dilution of bitterns.

As more information is developed on these topics, the estimated costs and benefits of the regional recycling alternatives should be modified to reflect this knowledge.

Report Format

The Executive Summary Document bound in this report provides a summary of the North Bay Regional Water Recycling Feasibility Study. The attached compact disc contains the detailed technical memorandums developed as part of this study. The following documents are included on the CD in Portable Document Format (.pdf):

- Executive Summary Document
- TM #1: Historical Studies and Data Collection
- TM #2: Market Assessment and Alternatives Development
- TM #3: Estimated Recycled Water Costs

For more information on the North Bay Watershed Association, please visit our website:
www.nbwatershed.org

