Evaluation of Supplemental Water Alternatives—

Technical Memorandum No. 1
Constraints Analysis

Nipomo Community Services District

President	Michael Winn
Vice President	Larry Vierheilig
Director	Cliff Trotter
Director	Ed Eby
Director	Jim Harrison
General Manager	Bruce Buel

Boyle Engineering Corporation

Project Manager	Mike Nunley, PE
Project Engineers	Malcolm McEwen, PE
	Cesar Romero, PE
	Rosalyn Piza, EIT

19996.32
June 2007

DRAFT

BOYLE 1194 Pacific Street, Suite #204 San Luis Obispo, CA 93401

Table of Contents

List of Tables

List of Figures

1.0 Introduction

The District is currently pursuing design and construction of transmission, storage, and pumping facilities to convey City of Santa Maria water to the District via the proposed Waterline Intertie Project. A 2005 Memorandum of Understanding between the two agencies defined conditions, on a preliminary basis, for transferring this water. The District's costs for that project will include purchase cost for the water from Santa Maria, cost for improvements within the Santa Maria system (if required), as well as capital and operations/maintenance costs for all required transmission, storage, and pumping facilities.

Boyle prepared a 2006 Preliminary Engineering Memorandum for the Nipomo Waterline Intertie Project that provided a preliminary analysis of hydraulic conditions within both the Nipomo and Santa Maria systems; disinfection alternatives; pipeline alignments; and storage/pumping options. Following this evaluation, the District moved to continue work after alternatives were explored. The Board directed staff to assess cost and feasibility for other supplemental water alternatives.

Two types of alternatives were evaluated: 1) those that import supplemental water from outside the NMMA; and 2) those that attempt to better manage the existing NMMA water resources.

Importation alternatives considered in this evaluation include the following:

- Santa Maria River Valley Groundwater – The City of Santa Maria may be willing to sell some of their entitlement to underflow water to the District. Facilities required to utilize this resource would include a wellfield, possibly treatment (based on regulatory review), pumping, storage, and a connection from the proposed wellfield to the District distribution system. It is assumed collector wells would be located along the River, near the end of Hutton Road, at the Bonita Well site, or possibly on other properties along the River.

  The Santa Maria groundwater basin is in adjudication; any activities that modify the hydrologic balance previously presented in testimony that becomes an element of the final stipulation may require Court approval.

- State Water or Exchange through State Water Pipeline – Unused capacity in the State Water Project (SWP) pipeline from one or more Central Coast Water Authority (CCWA) member agencies/project participants or exchange water could be provided via a turnout along the State Water Pipeline within the District boundary. Water would either be delivered directly to the District water system, or indirectly via aquifer storage and recovery.

- Desalinated Seawater or Brackish Water – Facility could be constructed at Nipomo Refinery (using cooling water as a source), another location owned by the District, or at the South San Luis Obispo County Sanitation District (SSLOCSD) Wastewater Treatment Facility.

- Brackish Agricultural Drainage – Either shallow ground water or surface runoff from agricultural lands into Oso Flaco Lake could be used as a water supply. In addition, a project to treat this water for District use could also be designed to improve the health of the Oso Flaco wetlands.

- Nacimiento Water Project – The District could participate in an extension of the Nacimiento Water Project from the City of San Luis Obispo to Nipomo, allowing the District to receive either raw or treated surface water.

Water resource management alternatives considered in this evaluation include the following:

- Groundwater Recharge with Recycled Wastewater Treated effluent from Southland Wastewater Treatment Facility (WWTF) could be applied to percolation ponds to better manage groundwater resources.
- Exchange Treated Wastewater for Direct Use Treated effluent from Southland WWTF could be used for irrigation of crops, parks, or golf courses, in order to reduce pumping by agricultural users near groundwater depressions.

2.0 Project Objective

This report represents Task 1 of the Evaluation of Supplemental Water Alternatives. The objective of the entire evaluation is to identify feasible alternative water supply options for the Nipomo Community Services District, and to recommend a strategy for implementing one or more of these alternative supplies. Tasks 2 and 3 will evaluate alternatives in greater detail.

Boyle reviewed existing sources of information to determine the permitting, legal, engineering, and hydrogeological constraints associated with utilizing each of the water source options listed above. This report includes a discussion of these issues (including identification of any "fatal flaws" associated with any particular option), a matrix to rank the feasibility of each alternative, and a recommended course of action.

The following constraints were addressed:

Physical

- Hydrogeology
- Supply
- Water quality
- Reliability

Institutional and Legal Constraints

- Required approvals from various stakeholders
- Water rights and the Santa Maria Groundwater adjudication litigation

Drinking Water and Wastewater Permitting

- California Department of Health Services
- Regional Water Quality Control Board

Implementation

- Required facilities
- Impacts to environmental resources and required resource agency permits
- Time required for implementation
- Conceptual cost comparison

For comparison to the cost opinions developed in the draft Waterline Intertie Project Technical Memorandum, the design flows for this study were 3,000 acre-feet per year (AFY) and 6,300 AFY.

3.0 Santa Maria Valley Groundwater

Introduction

The City of Santa Maria has rights to three "supplies" of groundwater within the Santa Maria River Basin, which could be available for sale or transfer to NCSD:

- Native Yield from the Santa Maria Valley Management Area (SMVMA) of the Santa Maria Groundwater Basin;
- Additional Yield from the SMVMA due to the implementation of the Twitchell Reservoir; and
- Return flows from State Water Project.

This section considers the constraints associated with acquiring water supplies from the City of Santa Maria and pumping the groundwater from a new well site adjacent to the Santa Maria River. Three possible locations are shown on Figure 3-1.

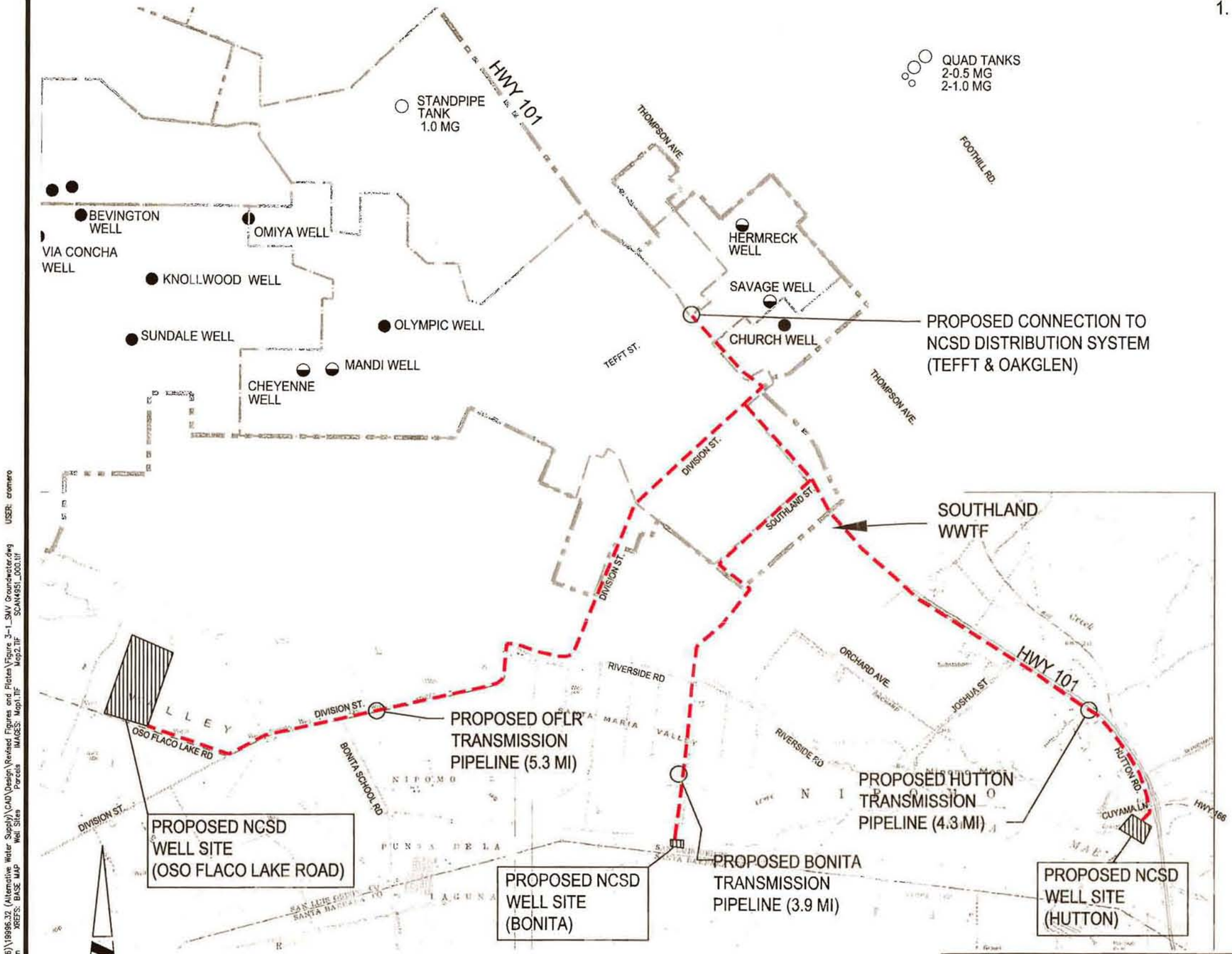
Previous Studies and Documents

The following list summarizes the studies and documents referenced for this evaluation:

- 2005 Urban Water Management Plan for City of Santa Maria, Public Review Draft (CH2MHill, February 2007)
- 2005 Santa Barbara County Groundwater Report (Santa Barbara County Public Works, Water Resources Department, March 2006)
- Water Resources of the Arroyo Grande - Nipomo Mesa Area (DWR Southern District, 2002)
- Stipulation of the Santa Maria Groundwater Litigation (June 30, 2005)
- Statement of Decision Regarding Trial Phase V of the Santa Maria Groundwater Litigation (Jan. 08, 2007)
- Nipomo Mesa Groundwater Resource Capacity Study (SS Papadopulos, March 2004)

NOTES:

1. DISTANCES LISTED REPRESENT ROUTE FROM EACH WELL SITE TO PROPOSED CONNECTION LOCATION. MASTER PLANNED PROJECTS TO IMPROVE TRANSMISSION CAPACITY ACROSS HWY-101 WILL BE CONSTRUCTED AND MAY REDUCE AMOUNT OF PIPELINE REQUIRED FOR THE CONNECTION.



LEGEND

- NIPOMO CSD WELLS
- NIPOMO CSD WELLS (STANDBY)
- NIPOMO CSD TANKS
- FUTURE WATER SYSTEM SERVICE AREA BOUNDARY
- EXISTING WATER SYSTEM SERVICE AREA BOUNDARY
- PROPOSED PIPELINE

BOYLE ENGINEERING CORPORATION

NIPOMO CSD EVALUATION OF SUPPLEMENTAL WATER ALTERNATIVES	BEC PROJECT NO.	FIGURE
SANTA MARIA VALLEY GROUNDWATER	19996.32	3-1

DWG: W:\Nipomo CSD (19996)\19996.32 (Alternative Water Supply)\CAD\Design\Revised Figures and Plates\Figure 3-1_SMV Groundwater.dwg USER: cromero
DATE: Jun 11, 2007 8:35cm XREFS: BASE MAP Well Sites Parcels IMAGES: Map1.TIF Map2.TIF SCAN4951_000.tif

Santa Maria Groundwater Basin

The Santa Maria Groundwater Basin (Basin) is composed of three management areas as described in the Santa Maria Groundwater Litigation proceedings. The three management areas are: (1) Northern Cities Management Area; (2) Nipomo Mesa Management Area (NMMA); and (3) Santa Maria Valley Management Area (SMVMA). The proposed well sites are all located within the Santa Maria Valley Management Area.

It is uncertain whether implementation of this alternative will provide a "new" supply to the NCSD, or if it will merely intercept the existing inflow of groundwater from the SMVMA to the NMMA (SAIC, pers. comm., 2007). The hydrogeologic interaction between NMMA and the SMVMA is currently not well defined. According to the 2005 Santa Barbara County Groundwater Report, these separate management areas appear to have limited interaction. However, the 2002 DWR study notes that groundwater flow from the SMVMA to the NMMA may occur and is dependent on groundwater elevation and hydraulic gradients. That report further estimated inflow to the NMMA from the SMVMA to be between 1,200 and 5,100 AFY in 1995. Current information regarding groundwater elevations and/or hydraulic gradients across the study area is needed to help assess the net effect to the NMMA water budget of pumping groundwater from the proposed well sites.

Of perhaps greater concern is the very real likelihood that extracting groundwater at the locations proposed would lower groundwater elevations, thereby reducing the hydraulic gradient between the SMVMA and the NMMA (SAIC, 2007). If such a reduction in gradient were to occur, the effect would be to reduce the quantity of groundwater flowing from SMVMA to NMMA, and by extension, could also reduce the movement of groundwater from NMMA to the Northern Cities Management Area. These changes in flow between aquifers would likely be prohibited under the pending adjudication.

These considerations, that pumping groundwater from near the Santa Maria River will result in no net gain to the District, *and* that significant institutional and legal obstacles would oppose such pumping, could be considered "fatal flaws" for this alternative.

Supply

Note that the Santa Maria Groundwater Adjudication has not come to final judgment. Therefore, the quantities of groundwater available to the City of Santa Maria summarized below should be considered preliminary estimates.

Local Groundwater Basin Water. The City of Santa Marias's UWMP identifies the city's current and projected groundwater supply at 12,795 AFY. This supply is based on appropriative rights to native yield from the Santa Maria Groundwater Basin as defined in the Stipulation. The Court's Statement of

Decision Regarding Phase 5 of the Trial indicates the City has established prescriptive rights to 5,100 AFY of basin water. Based on personal communication with Mr. Jim Markman (Special Counsel to NCSD) the safe yield based on prescriptive rights is approximately 500-700 AFY within the study area.

Twitchell Water. Twitchell Reservoir releases are controlled to maximize recharge of the groundwater basin through percolation along the Santa Maria River bed. The Santa Maria Groundwater Stipulation identifies the Twitchell Yield to be 32,000 AFY of "Developed Water," and allocates 14,300 AFY to the City of Santa Maria.

Return Flows from SWP. The June 30, 2005 Stipulation of the Santa Maria Groundwater Litigation defines "Return Flows" as "Groundwater derived from use and recharge within the Basin of water delivered through State Water Project facilities."

The City of Santa Maria's SWP Table A Amount is 16,200 AFY with an additional 1,620 AFY of drought buffer through its contract with CCWA. According to the Stipulation, the City of Santa Maria is entitled to recapture 65% of its SWP water used in the basin. The City's 2005 Draft UWMP[1] projects that its purchase of SWP water will remain steady at 13,706 AFY until the year 2030. Consequently, its "Return Flows" are also projected to remain steady at 8,909 AFY.

Thus, the City of Santa Maria has rights to return flows and local basin water equaling 9,409 to 9,609 AFY. Including Twitchell water raises the amount to between 23,709 and 23,909 AFY. Considering that the City plans to increase groundwater use to only 6,858 AFY in the year 2030, it appears sufficient water is available to meet NCSD needs.

The NCSD could acquire rights for up to 3,000 AFY of SWP return flows and prescriptive rights from the City. A place-of-use modification to the Twitchell Reservoir operating license (discussed later) could be used to secure up to 6,300 AFY of Twitchell water.

Quality

Only limited groundwater quality data is available within the study area along the Santa Maria River. Data from a Cuyama Lane Water Company well located just north of the proposed Hutton Well Site is summarized in Table 10-1. The single sample shows a specific conductance value of 530 umhos/cm, a value that would typically correspond with a TDS value of 340 ppm. (This is considered a relatively "soft" water.). It is also expected that nitrate will be an issue within the subject part of the Santa Maria Valley.

As indicated above, the City benefits from a portion of its discharged effluent in the form of SWP return flows recaptured from the commingled groundwater. As shown in Table 10-1, TDS measured in

[1] Table 3-1, Current and Planned Water Supplies for City of Santa Maria

purchased SWP water varies between 97 ppm and 358 ppm for the years 2005 and 2006. TDS from the City of Santa Maria's wells is higher, ranging from 650 ppm to 1300 ppm. TDS levels in the water from the proposed wells are expected to be somewhere between these levels, because the City is importing softer water to the groundwater basin.

Additional investigation of groundwater quality is recommended. The construction of test wells would greatly improve the knowledge of the groundwater quality in the areas in question at the depths to be considered.

Because the makeup of groundwater strata within the Santa Maria River is not well defined, predicting the depths to river underflow[2] and native groundwater as well as the required well depth to intercept both supplies is difficult without site specific field exploration. The average depth to groundwater is 281 feet, with a range of 16 feet to 1,220 feet (DWR, 2002.) It is anticipated that construction of a well that intercepts groundwater from the underlying aquifer will also likely benefit from deep percolation of Twitchell water along the Santa Maria River bed in addition to SWP return flows.

Groundwater extracted from the proposed well sites may be a "commingled" mix of Twitchell water, SWP return flows, and possibly native groundwater. Therefore water quality at the proposed well sites may be influenced by all supplies of groundwater within the Basin. Prior to utilizing groundwater pumped from the Santa Maria Valley, the NCSD will need to further investigate groundwater quality within the vicinity of the proposed well sites. Also, due to the proximity of the Bonita and Hutton well sites to the river, applicability of the Surface Water Treatment Rule (SWTR) at these sites will need to be confirmed as discussed under *Regulatory Constraints.*

It is anticipated the NCSD may need to disinfect and filter the water. Filtration of extracted groundwater would only be necessary if the water was deemed to be under the influence of surface water, or if there was chemical contamination that would require treatment (such as arsenic or exceedance of a secondary MCL). In addition, the District must ensure compliance with the drinking water standards for disinfection byproducts (DBPs) and ensure maintenance of a disinfectant residual.

Reliability

The City of Santa Maria's current water supply is derived, in part, from the groundwater supplies being considered in this analysis. The City of Santa Maria considers its water supply (including SWP water and associated return flows, Twitchell water, & native groundwater) to be 100 percent reliable through the year 2030. Reliability from SWP return flows is essentially the same as that of SWP water. See Section 4 for a discussion of SWP water reliability.

[2] Underflow is assumed to consist of Twitchell water and elements of SWP return flows

Obtaining Santa Maria Valley groundwater in any one year is reasonably reliable due to the large storage volume available, and because over long periods, annual rainfall totals are occasionally extremely high and therefore the likelihood of replacing groundwater pumpage in excess of the native yield is high (SAIC, 2007).

With regards to the reliability of the use of this groundwater by NCSD, it should be understood that the City's groundwater production has been significantly curtailed since receiving its first SWP water deliveries in 1997. Groundwater currently represents approximately 9% of its water supply, with a projected increase in the use of its groundwater to as much as 6,858 AFY in the year 2030.

Winter floodwaters captured annually at Twitchell Reservoir have been released into the Santa Maria River in all but three years since the implementation of the project in 1960. Therefore, Santa Maria River underflow provides a reasonable reliability to the annual supply for any one year (SAIC, 2007).

Required Facilities

Based on this constraints analysis, the following facilities will be required to provide supplemental groundwater from the proposed well sites:

- Collector well field (approximately 4 wells for 3,000 AFY, 8 wells for 6,300 AFY);
- Water treatment to filter and disinfect "surface" water (at the Bonita and Hutton sites only – possibly not required at Oso Flaco Lake Road site);
- Storage;
- Transmission pipeline from proposed well site to existing NCSD distribution system at Tefft
    - Hutton Site: 4.3 miles of pipe; or
    - Bonita Site: 3.9 miles of pipe; or
    - Oso Flaco Lake Road Site: 5.3 miles of pipe
- Interconnection to existing 16-inch NCSD pipeline at Tefft

A schematic map of the Project is shown in Figure 3-1.

Collector Well Field Options

Siting of the well field was considered at three sites: (1) Bonita and; (2) Hutton Road; (3) Oso Flaco Lake Road.

The Bonita Site is located on a 0.5-Acre site owned by NCSD in the Santa Maria Valley[3]. This site is immediately north of the San Luis Obispo/Santa Barbara County line near the northern Santa Maria

[3] NCSD owns an undeveloped well on this property (APN: 092-231-016).

River boundary. NCSD currently shares an easement with the adjacent SWP Coastal Branch pipeline to Riverside Road, however, it doesn't currently use this easement.

The Hutton Road Site is proposed to be located between the southernmost end of Hutton Road and the northern bank of the Santa Maria River. The Oso Flaco Lake Road Site is proposed to be located along Oso Flaco Lake Road just west of the intersection with Division Street. Neither of these sites is currently owned by NCSD.

Treatment System

The proximity of both the Bonita and Hutton Sites to the Santa Maria River requires consideration of the CDHS Surface Water Treatment Rule (SWTR). Based on a review of CDHS's Criteria for Evaluation of Ground Water Sources as discussed under *Regulatory Constraints,* it is assumed that complete treatment under the SWTR will be required at these well sites, but may not be required at the Oso Flaco Lake Road site.

Pipeline and Connection Location

The WIP Preliminary Engineering Memorandum (Boyle 2006) recommended the point of connection for supplemental water to be at Tefft and Oakglen. This same point of connection is recommended for this constraints analysis. In order to minimize lifecycle cost and pressure increases to NCSD's distribution system this connection point would require the installation of an 18-inch pipeline.

Implementation Schedule

It is estimated approximately 4 to 6 years will be required to fully implement this project as described below:

- Negotiations and agreements for transfer of water rights: 1 to 2 years
- Installation of test wells and evaluation water quality: 1 year (concurrent with negotiation)
- Project design: 1 to 2 years and
- Procurement of permits: 2 years[4] (Padre, 2007) (concurrent with negotiation and design)
- Project construction: 1 to 2 years

Constraints

Institutional:

Institutional constraints for the proposed project are identified as follows:

[4] Per Padre Associates Environmental and Permitting Constraints Analysis

- NCSD should consider the final Judgment in the Santa Maria Groundwater Litigation (pending) prior to pursuing this alternative.
- The City of Santa Maria must be willing to sell a portion of their groundwater pumping rights to NCSD. The District will need to initiate negotiations with the City of Santa Maria and the Santa Maria Valley Water Conservation District (SMVWCD), the agency which owns and operates Twitchell Reservoir.
- NCSD must acquire property for the proposed well sites. NCSD must also acquire necessary easements for transmission pipelines.
- Attempting to acquire transfer of Twitchell Yield from any of the Twitchell Participants may require NCSD to financially participate in sediment removal from the reservoir. The Reservoir's useful life is questionable because sediment is filling at a rate higher than initially expected.
- SMVWCD has expressed concerns regarding the District withdrawing water from the proposed wells. They consider that water part of their Twitchell Reservoir release and part of their groundwater recharge flow. SMVWCD's AB3030 Groundwater Management Plan prohibits export of water from the basin.

Legal:

Legal constraints are summarized as follows:

- Extracting groundwater at the locations proposed may lower groundwater elevations, thereby reducing the quantity of groundwater flowing from SMVMA to NMMA, and also reducing the movement of groundwater from NMMA to the Northern Cities Management Area. This change would likely be prohibited by the Basin Adjudication.
- The Phase V Statement of Decision confirms the ability of the SMVWCD to allocate Twitchell Reservoir Yield in the manner provided in the Stipulation. Therefore, NCSD will need to enter into agreements with both the SMVWCD and the City of Santa Maria to acquire a transfer of Twitchell Yield. Furthermore, a memorandum of agreement summarizing each transfer must be filed with the Court and provided to the Twitchell Management Authority in accordance with the Stipulation.
- NCSD will need to carefully structure the transfer of water rights at either of the three proposed well site properties in order to protect the water rights of the overlying users.
- NCSD should avoid a "term" in its agreement if it pursues return flows. Instead, the District should pursue an agreement with the City of Santa Maria that gives NCSD the right to pump return flows so long as the City takes State Water.
- The City of Santa Maria has the right to install a new well in the SMVMA, but any well that NCSD installs outside the NMMA will require adjudication. Any transfer of water from the SMVMA to the NMMA will required adjudication.

Regulatory:

- Twitchell Reservoir is operated under a State Water Resources Control Board license with restrictions on purpose (municipal / industrial) & place of use (within boundaries of Santa Maria Valley Water Conservation District). Use by NCSD may violate place of use restrictions without a permit amendment. Therefore, a place-of-use modification for Twitchell Reservoir will probably be required.
- The proximity of the Bonita and Hutton Sites to the Santa Maria River requires consideration of the CDHS Surface Water Treatment Rule (SWTR). Due to the proximity of both wells to the river, an evaluation is expected to show the source to be "Groundwater Under the Direct Influence" (GWUDI) of surface water, and that complete treatment under the SWTR may be required at both well sites. The Oso Flaco Road site is not expected to be categorized as a GWUDI source.
- Environmental review under CEQA must be initiated and completed for development of either of the well sites, and for the construction of the pipeline and storage facilities.
- Permits from the pertinent regulatory agencies must be secured prior to construction of any of the proposed facilities, including a discretionary development permit by the County of San Luis Obispo, permits from the USACE, RWQCB, and CDFG for any pipeline creek crossings, and a Caltrans encroachment permit for pipeline crossings at Highway 101, if crossed. NOAA Fisheries most likely will not be a key permitting agency under this alternative provided that surface water flows within the Santa Maria River are not affected.

Cost:

The estimated annual costs, including debt service on capital costs and O&M, ranged from $520/af (a 6,300 afy facility with minimal treatment at the Oso Flaco Road site) to $770/af (a 3,000 afy facility requiring coagulation and filtration at the Bonita site). Assuming a purchase price from Santa Maria of $1,250/af (the price for treated Santa Maria drinking water contained in the MOU for the Waterline Intertie Project), the total cost would be between $1,770/af and $2,020/af, plus costs for purchasing the Hutton or Oso Flaco Road site.

Capacity:

As noted above, withdrawing significant quantities of groundwater from a location near the boundary between the SMVMA and the NMMA is likely to affect the movement of water from the SMVMA into the NMMA. Institutional and legal considerations would likely prevent the District from implementing such a withdrawal.

It may be possible for the NCSD to acquire sufficient groundwater pumping rights to provide the full supplemental water needs of 3,000 and 6,300 AFY from other locations within the SMVMA.

4.0 CCWA, State, or "Other" Water

Introduction

The State Water Project (SWP) is a system of dams, reservoirs, power and pumping plants, canals, and aqueducts that conveys water from Lake Oroville to Southern California. The "Coastal Branch" of the SWP consists of water conveyance facilities built by the California Department of Water Resources (DWR) and regional distribution and treatment facilities constructed by the Central Coast Water Authority (CCWA).

Coastal Branch Phase I was completed in 1968. Phase II of the Coastal Branch was completed in 1997 and brings SWP water to San Luis Obispo and Santa Barbara Counties. Key facilities include the 43-MGD Polonio Pass Water Treatment Plant (PPWTP), approximately 143 miles of pipeline, and associated pumping plants and storage tanks. Individual components of the Coastal Branch were built by either the DWR or CCWA. However, CCWA is responsible for operating and maintaining the Polonio Pass Water Treatment Plant and all of the downstream Coastal Branch facilities.

The CCWA was established in 1991 and is presently composed of eight members, all of which are public agencies. Each vote on the CCWA Board of Directors is weighted in proportion to the entity's SWP Table A Amount contained in its original Water Service Agreement. (Although certain agencies subsequently amended their SWP Table A Amounts, their voting percentages remained unchanged.) (CCWA, 2007)

CCWA is a SWP contractor through Santa Barbara Flood Control and Water Conservation District (SBCFC & WCD). San Luis Obispo County Flood Control and Water Conservation District (SLOCFC & WCD) is also a SWP contractor. SWP contractors may request a maximum amount of water each year – the contractual "Table A" amount.

The SWP allocates deliveries in any year among its contractors based on "amounts" shown in Table A of the SWP contracts. However, full delivery of these "Table A Amounts" is not guaranteed. As noted in a DWR study of SWP delivery reliability:

> *Table A is used to define each contractor's portion of the available water supply that DWR will allocate and deliver to that contractor. The Table A amounts in any particular contract, accordingly, should not be read as a guarantee of that amount but rather as the tool in an allocation process that defines an individual contractor's "slice of the pie."* (DWR, 2006)

Therefore, for the remainder of this report we will use the term "Table A Amount" to indicate a numerical value that is used to allocate deliveries among SMP contractors.

During years when the SWP is unable to deliver all of its Table A Amounts, deliveries are cut back to a percentage of each contractor's Table A Amount. Many SWP contractors have established SWP Table A Amounts in excess of their planned deliveries to act as "drought buffers." For example, The City of

Santa Maria's SWP Table A Amount is 16,200 AFY, plus a 10% drought buffer. Therefore, in a year when the SWP restricts deliveries to 75% of Table A Amounts, the City would receive 82.5% (75% + 7.5%) of its 16,200 AFY.

During those years that availability of SWP water exceeds project participants' demand, project participants can store drought buffer water (and unused Table A Amounts) either directly into a groundwater basin or on an in-lieu basis (i.e., by taking delivery of the drought buffer and reducing groundwater pumping by an equal amount). During dry years when availability of SWP water is less than CCWA project participants' demand, stored drought buffer water (and stored Table A Amount water) can be used to augment SWP deliveries. (CCWA, 2007)

The State "Turnback Pool," is an internal SWP mechanism that pools unused SWP supplies early in the year for purchase by other SWP contractors at a set price. The turnback pool mechanism is only for one-year sales of water. (CCWA, 2007)

Each Santa Barbara County participant in the CCWA project is a water purveyor or user located in Santa Barbara County. Their SWP Table A Amounts are listed below.

Agency	SWP Table A Amount (AFY)
City of Buellton	578
Carpinteria Valley Water District	2,000
Goleta Water District	4,500
City of Guadalupe	550
La Cumbre Mutual Water Company	1,000
Montecito Water District	3,000
Morehart Land Company	200
City of Santa Barbara	3,000
Santa Barbara Research Center	50
City of Santa Maria	16,200
Santa Ynez RWCD, ID#1	2,000
Golden State (formerly "Southern California") Water Company	500
Vandenberg Air Force Base	5,500
SUBTOTAL	39,078
CCWA 10% Drought Buffer	3,908
SUBTOTAL	42,986
Goleta Water District additional Drought Buffer	2,500
TOTAL Contractual SWP Table A Amount	45,486

Each San Luis Obispo County water purchaser is a water purveyor or user located in San Luis Obispo County which obtained contractual rights from SLO County to receive water from the SWP. Their SWP Table A Amounts are listed below.

Agency	SWP Table A Amount (AFY)
Avila Beach Community Services District	100
Avila Valley Mutual Water Company, Inc.	20
California Men's Colony (State)	400
County of San Luis Obispo C.S.A. No. 16-1 - Shandon	100
County of San Luis Obispo Operations Center and Regional Park	425
City of Morro Bay	1,313
Oceano Community Services District	750
City of Pismo Beach	1,240
San Luis Coastal Unified School District	7
San Miguelito Mutual Water Company	275
San Luis Obispo County Community College District (Cuesta College)	200
SUBTOTAL	4,830
SLO County Drought Buffer	2,640
Annual Turn Back Sales	17,530
TOTAL Contractual SWP Table A Amount	25,000

The Coastal Branch aqueduct and Polonio Pass Water Treatment Plant were designed to deliver and treat the SWP Table A Amounts listed above, disregarding the drought buffers, Goleta's excess SWP Table A Amount, and SLO County's annual turn back sales. Design capacity = 39,078 + 4,830 = 43,908 AFY.

Previous Studies and Documents

The following list summarizes the studies and documents referenced for this evaluation:

- Pipeline System Modeling: Tank 1 to Santa Ynez Pump Facility - Definition of Available Extra Capacity (Penfield & Smith, June 2005)
- 2005 Santa Barbara County Groundwater Report (Santa Barbara County Public Works, March 2006)
- The State Water Project Delivery Reliability Report 2005 Final (Department of Water Resources, April 2006)
- 2005 Urban Water Management Plan for Central Coast Water Authority, Draft (CCWA, October 2005)

- CCWA meeting minutes, agendas, and other information available on CCWA website: http://www.ccwa.com/
- Final Urban Water Management Plan for Goleta Water District (URS/GWD, December 2005)
- 2005 Urban Water Management Plan for City of Santa Maria, Public Review Draft (CH2MHill, February 2007)
- Contract Between the State of California Department of Water Resources and SBCFC & WCD for a Water Supply (1963)
- Contract Between the State of California Department of Water Resources and SLOCFC & WCD for a Water Supply (1963)
- American States Water Company and Golden State Water Company Securities and Exchange Commission Form 10-K (Fiscal Year Ending December 31, 2006)

Acquisition Scenarios

This section considers constraints associated with obtaining supplemental water from the Coastal Branch of the SWP by way of the following scenarios:

(1) Acquiring unused or excess SWP Table A Amount:

   a. SLOCFC&WCD unused SWP Table A Amount (i.e., the drought buffer or the turn back pool)

   b. SBCFC & WCD suspended SWP Table A Amount

(2) Acquiring State water indirectly through purchase from CCWA project participants including:

   a. Goleta Water District (GWD)

   b. City of Santa Maria

(3) Directly participating in the SWP/CCWA:

   a. Purchasing SWP water as a CCWA Project Participant (outside of Santa Barbara County)

   b. Purchasing SWP water as a San Luis Obispo County Water Purchaser

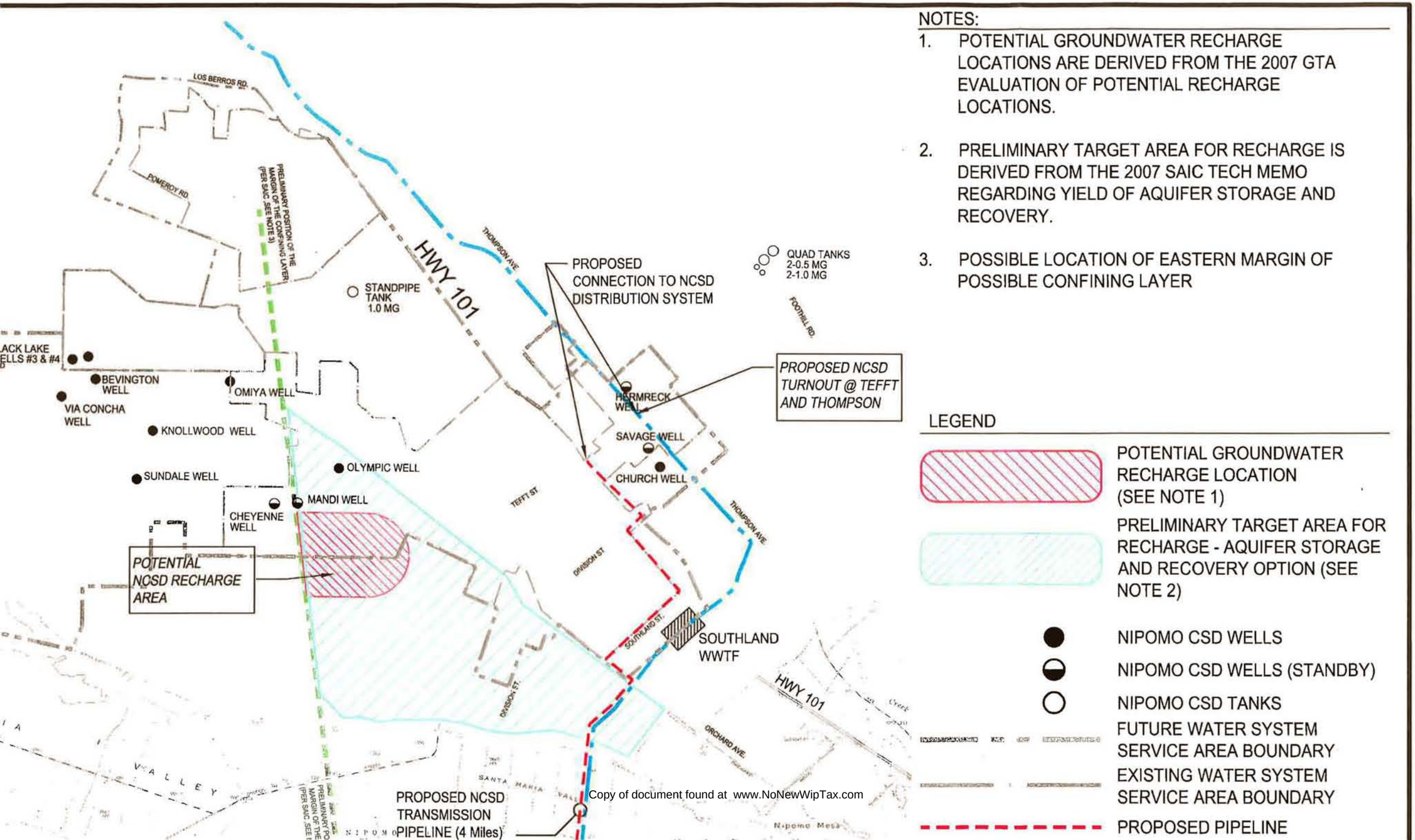
(4) Acquiring "other" water through CCWA project participants including:

   a. Purchase Golden State Water Company (GSWC) Natomas CVP entitlement in exchange for SWP water

   b. Purchase City of Santa Maria water per MOU in exchange for SWP water

Water could be provided to the NCSD via a turnout along the Coastal Branch within the District's boundary. Water would then either be delivered directly to the District water system, or indirectly via aquifer storage and recovery (ASR). A schematic map of the proposed project is shown in Figure 4-1.

This constraints analysis does not consider the use of SWP "Article 21" water. Article 21 water is made available by the SWP during times that abundant water and conveyance capacity is available, typically between January and March of most years. However, use of this water is restricted to the service area of the contractor taking delivery, with one exception: *"Article 21 water may be delivered outside the service area of a participating contractor for storage so long as it is later returned for use in the service area."* (DWR, 2006) Therefore, while Article 21 water may be available, eventually it would need to be returned, and therefore is not considered a true source of supplemental water.



NOTES:

1. POTENTIAL GROUNDWATER RECHARGE LOCATIONS ARE DERIVED FROM THE 2007 GTA EVALUATION OF POTENTIAL RECHARGE LOCATIONS.
2. PRELIMINARY TARGET AREA FOR RECHARGE IS DERIVED FROM THE 2007 SAIC TECH MEMO REGARDING YIELD OF AQUIFER STORAGE AND RECOVERY.
3. POSSIBLE LOCATION OF EASTERN MARGIN OF POSSIBLE CONFINING LAYER

LEGEND

- POTENTIAL GROUNDWATER RECHARGE LOCATION (SEE NOTE 1)
- PRELIMINARY TARGET AREA FOR RECHARGE - AQUIFER STORAGE AND RECOVERY OPTION (SEE NOTE 2)
- NIPOMO CSD WELLS
- NIPOMO CSD WELLS (STANDBY)
- NIPOMO CSD TANKS
- FUTURE WATER SYSTEM SERVICE AREA BOUNDARY
- EXISTING WATER SYSTEM SERVICE AREA BOUNDARY
- PROPOSED PIPELINE

Supply

This section addresses the constraints associated with the SWP providing either 3,000 acre-feet per year (AFY) or 6,300 AFY under the scenarios listed above. Later sections address constraints associated with delivery and reliability of this supply, as well as institutional, legal, and cost issues.

Scenario 1: Acquiring Unused or Excess SWP Table A Amount

Sufficient supply exists in the form of drought buffer or excess SWP Table A Amount, as shown below:

CCWA 10% Drought Buffer	3,908 AFY
Goleta Water District additional Drought Buffer	2,500
SLO County Drought Buffer	2,640
Annual SLO County Turn Back Sales	17,530
TOTAL Unused or Excess SWP Table A Amount	26,578 AFY

Scenario 2: Purchase Water from CCWA project participants

Clearly, sufficient supply (in the form of existing SWP Table A Amounts) exists to meet the needs noted above. In most cases, a purchase arrangement would need to be made with two or more CCWA participants to provide 3,000 AFY. To provide 6,300 AFY, an arrangement with two or more participants would very likely be required, unless the entire amount can be provided by the City of Santa Maria.

Scenario 3: Direct Participation in the SWP/CCWA

Acquiring a combination of CCWA's 10% drought buffer and GWD's additional drought buffer SWP Table A Amount could provide either 3,000 AFY or 6,300 AFY. Under this scenario the NCSD would become a SWP/CCWA participant through CCWA.

Acquiring a portion of SLO County's annual turn back sales could provide these same amounts. Under this scenario the NCSD would become a SWP/CCWA participant through SLOCFC&WCD.

Scenario 4: Acquiring "Other" Water through CCWA Project Participants

ASWC/GSWC Natomas Entitlement to Central Valley Project Water:

The federally funded and managed "Central Valley Project" may also provide a supply of supplemental water through one of the existing SWP/CCWA participants, under two options described below.

The Golden State Water Company (GSWC) provides water service to Orcutt, Sisquoc, Lake Marie, and Tanglewood areas. American States Water Company (ASWC) is the parent company for GSWC and American States Utility Services (ASUS). ASWC , through its ASUS subsidiary, recently purchased permanent Sacramento River water diversion rights from the Natomas Central Mutual Water Company (Natomas), allowing ASWC to divert up to 5,000 acre-feet of Central Valley Project (CVP) water per year. (ASWC, 2007) Therefore, it may be possible to purchase this 5,000 AFY CVP entitlement from GSWC.

GSWC has also entered into a water transfer agreement with Natomas under which Natomas will supply GSWC with up to 30,000 AFY of water to be used exclusively by GSWC to serve a proposed new service area in Sutter County, California. (ASWC, 2007) In order to provide retail water service to this portion of Sutter County, GSWC has filed for a Certificate of Public Convenience and Necessity with the California Public Utilities Commission (CPUC). Review of this application has been deferred by the CPUC pending completion of an environmental assessment. It may be possible to purchase a portion of this water, and exchange it for some or all of the GSWA CVP entitlement.

City of Santa Maria Water:

The water supply for the City of Santa Maria is 49,710 AFY (CH2MHill, 2007). This supply includes: 13,706 AFY of purchased SWP water; 12,795 AFY of groundwater; 14,300 AFY of Twitchell yield/commingled groundwater; and 8,909 AFY of SWP return flows (i.e., water used for irrigation or other purposes which "returns" via deep percolation to the aquifer.) This supply is greater than projected demands. The city's total projected water demand is estimated at 24,780 AFY in the year 2030, including the 3,000 AFY sold to NCSD and sales to other agencies. Therefore, adequate supply exists for the District to purchase "other" Santa Maria water in exchange for SWP water.

Unused and Excess Capacity for Treatment and Conveyance

Implementation of any of these scenarios requires that the SWP/CCWA treatment and conveyance facilities have sufficient capacity to accommodate proposed deliveries to the NCSD. System capacity will not be an issue under Scenario 2 if the SWP Table A Amount or entitlement is purchased from CCWA participants downstream of NCSD and the delivered volume is equal to the water purveyor's historically delivered SWP Table A Amount. However, system capacity will be an issue if NCSD requests delivery of a drought buffer Table A Amount, an unused Table A Amount, or some other water source, as is the case for the three other scenarios being considered.

The existing treatment and conveyance facilities were designed, constructed, and (in the case of the treatment plant) rated at a contracted capacity equal to the SWP Table A Amounts listed above (neglecting drought buffers, suspended amounts, and undeliverable capacity). Each portion of the system was designed with a small amount of unused capacity. Subsequent experience has shown that

the system is working more efficiently than designed, thereby providing some excess capacity beyond design requirements.

The following table summarizes the contracted, unused, and excess capacity in the existing CCWA treatment and conveyance facilities.

***Table 4-1* Capacities of the CCWA Treatment and Conveyance Facilities**

Facility	Polonio Pass Water Treatment Plant	Pipeline above Lopez Dam	Pipeline from Lopez Dam to Santa Maria
Contracted Capacity	43,908 AFY	43,908 AFY	39,078 AFY
Unused Capacity	0 AFY (a)	3,908 AFY (b)	3,908 AFY (b)
Excess Capacity	5,000 AFY (d)	5,600 to 9,100 AFY (c)	up to 5,600 AFY (c)

(a) CCWA web site shows WWTP design capacity of 43 MGD, giving 44,000 AF in 11 months, a value within the rounding error of contracted capacity.
(b) Penfield & Smith (2005) analysis using design assumptions.
(c) Penfield & Smith (2005) analysis using calibrated model. Pipeline capacities above and below Lopez turnout depend on volume released at Lopez.
(d) "CCWA has determined that the treatment capacity at the Polonio Pass Treatment plant is approximately 5,000 AFY greater than its current permitted rating." City of Santa Maria, Urban Water Management Plan (2007) page 3-13.

Quality

The SWP Coastal Branch conveys surface water which is treated to DHS drinking water standards at the Polonio Pass Water Treatment Plant using advanced coagulation, activated carbon filters, chlorine, and chloramines. Algae; taste and odor; and disinfection byproduct formation are potential water quality issues that may affect SWP participants (CCWA, 2005).

Because NCSD currently disinfects its groundwater with free chlorine and the SWP supplemental water uses chloramines, provisions must be made to either convert the SWP water over to free chlorine residual, or convert NCSD groundwater over to chloramine residual (Boyle 2006).

Reliability

State Water Project

The reliability of State Water Project (SWP) supplemental water will depend on the quantity of water obtained from the SWP (or the CVP), and on the amount of conveyance and treatment capacity obtained from the CCWA.

Being dependent on Northern California hydrological conditions, the SWP is not always able to provide the entire Table "A" amount to all its contractors. In such cases, deliveries are allocated to each contractor based on their Table "A" amount. The probability of receiving SWP deliveries has been estimated in the year 2025, and is summarized in the following figure.

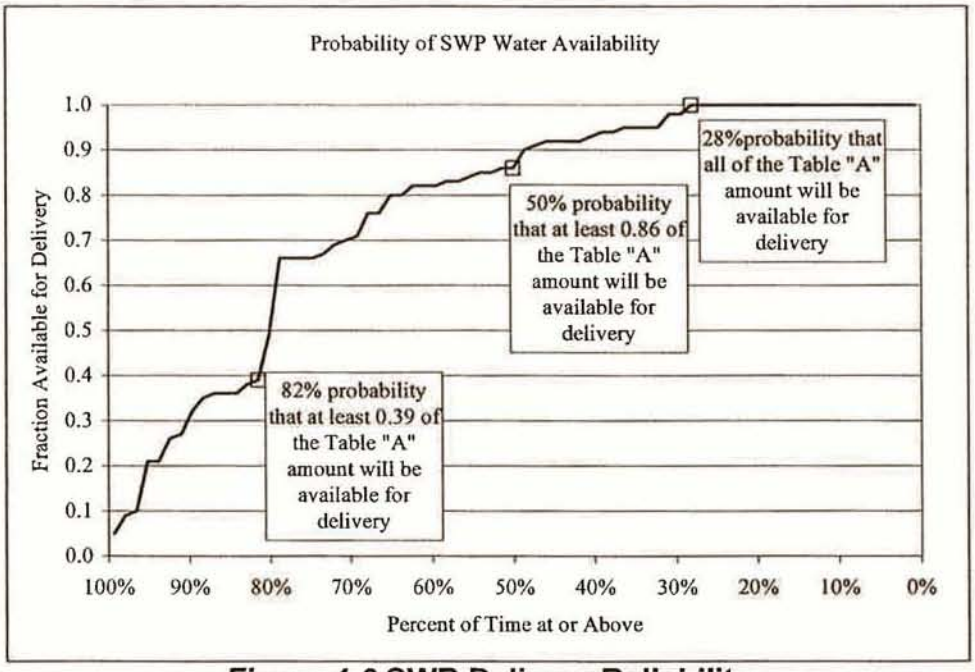


***Figure 4-2* SWP Delivery Reliability**

Source: The State Water Project Delivery Reliability Report 2005, April 2006.

Predicted SWP water deliveries to San Luis Obispo County participants and CCWA participants in Santa Barbara County are dependent on the reliability of the SWP supply and the available CCWA conveyance and treatment capacity (SAIC, 2007), as summarized below.

***Table 4-2* Predicted SWP/CCWA Water Deliveries**

	San Luis Obispo County		Santa Barbara County	
Year Type	Available from SWP (1)	Delivered	Available from SWP	Delivered
"Wet" Year	24,000 AFY	4,830 AFY (2)	43,500 AFY	39,078 AFY (2)
50% Probability	21,000	4,830	38,000	38,000
Long Term Average	19,000	4,830	34,500	34,500
"Dry" Year	16,500	4,830	29,500	29,500

(1) based on full 25,000 AFY Table A Amount held by San Luis Obispo County.
(2) Limited by pipeline and treatment design capacity, although unused and excess capacity may be available, as discussed above.

It is evident that the reliability of any supplemental SWP water will depend on its SWP Table A Amount (including drought buffer), and on the contracted portion of the treatment and conveyance capacity within the CCWA.

Central Valley Project

The reliability of water obtained from the Central Valley project via the Natomas Central Mutual Water Company is assumed to be similar to the reliability of CVP water as a whole. The reliability of CVP deliveries is similar to the SWP, as shown below.

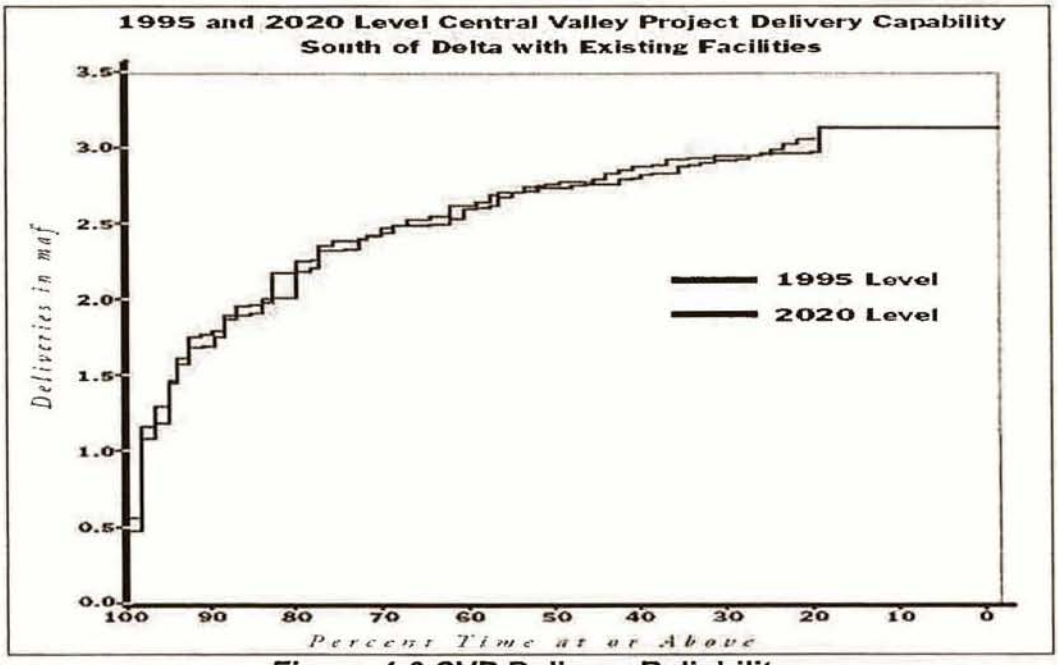


***Figure 4-3* CVP Delivery Reliability**
Source: California Water Plan, Bulletin 160-98,

It has been estimated that in 2020 during "drought" years (defined as the 1990-91 water years, an event with a recurrence interval of about 20 years, or a 5 percent probability of occurring in any given year) the CVP as a whole will be able to deliver 70% of its historical "average" deliveries (DWR, 1998).

Required Facilities

Two physical options to provide supplemental SWP water within the Nipomo CSD study area were considered in this Constraints Analysis. They are as follows:

- Connect the District water system directly to the SWP Coastal Branch; and
- Provide facilities for aquifer storage and recovery (ASR) of SWP water

For the direct connection option, it is anticipated the supplemental water transmission system may originate from a proposed CCWA turnout near the intersection of Tefft Street and Thompson Road or the Bonita Well Site as shown on Figure 4-1. Depending on the final turnout location and disinfection alternative pursued, water treatment, conveyance, and interconnection facilities will also be required for this option.

Implementation of the ASR option will also require a turnout as identified above. Additionally, percolation and/or injection sites in addition to pumping facilities will also be required. It may be possible to incorporate percolation functions into existing or planned facilities, such as over-irrigation of landscaped areas or seasonal percolation through stormwater detention basins. The feasibility of direct injection would have to be evaluated with test facilities. The main concern would be clogging of the aquifer, thus reducing the aquifer transmissivity, over time due to the high nutrient loading from the excess nitrogen present due to the ammonia content in the chloramines in treated CCWA water. (A more detailed description of this option will be provided in Tech Memorandum No. 2.)

Project Components for Direct Connection:

The following facilities will be required for a direct connection to the SWP Coastal Branch Pipeline:

- Turnout facility (including all required appurtenances) from existing 42-inch SWP pipeline at either Tefft and Thompson or at Bonita Well Site;
- Pipeline extension from turnout to existing NCSD distribution system as follows:
  - Turnout at Tefft and Thompson: 0.5 miles of pipe; or
  - Turnout at Bonita Well site: 4.2 miles of pipe
- Water treatment/disinfection facilities as follows:
  - Facilities upstream of interconnection to NCSD system to convert SWP water to free chlorine residual; or

- Facilities at each well to convert NCSD wells to chloramine residual
- Interconnection to existing NCSD distribution system

Project Components for ASR:

The following facilities will be required for using supplemental SWP water in an aquifer storage and recovery program:

- Turnout facility (including all required appurtenances) from existing 42-inch SWP pipeline at either Tefft and Thompson or at Bonita Well Site;
- Pipeline extension from turnout to proposed spreading pond facilities or injection facilities;
- Water treatment facilities (if required) upstream of direct injection facilities;
- Spreading ponds (dimensions and preferred location(s) will be conceptually reviewed in Technical Memorandum No. 2);
  [Assuming a 6 inch per day percolation rate, and adequate time for pond rotation for drying and maintenance, approximately 50 acres of pond would be sufficient to percolate 6,300 AFY (SAIC, 2007). Likewise, 24 acres of pond would be required to infiltrate 3,000 AFY.]
- Recovery well field and/or upgrades to existing wells (expected recovery rates will be conceptually reviewed in TM No. 2); and
- Pipeline extension from recovery well field to interconnection with existing NCSD distribution system (if required)

Implementation Schedule

Assuming the NCSD moves aggressively to obtain agreements with other agencies, it is estimated approximately 4 to 6 years will be required to fully implement this project. This estimate is based on the following:

• Obtain tentative agreement from providing agency and from CCWA	0.5 to 1.5 years
• Hold special election to obtain agreement of NCSD rate payers	1.0 to 0.5 years
• Site specific investigation of feasibility of percolation or direct injection	0.5 to 1.0 years
• Design, Permitting, and Environmental Review	1.0 to 1.5 years
• Construction and Start Up	1.0 to 1.5 years

Constraints

This section presents an analysis of constraints to obtaining supplemental water from the SWP (or other sources) through the Coastal Branch aqueduct under the following scenarios:

- Acquire unused or excess SWP Table A Amounts from CCWA or SLOCFC&WCD;
- Acquire State Water indirectly through purchase from CCWA project participants (Goleta Water District or City of Santa Maria);
- Directly participating in the SWP/CCWA as either a project participant contracted through CCWA or a water purchaser contracted through SLOCFC&WCD; or
- Acquire "other" water through CCWA project participants (GSWC/Natomas or City of Santa Maria)

Institutional

Any transfer of permanent entitlement from one state water contractor to another requires more than CCWA approval. A transfer would also require SLO County Board of Supervisors, Santa Barbara County Board of Supervisors, and DWR approvals. Therefore, the opinions of many people and the policy deliberations of many elected officials will need to be addressed. NCSD's desire to not pay past costs may be in conflict with State Water contracts, depending on the specifics. (Ogren, pers. comm.)

There exists competing interest among existing project participants with regards to available unused/excess capacity in SWP/CCWA facilities as well as unused Table A allotments.

- CCWA is interested in acquiring SLOCFC & WCD's unused SWP Table A Amount as additional drought buffer to improve water delivery reliability.
- SLOCFC & WCD has developed a proposed policy regarding transfer/sale of its SWP Excess Entitlement. Policies that may hinder NCSD's bid for some of this water include:
    - Existing local Project Participants have first right to utilize excess entitlement for reliability purposes. NCSD is not currently a contracted Project Participant.
    - Interested agencies may be required to "buy into" the District's past costs.
- Both CCWA and the City of Santa Maria are interested in SBCFC&WCD's suspended Table A allotment of 12,214 AFY. It is understood CCWA is actively pursuing a possible repurchase of this allotment for reliability purposes.
- California Department of Water Resources owns the Coastal Branch Pipeline from Tank No. 1 to Tank No. 5 on Vandenberg AFB, however, CCWA is responsible for operating and maintaining it. Furthermore, CCWA owns and operates the Polonio Pass Water Treatment Plant at the State's Tank No. 1 site as well as the 42-mile pipeline extension from Vandenberg AFB to Lake Cachuma. Therefore, it is possible that CCWA could block any agreement between NCSD and

existing project participants for SWP or "other" water. This includes the proposed purchase of Natomas entitlement from GSWC.

Reliability

The long-term rate of delivery for any SWP Table A Amount is approximately 76 %. Reliability for CVP water is similar. Therefore, additional SWP Table A Amounts for "drought buffer" would be required to improve the reliability of this proposed supply.

Conveyance and Treatment Capacity

The City of Santa Maria, among others, is interested in acquiring tentative additional treatment capacity at Polonio Pass WTP. This is contingent on CCWA's successful re-rating of the plant's filters.

- The City of Santa Maria is also interested in acquiring the additional 5,000 AFY available for delivery at the City's turnout as identified in the 2005 P&S Capacity Study and the City's UWMP. This is the additional capacity that could be available for existing project participants and/or Nipomo CSD as discussed in the analysis.
- GSWC's entitlement to 30,000 AFY of Natomas water is intended to serve a proposed new service area in Sutter County. GSWC has filed for a Certificate of Public Convenience and Necessity with the California Public Utilities Commission (CPUC) in order to provide retail water service to this area. It is understood that Rob Saperstein of Hatch & Parent (attorney for GSWC) is currently conducting an analysis that may address both the institutional and legal feasibility for procuring this water. Furthermore, delivery of any portion of this water through the SWP pipeline to NCSD will be restricted by limitations in available pipeline capacity and the City of Santa Maria's mutual interest in acquiring the same as discussed above.
- The City of Santa Maria is opposed to providing NCSD exchange water through a connection to the SWP pipeline within District boundaries. This is their "higher quality" surface water used for blending with pumped groundwater.
- Goleta Water District's additional 2,500 AFY of SWP allotment might be available on a "short term" basis when the District's projected or actual supplies exceed its demand and ability to inject groundwater. However, delivery of any portion of this water is also constrained by limitations in available pipeline capacity and the competing interest for the same as discussed above. NCSD must decide if a "term" contract with GWD is acceptable.

Legal:

Following a meeting with NCSD staff and its legal counsel, it is understood that the District desires to avoid: (1) "term" contracts for obtaining water from existing participants; and (2) buying into SWP construction costs. The following legal constraints attempt to summarize the necessary instruments, agreements, and contracts required for obtaining supplemental water from the SWP pipeline.

- A prior voter referendum regarding NCSD involvement in the State Water Project specified that the District would not contract with the State DWR for State Project water. Therefore the District should require a public vote prior to pursuing any supply option involving CCWA/SWP facilities to convey supplemental water to NCSD.
- As previously indicated, Hatch & Parent (attorney for GSWC) is currently conducting an analysis that may address the legal requirements for NCSD's procurement of a portion of the Natomas water. The legal and contractual terms are currently pending.
- In order to acquire a portion of SBCFC & WCD's suspended 12,214 AFY amount, NCSD will likely need to enter an agreement with both CCWA and the DWR requiring it to pay costs with interest associated with the water.
- NCSD will likely need to enter an agreement with both SLOCFC & WCD and CCWA in order to acquire a portion of SLOCFC & WCD's unused SWP Table A Amount. As described in San Luis Obispo County's Excess Entitlement Policy, NCSD may be required to "buy into" their past costs. Furthermore, since San Luis Obispo County participated in construction of treatment and conveyance facilities for only 4,830 AFY, it is assumed NCSD may also be required to "buy into" a portion of other project participant's construction costs.
- Because existing CCWA Project Participants are provided with SWP water in accordance with their respective agreements with CCWA, NCSD will likely need to obtain their approval and/or enter an agreement with CCWA for any other scenario considered in this evaluation.

Regulatory

- NCSD will also need to satisfy the requirement of a Title 22 Engineering Report for DHS/RWQCB review if aquifer storage-recovery is pursued.
- The construction of a treatment system, pipelines (including multiple stream crossings), and pumping facilities will require permits from local, state, and federal agencies.

Cost

The estimated annual costs for construction and operation of a turnout, pipeline extension, and treatment facilities for a direct connection, including debt service on capital costs and O&M are $380/af with a 3,000 afy facility, and $130/af with a 6,300 afy facility.

Purchase of water from a willing seller will involve an agreement on two cost components: (1) annual costs for CCWA operation, maintenance, and continuing debt service; and (2) buy-in cost for past capital improvement payments made by the seller. For the purpose of this analysis we estimate per acre-foot rates will be similar to those in a recent sale of 400 AFY from Carpinteria Valley Water District. In that sale, annual costs were $1,500/af and initial buy-in costs ("one time" fee) were $5,000/af. (CVWD, 2006)

Therefore buy-in cost would be $15 million for a 3,000 AFY facility and $31.5 million for a 6,300 AFY facility. Financing these costs over 20 years at 6% would result in annual costs equivalent to $436/AF, bringing the total cost to $2,310/AF for a 3,000 AFY facility and $2,070/AF for a 6,300 AFY facility.

Capacity

There is not enough excess or unused delivery capacity in the CCWA conveyance and treatment facilities, nor are there sufficient excess SWP Table A Amounts available to satisfy the NCSD's need for 3,000 AFY or 6,300 AFY, plus the competing interests for the same water as summarized above under *Institutional Constraints*.

- Assuming full delivery of project participant allotments including drought buffers, the SWP pipeline upstream of the Lopez turnout doesn't have enough extra capacity to convey the full SLOCFC & WCD's unused Table A allotment of 20,170 AFY. According to the 2005 P&S Capacity Study, only 9,100 AFY (13.7 cfs) of additional water can be added to the pipeline between Tank No. 1 and the Lopez Turnout where it would be subsequently removed.
- Assuming full delivery of project participant allotments including drought buffers, the SWP pipeline both upstream and downstream of the Lopez Turnout and serving CCWA participants in Santa Barbara County doesn't have enough extra capacity to convey the full SBCFC & WCD's suspended Table A allotment of 12,214 AFY. According to the 2005 P&S Capacity Study, only 4,700-5,600 AFY of additional water can be added to the pipeline between Tank No. 1 and Santa Maria Valley. This is the additional capacity that could be available for existing project participants and/or Nipomo CSD as discussed in the analysis.
- Assuming full delivery of project participant allotments only (no drought buffers), CCWA's Polonio Pass WTP may have only 4,260 AFY[5] of available capacity at the current plant rating of 43-MGD. The WTP may have an additional capacity of 5,000 AFY if it is successfully re-rated by CCWA.

Available Storage:

It has been estimated that the aquifer underlying the NMMA has available storage on the order of 400,000 AF. However, it is possible that hydrogeology considerations limit the area available for percolation ponds to approximately one-quarter of the 20,000 acres in the NMMA. Percolation of up to 6,300 AF within this area would likely raise the groundwater elevations by 10 feet over the 5,000 acres without consideration for likely lateral flow (SAIC, 2007). Therefore, adequate storage exists for the quantities under consideration.

[5] This is equivalent to 3,905 AFY on an 11-month basis.

5.0 Desalination of Sea Water/Cooling Water

Introduction

Desalination of seawater or brackish groundwater could provide the District with a reliable source of additional water. Key factors in the implementation of this approach are the source of the saline water, the location where it will be treated, and where the brine is disposed. For this analysis, three distinct combinations of source, treatment, and disposal are examined:

Table 5-1 Desalination Alternatives

Alternative	Water Source	Treatment Location	Brine Disposal
Partner with Nipomo Refinery	Seawater/brackish water from new wells located on Nipomo Refinery land and "used" Nipomo Refinery cooling water	Nipomo Refinery	Additional capacity in existing Nipomo Refinery outfall through desalination of "used" cooling water.
NCSD Owned Facility	New beach wells	South of State Parks land	New ocean outfall or beach injection
Partner with SSLOCSD with Added NCSD Pipeline	New beach wells located in Oceano	Adjacent to SSLOCSD Wastewater Treatment Plant in Oceano	New District-built ocean outfall or beach injection

These alternatives are briefly described below.

Partner with Nipomo Refinery

<References to the "Nipomo Refinery" option are based on earlier investigations and conceptual analysis regarding this option. A more complete constraints analysis is being performed by another consultant to the District. Therefore, if needed, this section may be revised based on the pending report.>

The Nipomo Refinery was built in 1955 and is designed to provide feedstocks for the San Francisco Refinery. Crude oil is transported by pipeline to the refinery, where it is run through the crude distillation units which have a rated input capacity of 44,400 barrels a day. Manufacturing operations are continuous, 24 hours per day, 365 days per year, except for yearly maintenance and repair shutdowns. (CRWQCB, 2002)

The refinery pumps 800-850 gpm of groundwater for cooling water and discharges 300 gpm of blowdown water and other wastewaters to an existing outfall. (Kennedy/Jenks, 2001.) Treatment of this blowdown water is a key component of this water supply alternative.

> "Most industrial cooling towers use river water or well water as their source of fresh cooling water. The large mechanical induced-draft or forced-draft cooling towers in industrial plants such as power stations, petroleum oil refineries, petrochemical plants and natural gas processing plants continuously circulate cooling water through heat exchangers and other equipment where the water absorbs heat. That heat is then rejected to the atmosphere by the partial evaporation of the water in cooling towers where upflowing air is contacted with the circulating downflow of water. The loss of evaporated water into the air exhausted to the atmosphere is replaced by "make-up" fresh river water or fresh cooling water. Since the evaporation of pure water is replaced by make-up water containing carbonates and other dissolved salts, a portion of the circulating water is also continuously discarded as "blowdown" water to prevent the excessive build-up of salts in the circulating water." (Beychok, 1967, in Wikipedia)

Another key component of this alternative will be utilization of the existing ocean outfall. All process wastewaters and contaminated storm water are collected and treated in a central wastewater treatment facility. This wastewater treatment facility is designed to treat 575,000 gallons per day (approximately 400 gpm). The final treated wastewater discharge is discharged to the Pacific Ocean through an outfall terminating 1,700 feet offshore and 27 feet deep. The discharge has not caused a violation of water quality standards to date, and based on past monitoring results, degradation of the marine environment has not occurred. (CRWQCB, 2002)

The alternative being evaluated would involve:

1. desalination of a portion of the cooling water before it enters the Nipomo Refinery wastewater treatment plant, thereby making additional capacity available in the outfall; or
2. desalination of seawater from new beach wells or brackish water from new wells at an undetermined location, and
3. disposal of the brine in the existing Nipomo Refinery ocean outfall.

Figure 5-1 Partner with Nipomo Refinery Desalination Alternative

NCSD Owned Facility

This alternative would involve construction of a stand-alone desalination facility, new beach intake and disposal wells, and associated pipelines. For evaluation purposes the desalination plant is assumed to be located on Highway 1 between Oso Flaco road and the Santa Maria River, the intake and brine lines are assumed to pass through the dunes south of State Park lands to the ocean, and the pipeline for the product water runs north up Highway 1 to connect with NCSD pipe network near the Eureka well site. See Figure 5-2.

In the case of an NCSD-owned facility, less environmental impacts, quicker environmental review, and greater likelihood of Coastal Commission approval would be associated with beach wells or other subsurface facilities, rather than direct ocean connections, for both intake and brine disposal. To implement this option the District will need to verify that adequate separation is provided between extraction and injection wells such that the injected brine does not impact the extraction water quality.

Figure 5-2 Stand-alone Desalination Alternative

Partner with SSLOCSD with Added NCSD Pipeline

This alternative would involve partnering with the cities of Arroyo Grande and Grover Beach, and with the Oceano Community Services District to expand their planned desalination facility at the South San Luis Obispo Community Services District (SSLOCSD) wastewater treatment plant. Unfortunately, it has been reported that the water needs of the SSLOCSD are such that the planned project (for SSLOCSD only) will utilize all the excess capacity in the existing ocean outfall. This lack of excess capacity will require the NCSD to build and permit a new brine disposal facility to accommodate the expanded desalination facility. As noted above, it may be possible to use beach injection to dispose of the brine.

For evaluation purposes it is assumed the pipeline for the product water runs south along Highway 1 to connect with NCSD pipe network near the Eureka well site. See Figure 5-3.

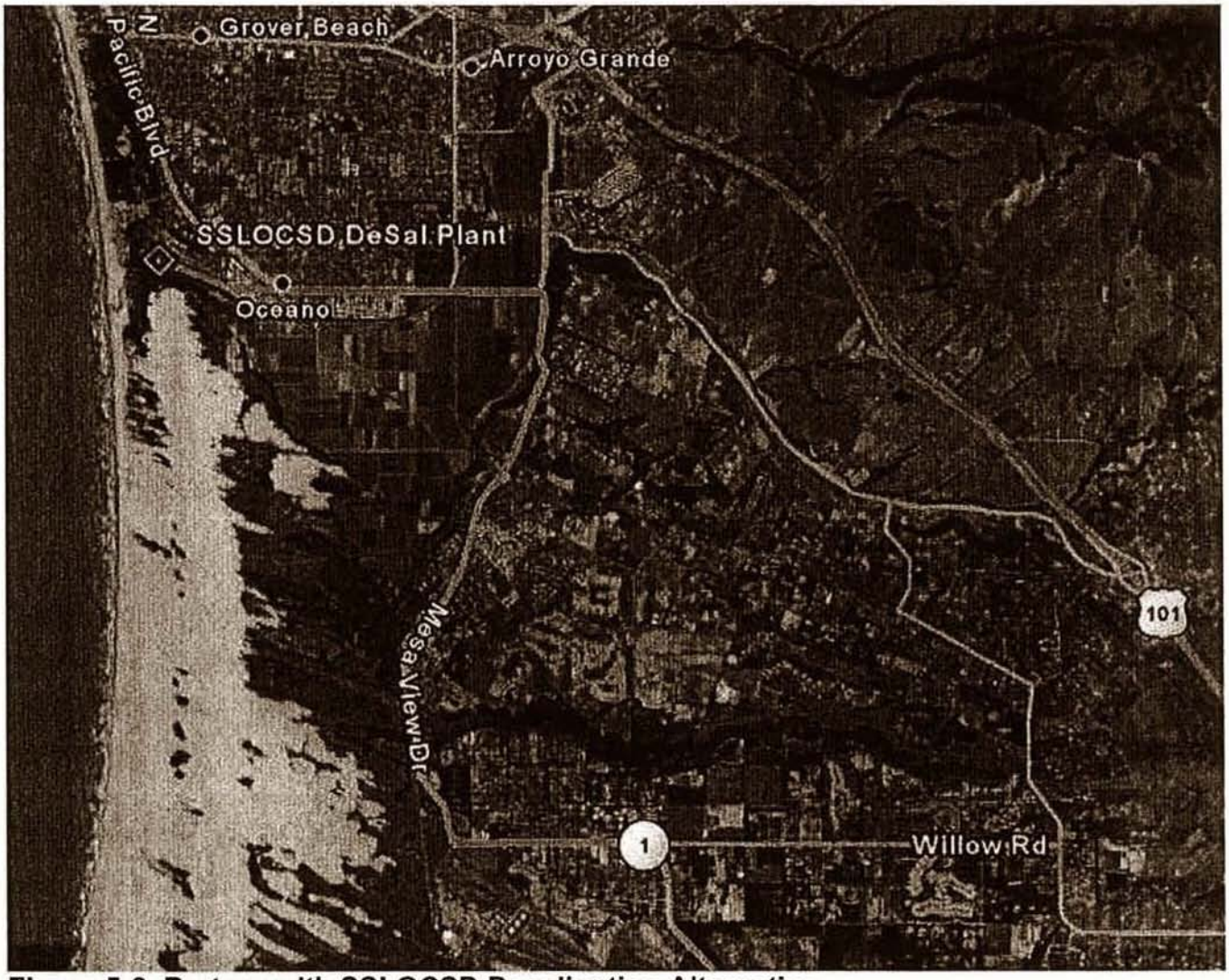


Figure 5-3 Partner with SSLOCSD Desalination Alternative

Previous Studies

Previous studies have been made of the alternatives under consideration, as discussed below.

Partner with Nipomo Refinery – Previous Studies

A 2001 report by Kennedy/Jenks Consultants looked at treating the used blowdown water for re-use as cooling water in the refinery. This additional treatment would reduce Nipomo Refinery need for groundwater by approximately 360 AF/yr. The cost for this source was estimated to be $2,161 /AF

based on year 2001 capital costs of $4 million (excluding land purchase) amortized over 20 years at 8% plus $400,000/year O&M costs.

At the time of this writing (5/9/07) Cannon Associates is preparing a water supply feasibility study utilizing Nipomo Refinery cooling tower effluent, Nipomo Refinery groundwater, brackish/sea water from new NCSD wells, and reverse osmosis treatment. The memo is in draft form, and has not yet been reviewed by Nipomo Community Services District (NCSD).

NCSD Owned Facility – Previous Studies

Boyle is unaware of any previous studies of a proposed NCSD owned seawater desalination facility.

However, numerous studies have been performed regarding construction of seawater desalination facilities for various municipalities and water Districts in California. As of 2004, the California Coastal Commission noted that there were 11 existing seawater desalination facilities on the California coast, with a combined capacity of approximately 3 MGD, or 3,300 afy. At that time, an additional 21 facilities were proposed, with a combined capacity of 240 MGD, or 260,000 afy (CCC, 2004).

Partner with SSLOCSD – Previous Studies

A 2006 report by the Wallace Group looked at the feasibility of desalinating seawater at the South San Luis Obispo County Sanitation District (SSLOCSD) wastewater treatment plant, installing new beach wells for intake and utilizing the existing outfall for brine disposal. Key findings of that report include:

- Approximately 2 MGD (approx 2300 AFY) could be produced.
- Assuming a 50% recovery rate, the projected brine effluent flow rate (2 MGD) would utilize all excess capacity in the existing wastewater treatment plant outfall.
- Capital costs would be $17.5 million. (December 2005 dollars.)
- Annual O&M costs would be $4.5 million, assuming energy costs at $0.15/kwh.
- Assuming a 20-year life cycle and 7% interest, water cost would be $2,400/afy.

Supply

Desalination using the Pacific Ocean as a source would allow for a virtually unlimited water supply, subject to limits imposed by regulatory agencies. These limits are unknown at this time, but for purposes of this screening analysis, are considered unlikely to restrict the amount of water that could be produced to amounts less than those noted above.

Partner with Nipomo Refinery – Supply

<This section will be completed pending the completion of the study being prepared by Cannon Associates.>

NCSD Owned Facility – Supply

Construction of an NCSD-dedicated facility would allow for a virtually unlimited water supply, subject to limits imposed by regulatory agencies.

Partner with SSLOCSD – Supply

According to the water supply study recently completed for Oceano CSD, the City of Grover Beach, and the City of Arroyo Grande, a desalination facility built at the SSLOCSD WWTP to meet the water needs of these agencies would utilize all excess capacity in the existing wastewater treatment plant outfall. Therefore, existing discharge capacity is a constraint on supply for this alternative. Additional discharge capacity would need to be installed for the NCSD to process the additional product water needed. Additional beach wells or other inlet facilities would need to be installed and intake, conveyance, and discharge facilities would need to be enlarged to accommodate the increased flows foreseen.

Quality

Typical product water recovery rates of 45% are reported for reverse osmosis seawater desalination plants on the California coast. Product water quality for these plants is between 284 and 400 ppm TDS. In addition, the RO process can remove unwanted contaminants, such as trihalomethane-precursors, pesticides, and bacteria (CCC, 2003). If the District chooses brackish water or beach well desalination, the lower TDS should result in higher recovery.

There is concern regarding the quality of cooling water due to the anti-scalant chemicals added. NCSD must be able to demonstrate that these chemicals are nontoxic to humans and can be removed in the treatment process.

Additional constituents of concern in sea water include algal toxins, such as domoic acid, and boron, which is not well removed by RO. RO treated water is also highly corrosive and must include provisions for corrosion control.

Reliability

The reliability of these alternatives is considered very high. Temporary interruptions in service may occur due to power outages or maintenance or repairs to supply and delivery lines, but the source itself – the Pacific Ocean – can be considered a reliable source for the foreseeable future.

Required Facilities

Based on this constraints analysis, the facilities required to obtain seawater or brackish water, treat it, dispose of the waste, and transport the treated water to the NCSD distribution system are listed below for production of 3,000 afy and 6,300 afy.

Table 5-2 Facilities Required for Desalination Alternatives – 3,000 afy

Alternative	Intake Structure	Intake Pipeline	Treatment Plant	Delivery Pipeline
a. Partner with Nipomo Refinery	7 Brackish or Beach Wells	24 inch diameter 1 mile	3,000 afy (2.7 MGD)	18 inch diameter 1.9 miles
b. NCSD Owned Facility	7 Beach Wells, 0.9 mgd each	24 inch diameter 3.8 miles	3,000 afy (2.7 MGD) plus 3.8 mile 18" discharge line and ocean outfall	18 inch diameter 3.6 miles
c. Partner with SSLOCSD with Added NCSD Pipeline	7 additional Beach Wells, 0.9 mgd each	Enlarge planned SSLOCSD intake pipeline	Enlarge SSLOCSD facility by 2.7 MGD plus 0.4 mile 18" discharge line and ocean outfall	18 inch diameter 7.8 miles

Table 5-3 Facilities Required for Desalination Alternatives – 6,300 afy

Alternative	Intake Structure	Intake Pipeline	Treatment Plant	Delivery Pipeline
a. Partner with Nipomo Refinery	15 Brackish or Beach Wells	36 inch diameter 1 mile	6,300 afy (5.7 MGD)	24 inch diameter 1.9 miles
b. NCSD Owned Facility	15 Beach Wells, 0.9 mgd each	36 inch diameter 3.8 miles	6,300 afy (5.7 MGD) plus 3.8 mile 24" discharge line and ocean outfall	24 inch diameter 3.6 miles

c. Partner with SSLOCSD with Added NCSD Pipeline	15 additional Beach Wells, 0.9 mgd each	Enlarge planned SSLOCSD intake pipeline	Enlarge SSLOCSD facility by 5.7 MGD plus 0.4 mile 24" discharge line and ocean outfall	24 inch diameter 7.8 miles

Implementation Schedule

Given the time needed for cooperation between agencies/facility owners, extensive environmental review, pilot testing, field investigations, design, construction, and startup, it is expected that implementation of any of these alternatives would take between 6½ and 10½ years. This estimate is based on the following:

- Obtain agreement from cooperating entities — 0.5 to 1.5 years
- Pilot studies of treatment options and Concurrent field investigations of intake/disposal options — 1.0 to 1.5 years
- Design — 1.0 to 1.5 years
- Permitting and environmental review — 3.0 to 4.5 years
- Construction and Start Up — 1.0 to 1.5 years

Constraints

Institutional

Institutional constraints for the proposed project are identified as follows:

- If the District decides to partner with SSLOCSD, then the NCSD should promptly notify SSLOCSD (Oceano CSD and the cities of Arroyo Grande and Grover Beach) of its intentions and receive approval from the existing project participants. They would be unlikely to support any actions that would delay their project.
- In the case of an NCSD-owned facility, construction of pipelines across dunes to the ocean may be prevented by the numerous resource agencies that have an interest in preserving the biological resources there, especially if the proposed pipeline crosses agency-owned land.

Regulatory

- District must obtain approval of the Coastal Commission and the State Lands Commission for construction of intake and discharge facilities.
- Environmental review under CEQA must be initiated and/or completed by way of an EIR.
- The desalination treatment must be piloted to assist in the design of the facilities and demonstrate compliance with regulatory standards. Typically, long-term pilots are proposed for desalination projects - up to 1 year long - to ensure the pretreatment proposed works under all conditions.
- The construction of a treatment system, pipelines (including multiple stream crossings), and pumping facilities will require permits from local, state, and federal agencies.
- The desalted water would also require filtration and disinfection to meet federal and state surface water treatment regulations.
- Under the Nipomo Refinery option, chemicals added to the coolant water must be demonstrated to be nontoxic to humans to get DHS approval to use as a domestic source. Pilot testing would need to demonstrate that these chemicals are removed via the treatment process.

Legal

If the District decides to partner with either SSLOCSD or the Nipomo Refinery owner, then NCSD must enter into an agreement with either entity to secure deliveries from the new facility.

Cost

The estimated annual cost, including debt service on capital costs and O&M of the three alternatives, at the two pumping rates, is summarized below.

Table 5-4 Probable Costs per acre-foot for each Desalination Alternative

Delivery Rate	a. Partner with Nipomo Refinery	b. NCSD Owned Facility	c. Partner with SSLOCSD with Added NCSD Pipeline
3,000 afy	$2,500/af	$2,900/af	$2,600/af
6,300 afy	$2,200/af	$2,400/af	$2,300/af