9.0 Direct Use of Recycled Water in-lieu of Groundwater Pumping

Introduction

Background

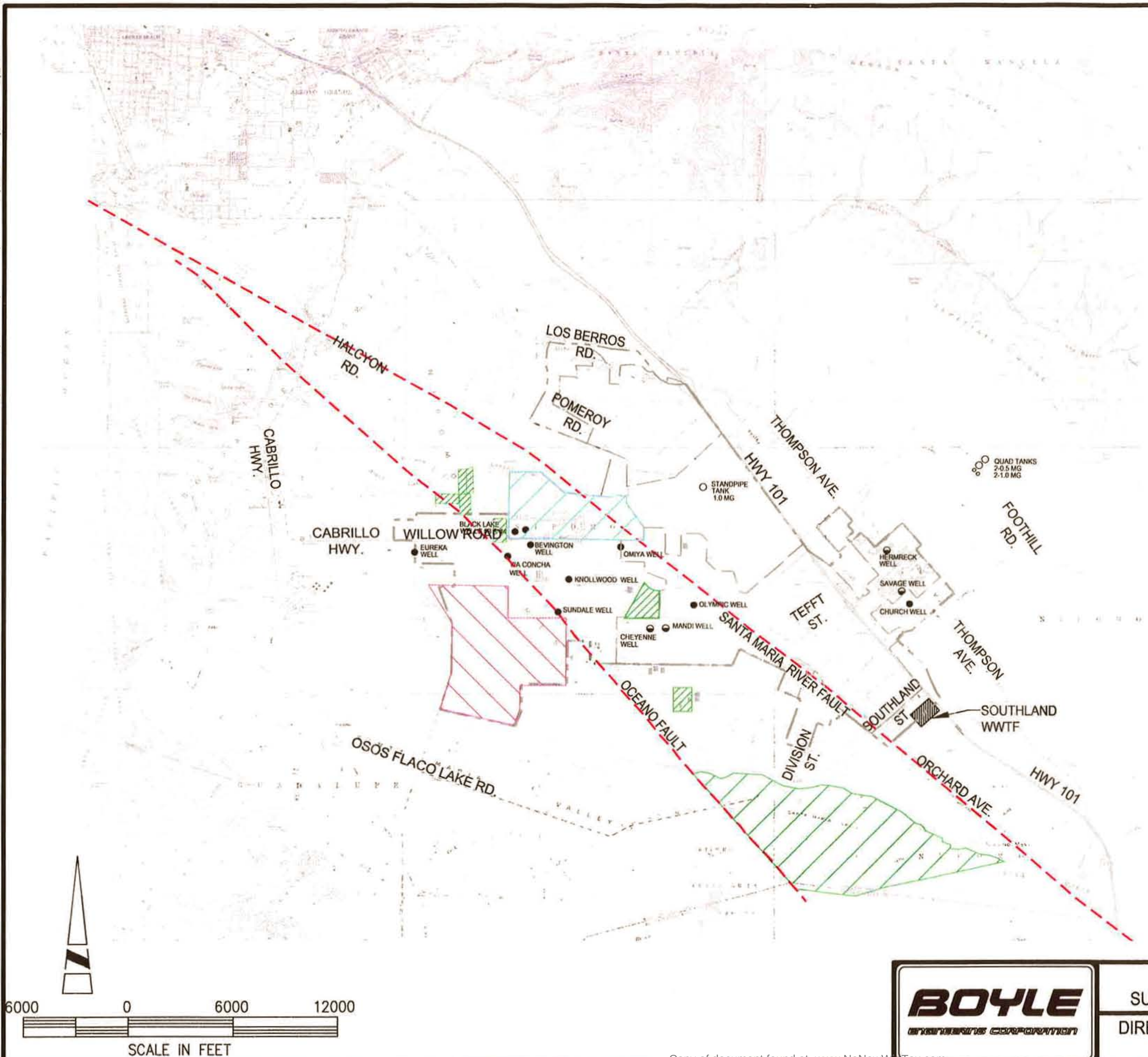
This alternative consists of developing a program involving delivery of recycled water from Southland WWTF to direct use as irrigation in-lieu of groundwater pumping from the principal production aquifer on Nipomo Mesa. This alternative provides for the disposition of effluent from Southland WWTP to locations other than the existing percolation ponds. Additionally, this alternative allows for an increase in operational flexibility of groundwater pumping by reducing the daily pumpage requirements.

Objective

As proposed, this scenario will provide for the transfer of a non-potable water source (reclaimed water from Southland WWTF) to users for direct reuse in irrigation of crops or turfgrass. The net available groundwater made available by this exchange would either be: (1) directly pumped (at the subject wells) and transmitted for use by NCSD; or (2) indirectly extracted by NCSD at existing or new well locations. Therefore, this scenario will effectively function as a groundwater management program and not a true supplemental water alternative.

The objectives of this alternative include:

- Stabilize and elevate existing groundwater pumping depressions; and
- Prolong useful life of existing NCSD wells.



NOTES:

1. AGRICULTURAL LAND USE IS BASED ON THE SOUTH COUNTY-INLAND PLANNING AREA RURAL LAND USE CATEGORY AND COMBINING DESIGNATION MAP.

LEGEND

- NIPOMO CSD WELLS
- NIPOMO CSD WELLS (STANDBY)
- NIPOMO CSD TANKS
- FUTURE WATER SYSTEM SERVICE AREA BOUNDARY
- EXISTING WATER SYSTEM SERVICE AREA BOUNDARY
- APPROXIMATE FAULT LINE
- AGRICULTURAL LAND USE AREA BETWEEN FAULTS
  - 1443 ACRES IN VALLEY
  - 181 ACRES ON MESA
- BLACKLAKE DEVELOPMENT
- WOODLANDS DEVELOPMENT

BOYLE ENGINEERING CORPORATION	NIPOMO CSD EVALUATION OF SUPPLEMENTAL WATER ALTERNATIVES	BEC PROJECT NO.	FIGURE
	DIRECT USE OF RECYCLED WATER IN-LIEU OF GROUNDWATER RECHARGE	19996.32	9-1

Previous Studies/Documents

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

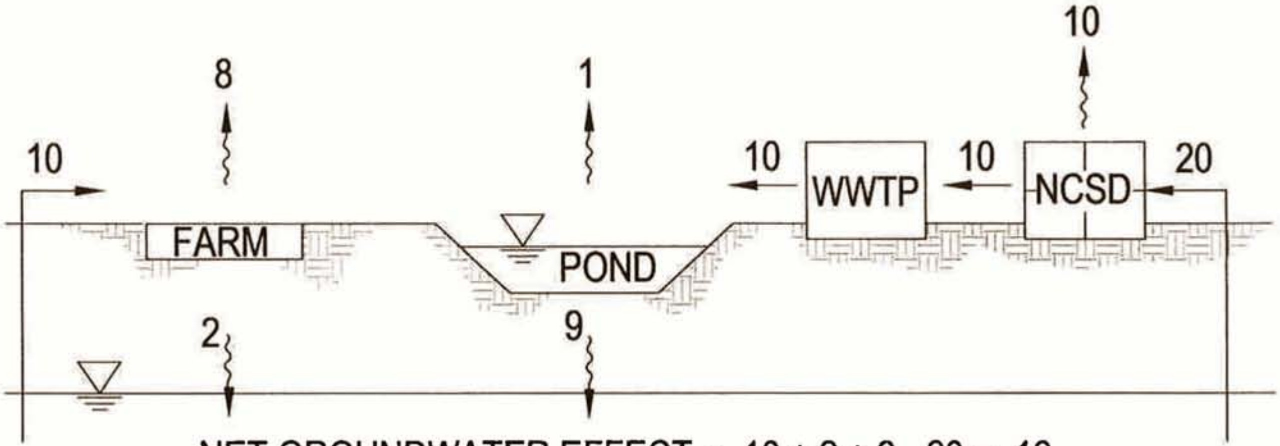
- Southland Wastewater Treatment Facility Master Plan (Boyle Engineering, Draft February 2007)
- Groundwater in Storage Underneath the Nipomo Mesa Management Area As of April 2006, Draft Technical Memorandum (SAIC, October 11, 2006)
- Nipomo Mesa Current and Projected Demands and Potential for Seawater Intrusion, Draft Technical Memorandum (SAIC, October 24, 2006)
- Urban Water Management Plan 2005 Update (SAIC, January 2006)
- Phase V Stipulation of the Santa Maria Groundwater Litigation (June 30, 2005)
- Nipomo Mesa Groundwater Resource Capacity Study (SS Papadopulos, March 2004)
- Water Resources of the Arroyo Grande - Nipomo Mesa Area (DWR Southern District, 2002)
- Final Report: Evaluation of Water Supply Alternatives (Kennedy/Jenks, October 2001)
- Evaluation of Alternative Water Supplies (Bookman-Edmonston, July 1994)

Supply

<u>Small Increase in "Supply":</u>

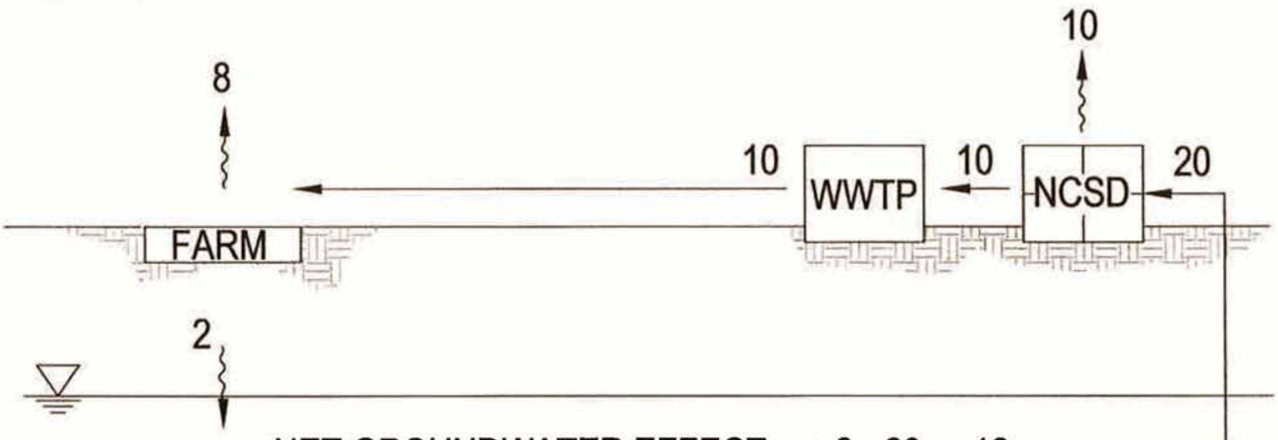
The proposed groundwater exchange alternative is intended to function as a groundwater management program within the subject area of the NMMA. No, or very little, increase in supply to the District would result because the net effect of this type of exchange is much smaller than the volume of water exchanged. Figure 9-2 shows a water balance for a hypothetical exchange of 10 units of water. The assumptions used in this water balance include: (1) 20% of irrigation water returns to the aquifer, while the remainder is lost through evapotransporation or shipped out of the NMMA as agricultural product, (2) approximately half the water demand of the District is used for irrigation with the remainder going to wastewater treatment, and (3) approximately 90% of water applied to the existing Southland WWTP reaches the aquifer, the remainder being lost to evaporation. As shown, the net impact of an exchange of 10 units of water is a net gain of one unit to the underlying aquifer. Small changes in the assumptions would alter this result slightly, but not significantly.

BEFORE



NET GROUNDWATER EFFECT = -10 + 2 + 9 - 20 = -19

AFTER



NET GROUNDWATER EFFECT = + 2 - 20 = -18

TOTAL GROUNDWATER GAIN = (AFTER - BEFORE) = -18 - (-19) = (+ 1)

BOYLE ENGINEERING CORPORATION	NIPOMO COMMUNITY SERVICES DISTRICT	BEC PROJECT NO.	FIGURE
	NET EFFECT OF DIRECT USE OF RECYCLED WATER IN LIEU OF GROUNDWATER PUMPING	19996.32	9-2

As no new supplemental water will be imported from outside the NMMA, there will be no effect on the overall water balance within the NMMA. However, there may be some benefit to the specific study area, previously described as the depressed groundwater basin within the NMMA if agricultural pumping from this location is decreased.

Quantity Available from Southland WWTF:

Average annual flow rates to the Southland WWTP are currently 0.59 MGD, equivalent to approximately 662 acre-feet per year (AFY). These flows are projected to increase to 1,460 AFY (1.3 MGD) in the year 2030. For the purpose of this analysis, it is assumed effluent flows, and therefore flows discharged to the infiltration basins, are equivalent to the existing and projected influent flows.

Agricultural Demand for Applied Water:

Multiple attempts have been made in previous studies to estimate total demand for applied agricultural irrigation water for varying boundaries within the Nipomo Mesa. The estimated use in 1995 ranges between 1,600 AFY (2002 DWR) and 3,780 AFY (2003 SAIC), while projected use in 2020 ranges from 1,600 AFY (2002 DWR) to 4,410 AFY (2003 SAIC). The variation in these estimates can be explained by differences in the area studied and differences in method and assumptions used.

The range of agricultural demand values was used to develop a recycled water demand duty factor for estimating potential recycled water demand as follows:

- Average of historical and projected applied demands = (1,600 + 4,410 AFY)/2 = 3,005 AFY
- Approximate Agricultural land use in Nipomo Mesa per 2002 DWR study, Table 4 = 1,220 Acres (as of 1995)
- Agricultural irrigation demand duty factor = 3,005 AFY/1,220 Acres ≅ 2.5 feet/year

The potential recycled water demand within the studied area will likely be lower than the total agricultural demand for applied water. Assume 50% of the agricultural users switch to recycled water:

- Recycled water demand duty factor = 50% x 2.5 feet/year = 1.25 ft/year.

This duty factor was then applied to the agricultural zoned parcels within the confines of the study area shown on Figure 9-1:

- Area on Figure 9-1 in agricultural operation = 181 acres
- Estimated recycled water demand within studied area = 1.25 ft/year x 181 acres = 226 AFY.

Landscape Demand for Applied Water:

The Woodlands development plans to use a mixture of treated wastewater and well water to irrigate its golf course and landscaped areas. Total water demand for this mixed water for village landscaping, business park, golf course, and evaporation from lined ponds is estimated at 824 AFY. The water demand for the development as a whole is estimated to be 1,583 AFY, while the wastewater plant is sized to treat 394 AFY (SLO County, 1998). Therefore, approximately 425 AFY of well water will be mixed with treated wastewater and used for irrigation, and may be available for exchange under this alternative.

The Blacklake development also includes a golf course and residential development, a dedicated wastewater treatment plant, and uses a mixture of treated wastewater and well water to irrigate its golf course and landscaped areas. With a total water demand of 450 AFY, assuming similar rates of wastewater generation and irrigation gives a rough estimate of 130 AFY of well water that is now mixed with treated wastewater for irrigation. This quantity may be available for exchange under this alternative.

Therefore it is estimated that 781 AFY (rounded to 800 AFY for this analysis) would be available for exchange under this alternative.

Quality

The proposed groundwater exchange may have negative impacts to water quality in the local, underlying aquifer due to salt accumulation. The following two criteria were considered in evaluating the quality of water resources proposed for exchange in this alternative:

- Quality of recycled water from Southland WWTF
- Quality of available groundwater for exchange within studied area

Recycled Water from Southland WWTF:

The Southland WWTF provides secondary treatment for wastewater generated within the Nipomo community. Constituents in treated wastewater from the Southland WWTF that may affect recycled water suitability for irrigation of crops or landscape species include salts or "total dissolved solids" (TDS, often estimated by the measurement of electrical conductivity, ECw), sodium adsorption ratio (SAR), bicarbonates, chlorides, and boron. SAR is a measure of sodium hazard and is also used to predict reductions in soil permeability following application. Chlorides, boron, and sodium are ions that can reach toxic concentrations. Different crops vary in their tolerance to these constituents.

Constituents in Southland WWTF effluent with concentrations that may be problematic to crops include:

- Chloride
- Total Nitrogen (excess N may affect production of certain crops)
- TDS

- Sodium

Effluent quality data regarding boron, bicarbonates, ECw, and SAR has not been collected. This data would be required to confirm suitability of reclaimed water for irrigation.

Title 22 of the California Code of Regulations (CCR) provides regulations for median and maximum total coliform limits in reclaimed water as well as usage restrictions. These regulations are driven by concerns for public safety and do not address suitability of reclaimed water for irrigation of crops. It is anticipated NCSD will attempt to meet the most stringent requirements in order to provide flexibility for all uses allowed under the Title 22 criteria.

Exchange Groundwater:

It is assumed the exchange groundwater will likely be pumped from existing NCSD wells. Therefore, water quality should be similar to existing groundwater pumped from within the NMMA.

If groundwater were pumped directly from an exchange participant's wells, and if no confining layer were present between the pumped aquifer and the place of application, water quality of the pumped groundwater could be impacted by the percolation of applied recycled water.

Reliability

Recycled Water from Southland WWTF:

Recycled water is considered a reliable water supply. However, its reliability as it pertains to exchange for direct use is contingent on the NCSD's ability to provide and maintain recycled water quality meeting the appropriate standards as well as taking additional necessary measures to mitigate salt accumulation in the groundwater basin.

Exchange Groundwater:

The groundwater will be extracted by existing or new NCSD wells, or by the exchange participant's wells. Therefore, the reliability of the return flows will be approximately the same as the existing groundwater supply. Therefore, its reliability may be hindered by drought conditions within the NMMA and any further development/expansion of the pumping depressions.

Required Facilities

In order to utilize its wastewater discharge as a resource, it is expected the NCSD will attempt to upgrade its treatment to provide Tertiary Recycled Water for Unrestricted Irrigation. As noted above, this level of treatment will require oxidation, coagulation, filtration and disinfection. The NCSD may also need to consider blending the recycled water with higher quality groundwater in order to reduce TDS and other constituents of concern. In order to convey its recycled water to agricultural users, the NCSD would also need to construct storage, pumping, and transmission pipeline facilities.

Depending on the location(s) of potential agricultural users, the NCSD may also need to construct pumping and transmission facilities to convey pumped groundwater from the subject agricultural sites to interconnect with existing NCSD facilities. It is also possible NCSD may need to upgrade some of its existing water pumping, treatment, and transmission facilities. The extent of required upgrades is currently unknown.

Project Components:

For the purposes of comparison within the scope of this constraints analysis, the following facilities are assumed to be required to implement groundwater exchange of recycled water for agricultural production:

- Upgrades to Southland WWTF to provide Tertiary Recycled Water, including filtration and disinfection;
- Storage facilities at Southland WWTF, booster pump station(s), and transmission pipelines to convey recycled water to agricultural users; and
- Transmission facilities to convey pumped "exchange groundwater" from agricultural sites to NCSD facilities
- Upgrades to existing water pumping, treatment, and transmission facilities.

Implementation Schedule

It is estimated approximately 2 to 4 years will be required to fully implement this project.

Constraints

Institutional

Public perception with the use of recycled water for irrigation of food crops, non-food crops, and recreation areas may reduce the demand for recycled water.

Legal

NCSD will need to identify interested parties and enter into agreements with users.

Assuming 10% of this groundwater exchange is considered *New Developed Water* as defined in the Phase V Settlement Stipulation, NCSD may be required to obtain an order from the Court, quantifying and allocating the rights to the New Developed Water, before they have the prior right to the New Developed Water.

Regulatory

In order to allow for unrestricted irrigation of crops, NCSD will need to upgrade its treatment to provide Tertiary Recycled Water. This level of treatment meets the most stringent of Title 22 criteria. NCSD will also need to revise the Waste Discharge Requirements for Southland WWTF to allow reuse of plant effluent for unrestricted urban use.

NCSD will need to satisfy the requirement of a Title 22 Engineering Report for DHS/RWQCB review.

The construction of an expanded treatment system, pipelines, percolation basins, and pumping facilities will require permits from local and state agencies.

Cost

The probable cost of improvements is approximately $19 million and includes treatment and conveyance facilities. Amortizing this cost over 20 years and including approximately $40,000 in annual operational costs brings the total annual cost to $1.7 million. This alternative recycles 800 AFY of treated wastewater, but is expected to produce only 80 AFY of "new" return flows. Therefore, the cost per acre-foot of "new" water is $21,000.

Capacity

Assuming that the Woodlands, Black Lake, and 50% of the agricultural users overlying the groundwater depression were to switch to irrigation with 100% recycled water, the total demand would be approximately 800 AFY. Average annual flow rates to the Southland WWTF are approximately 662 AFY, and are projected to increase to 1,460 AFY in the year 2030. Therefore, adequate supply does not now exist to make full use of this alternative, but is expected to become available within 20 years.

However, as noted above, it is reasonable to assume that for every 10 units of water exchanged, only one additional unit of groundwater would be made available. Therefore, at full capacity of 800 AFY exchange, perhaps as little as 80 AFY of additional water from the NMMA would be available.

10.0 Summary of Water Quality

The following table provides a summary of water quality for some of the alternatives considered. State and national drinking water standards (i.e., Primary and Secondary Maximum Contaminat Levels) are also provided.

Nipomo Community Services District Evaluation of Supplemental Water Alternatives
Table 10-1 Summary of Water Quality Data & Drinking Water MCL's

Parameter	CDHS MCL	USEPA MCL	Lake Nacimiento[1] See note 1			CCWA State Water (from PPWTP)[2] 2005			CCWA 2006			Nipomo Community Services District - Town Division[3] 2005			NCSD 2006			Santa Maria River Surface Water @ Bull Canyon Road[4] 6/1/2000			Cuyama Lane Water Company Well[5] 2006	City of Santa Maria Wells[6] 2005			City of Santa Maria Wells 2006		
			Min	Max	Avg	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min	Max	Avg.	Only one sample	Min.	Max.	Avg.	Min.	Max.	Avg.
Primary Standards																											
Aluminum (Al), ppm	1					0.05	0.26	0.11	0.049	0.220	0.128	--	0.4	0.067							--						
Antimony, ppm	0.006											--	2	--						0.45	--						
Arsenic (As), ppb	50	10										--	57	7.7	--	8	2.3	in sediment (mg/kg)		5	--	2.0	2.6	2.2	last tested in 2005		
Asbestos, MFL	7	7				4/1/1998		--			--																
Barium (Ba), ppm	1	2										0.0223	0.062	0.0419						96	--						
Beryllium, ppm	0.004	0.004																		0.028	--						
Cadmium (Cd), ppm	0.005	0.005										--	0.0009	0.00046				in sediment (mg/kg)		0.039	--						
Total Chlorine Residual, ppm						2	3.1	2.5	0.95	3.2	1.8																
Chromium, ppm	0.05											--	0.007	0.0016				in sediment (mg/kg)		21	--						
Coliforms, Fecal MPN/100mL								--			--			1 month violation				110	700	378 4/1/2001	NEG			--			--
Coliforms, Total, MPN/100mL	See Note 7		0	77,000	38,500			<1	see note 7		--			--				2300	50,000	19,620	POS			--			--
Copper, ppm		1.3									--							in sediment (mg/kg)		18	0.96	7/2004		--	last tested in 2004		
Cyanide, ppm	0.15																				--						
Fluoride, ppm	2	4						0.1			0.06	--	3	0.16							--	0.18	0.25	0.22	last tested in 2005		
Haloacetic acids (HAA), ppb	60	60				8.5	24.0	15.0	5.8	17.0	10.2										--	7.5	24.1	15.2	11.0	24.1	16.9
Lead, ppm	0.015	0.015									--							in sediment (mg/kg)		7.1	--	7/2004		--	last tested in 2004		
Mercury, ppb	2	2										0.02	0.04	0.032				in sediment (mg/kg)		0.035	--						
MTBE, ppm	0.013							--			--																
Nickel, ppm	0.1											--	0.004	--				in sediment (mg/kg)		22	--						
Nitrate (as nitrogen), ppm		10																0.05	0.5	0.264	--						
Nitrate (as NO3), ppm	45					1.8	7.6	4.44			1.6	--	24.4	6.79	--	11.6	5.1	0.223	2.225	1.174 4/1/2001	--	<2	100	29.3	2.1	99	28.7
Nitrate+Nitrite (sum of nitrogen), ppm	10							0.51			0.37							0.05	0.7	0.417	--						
Nitrite (as nitrogen), ppm	1	1																0.015	0.05	0.037	--						
Perchlorate, ppb	See Note 8										--																
Selenium(Se), ppm	0.05	0										--	0.004	--						1	0.008						
Thallium, ppm	0.002	0.002																in sediment (mg/kg)		0.4	--						
Total organic carbon, ppm			2.8	4.4	4	1.4	4.5	2.4	1.3	2.6	1.8																
Trichloroethylene (TCE), ppb	5	5																			--	0.82	2.3	1.8	0.66	2.9	1.6
Total trihalomethanes (THM), ppb	80	80				37	72	53	25	47	36	--	3.1	--							72.0	36.7	65.4	54.2	33.6	65.4	46.1
Secondary Standards																											
Aluminum (Al), ppm	0.2	0.05 - 0.2				0.05	0.26	0.11				--	0.4	0.067							--						
Apparent Color(Unfiltered)	15	15						--			3	--	30	--							--			5	last tested in 2005		
Chloride, ppm	250-500	250				21	125	65	21	125	52	43	106	58	44	106	59	20.3	86.6	53.6 4/1/2001	7.5	23	89	48.7	last tested in 2005		
Copper, ppm	1										--							in sediment (mg/kg)		18	0.96	7/2004		--	last tested in 2004		
Corrosivity (Langlier Index)		--	-1.5	0.5	-0.5		--	--			--	-1	0.3	-0.2	-0.7	0.3	-0.2				0.2						
Iron (Fe), ppb	300	300	31	2,800	1,416			--			--	--	1270	204							--						
Manganese, ppm	0.05	0.05	0	0.640	0.320			--			--	--	0.050	--							--						
MTBE, ppm	0.005							--			--																
Odor Threshold	3	3				1	3	1	1	3	1										--			1			
Specific Conductance, umhos/cm	900					268	730	467	206	666	360	455	1410	903	554	1410	948	983	1610	1,211	530	890	1600	1124	last tested in 2005		
Sulfate (SO4), ppm	250-500	250						58			39	39	332	216	59	332	240	370	540	455 4/1/2001	12	240	560	364			
TDS, ppm	500	500				131	358	239	97	326	172	300	950	645	340	920	676	666	1210	898		650	1300	874	last tested in 2005		
Turbidity, NTU	5		0.7	74	37	0.03	0.12	0.06	0.03	0.26	0.04	--	17.2	2.58				3	350	86	0.8	0.1	0.5	0.2			
Zinc, ppm	5	5																in sediment (mg/kg)		49							
Radioactivity																											
Gross Alpha Particle Activity, pCi/L	15	15										--	8.5	3.65								<1	5.4	4.1	last tested in 2005		
Gross Beta Particle Activity, mrem/yr	4	4												0.394													
Radium-226, pCi/L																											
Radium-228, pCi/L																											
Combined Radium-226 and Radium-228, pCi/L	5	5																									
Strontium-90, pCi/L	8																					7/2004					
Tritium, pCi/L	20000																										
Uranium, pCi/L	20	30 ug/L										0.11	5.37	3.75								3.3	4.3	4	last tested in 2004		
Additional Parameters																											
Alkalinity, mg/L as CaCO3			74	130	102	42	76	63	34	80	57										14						
Bicarbonate, ppm																					17						
Boron, ppm	See Note 9					8/15/02			0.098 ppb			--	0.1	--				0.120	0.230	0.164 4/1/2001		<0.1	0.150	0.118	last tested in 2005		
Bromoform, ppb												--	2.4	--													
Blue Green Algae, #/mm^2			0	232	116																						
Calcium (Ca), ppm			20	38	29	28	74	50	24	68	42							99	155	125 4/1/2001	160						
Chromium VI, ppb								--			--	--	2.2	0.74										1.2	last tested in 2002		
DCPA Di+Mono Acid, ppb																						2.6	13	7.8	7/2003		
Dibromochloromethane												--	0.7	--								2/2002					
Free CO2, ppm			1.2	63	32																						
Hardness as CaCO3, ppm						50	140	98	42	120	76	106	552	343	134	552	351	465	806	576 4/1/2001	850	410	790	558.9	last tested in 2005		
Heterotrophic Plate Count, CFU/mL						<1	2	1	<1	2	1																
Manganese, ppm	See Note 9		0	0.64	0.32			--			--	--	0.05	--							--						
Magnesium (Mg), ppm								12			9.5							40	102	66 4/1/2001	110						
Odor, Tons			0	15	8																--						
pH		6.5-8.5	6.54	8.86	8	6.7	9	8.1	6.9	8.9	8.2				6.9	7.3	7.2	7.9	8.46	8.232 4/1/2001	7.9	7.3	7.8	7.5	last tested in 2005		
Potassium (K), ppm								2.9			2.3										2	1/2000					
Radon, pCi/L																						615	770	707.8	last tested in 2001		
Sodium, ppm								53			45	45	93	58.6				46.8	81.2	64.3 4/1/2001	190	44	96	59.8	last tested in 2005		
Total Algae, #/mm^2			0	1,400	700																						
Vanadium, ppb	See Note 9					8/15/2002		3.7	8/15/2002		3.7	--	11	5.9				in sediment (mg/kg)		35	14 sampled in 2004	<3	3.5	3.3	last tested in 2005		

Notes:

1. SLO County Flood Control and Water Conservation District Nacimiento Water Project TM 8 Water Quality Investigations - Black and Veatch, 2005. Data collected from 5/1997 to 5/1998 and 8/2001 to 6/2005 and is based on stratified reservoir conditions (Epilimnion and Hypolimnion)

2. Polonio Pass Water Treatment Plant Consumer Confidence Report Data - Central Coast Water Authority, 2005 & 2006

3. NCSD 2005 Town Division Consumer Confidence Report and NCSD 2006 data from "Waterline Intertie Project - Disinfection Alternatives Evaluation by Boyle Engineering dated November 2006

4. CCAMP website www.ccamp.org, Site 312SBC

5. San Luis Obispo County Public Health Dept., Environmental Health Services Division, Lab Report Data

6. City of Santa Maria 2005-Final and 2006-Draft Consumer Confidence Report

7. No more than 5% samples total coliform-positive in a month per USEPA standards

8. Perchlorate has a proposed Primary MCL of 6 ppb

9. California Notification Level as follows:
Boron, NL = 1 ppm
Manganese, NL = .500 ppm
Vanadium, NL = 50 ppb

Symbols:
" blank " means not sampled or data not available

" -- " means value below detection limit; non-detect

mg/kg (dw) = milligrams per kilogram of dry weight sample collected

mg/L = milligrams per liter of sample collected = ppm

MPN/100mL = most probable number method per 100 milliliters of sample collected

NTU = Nephelometric Turbidity Units

ppm = parts per million

ppb = parts per billion

umhos/cm = millisiemens per centimeter

11.0 Comparison of Alternatives

In this section each of the seven alternatives under consideration is compared to the Waterline Intertie Project. Separate comparisons are made concerning supply, water quality, reliability, and the time required to implement, as well as institutional, legal, and regulatory constraints.

Each alternative receives a score (1=best; 8=worst). These scores are then combined and a numerical ranking of alternatives is presented.

Supply

Ability to provide 3,000 AFY or 6,300 AFY

	Constraints	**Supply**	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Sufficient supply exists.	1
2	**CCWA, State, or "Other" Water**	Sufficient supply exists.	1
3	**Desalination of Sea Water/Cooling Water**	Sufficient supply exists.	1
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	440 to 968 AFY, assumed constrained by ag. return flows.	6
5	**Nacimiento Water Project Extension**	2,148 AFY	5
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	No Increase in Supply	8
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	No or Very Little Increase in Supply	7
8	**Waterline Intertie Project**	Sufficient supply exists, with minor improvements to expand to 6,300 AFY	1

Water Quality

	Constraints	Water Quality	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Insufficient data available. High TDS and nitrate may be a concern. Proximity to river makes treatment a likely requirement.	4
2	**CCWA, State, or "Other" Water**	Treated to Municipal Standards. Uses chloramines for disinfection, while District uses chlorine.	1
3	**Desalination of Sea Water/Cooling Water**	Depends on source. Seawater has history of successful treatment with RO. Cooling water may require additional treatment.	7
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	Poor water quality. Does not support "Municipal Water Supply" in Basin Plan.	8
5	**Nacimiento Water Project Extension**	Raw surface water from Lake Nacimiento	3
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	Salt, nitrogen, and other contaminants will require additional treatment upgrade at Southland WWTP	6
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	Salt, nitrogen, and other contaminants will require additional treatment upgrade at Southland WWTP	5
8	**Waterline Intertie Project**	Santa Maria disinfects using chloramines. District would need to remove chloramines from new water, or convert existing system to chloramines.	1

Reliability

	Constraints	Reliability	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Reliability is good.	5
2	**CCWA, State, or "Other" Water**	Reliability depends on amount of allocation acquired. Long term average delivery = approx. 75% of allocation.	6
3	**Desalination of Sea Water/Cooling Water**	Reliability is good.	1
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	Unknown. More study required.	8
5	**Nacimiento Water Project Extension**	Reliability is considered good.	6
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	Reliability is similar to existing groundwater supply.	3
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	Reliability is similar to existing groundwater supply.	3
8	**Waterline Intertie Project**	Reliability is considered good.	1

Implementation Schedule

	Alternative	Time Required	Score
1	**Santa Maria Valley Groundwater**	4 to 6 years	4
2	**CCWA, State, or "Other" Water**	4 to 6 years	4
3	**Desalination of Sea Water/Cooling Water**	6.5 to 10.5 years	7
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	7 to 10 years	8
5	**Nacimiento Water Project Extension**	5 to 7 years	6
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	2 to 4 years	2
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	2 to 4 years	2
8	**Waterline Intertie Project**	2 to 3 years	1

Institutional Constraints

	Constraints	Institutional Constraints	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Need to purchase water rights from SMVMA user.	3
2	**CCWA, State, or "Other" Water**	Need approval from numerous institutions and voters. May be required to buy into past costs.	5
3	**Desalination of Sea Water/Cooling Water**	Will require cooperation with participants and/or affected landowners.	2
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	Lake is owned by State Parks, who would likely oppose extraction.	6
5	**Nacimiento Water Project Extension**	Need to act quickly if costs will be shared. **FATAL FLAW** (Project is out to bid.)	8
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	Public perception issues for use of recycled water and siting of percolation ponds.	7
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	Public perception issues for use of recycled water may block implementation.	4
8	**Waterline Intertie Project**	MOU with City of Santa Maria is in place.	1

Legal Constraints

	Constraints	Legal Constraints	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Need to satisfy pending groundwater adjudication. Pumping at boundary may not be possible. **FATAL FLAW.**	8
2	**CCWA, State, or "Other" Water**	Will need to hold an election. Will need contracts to purchase water.	7
3	**Desalination of Sea Water/Cooling Water**	Will require contracts between cooperating participants (if any).	2
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	Part of the Santa Maria Valley Management Area, therefore requires approval of all litigants.	6
5	**Nacimiento Water Project Extension**	Need to execute appropriate contracts.	3
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	No "new supply" created.	4
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	Would need court judgement to use any "new" water created.	5
8	**Waterline Intertie Project**	(None identified)	1

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Regulatory Constraints

	Constraints	Regulatory Constraints	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Use of Twitchell reservoir water will require DWR license modification. DHS will require treatment.	6
2	**CCWA, State, or "Other" Water**	Treatment will require DHS approval. Minor resource agency oversight expected.	1
3	**Desalination of Sea Water/Cooling Water**	Coastal Commission, State Lands, and Resource Agencies' concerns will need to be addressed. Cooperating parties will require mutual agreements. DHS/RWCB permits will be required.	8
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	DHS would consider this an "Extremely impaired Source." Significant resource agency regulatory involvement expected.	7
5	**Nacimiento Water Project Extension**	CEQA via Supplemental EIR required. Resource agency permits required for construction. State and federal drinking water regulations would apply to treatment plant.	3
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	Requires new WDR for Southland WWTP, increased regulatory burden for recharging groundwater with recycled water, as well as nominal construction permitting.	5
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	Requires new WDR for Southland WWTP, increased regulatory burden for using recycled water, as well as nominal construction permitting.	4
8	**Waterline Intertie Project**	State and federal drinking water regulations would apply to disinfection improvements. Resource agency permits required for construction.	1

Numerical Ranking of Alternatives

	Constraints	**Summary**		
	Alternative	Total Score	Rank	Biggest Obstacle
1	**Santa Maria Valley Groundwater**	29	4	**FATAL FLAW** Need to satisfy adjudication.
2	**CCWA, State, or "Other" Water**	24	2	Supply is limited and unreliable. Need significant political and institutional support.
3	**Desalination of Sea Water/Cooling Water**	28	3	Permitting from Coastal Commission and other Resource Agencies
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	49	8	Insufficient Supply and Poor Water Quality
5	**Nacimiento Water Project Extension**	29	4	**FATAL FLAW** Project is out to bid.
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	37	7	Not a new source.
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	32	6	Insufficient supply.
8	**Waterline Intertie Project**	10	1	Capital Cost

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12.0 Conclusions

Comparison of Alternatives

As discussed in previous sections, the following alternatives appear to have "fatal flaws" that would prevent the District from pursuing them as viable, supplemental water sources:

> **Santa Maria Valley Groundwater** – This alternative would likely affect the flow of water between Santa Maria Valley and the NMMA, and would likely be prevented as a result of the adjudication.
>
> **Nacimiento Water Project Extension** – The Nacimiento Water Project is currently out to bid, and as designed would not deliver the District's desired 3000 AFY. Revisions to the project would cost at least $4000 per AF for extending the pipeline from City of San Luis Obispo to Nipomo, not including costs to increase the pipeline upstream of San Luis Obispo to expand capacity and deliver 3000 AFY.

Oso Flaco Drainage - Although drainage from Oso Flaco could be treated, and this alternative does not have any "fatal flaws", it is not considered to be a feasible supplemental water alternative due to the poor water quality of the water, inadequate quantity, likelihood of requiring approval from parties in Santa Maria Valley adjudication, and lack of support expected from CDHS.

Groundwater Recharge or Reuse - Groundwater recharge of treated wastewater, and direct reuse of this resource, will not increase the water supply available to the District, but may assist with managing groundwater depressions and with providing a market for treated plant effluent because onsite discharge may no longer be desired at Southland WWTF.

Seawater Desalination - Seawater desalination is expected to take many years for implementation, would be an expensive water supply, and would require many years of studies and negotiation with resource agencies, but would represent the most reliable water supply available to the District. While this may not meet the District's short-term need for water, it is recommended that the District consider desalination in long-term water supply planning. Desalination will be addressed in more detail in Task 3 of this evaluation.

State Water or "Other" Water - Although direct purchase of 3,000 AFY or 6,300 AFY of State Water from the SWP pipeline does not appear to be feasible, due to institutional and legal constraints, acquiring off-peak or excess capacity and storing that water in an aquifer storage-recovery facility may be viable. This alternative will be explored in greater detail in Task 2 of this evaluation, and the evaluation will benefit from an ongoing analysis of the Natomas water exchange (currently being conducted by Hatch & Parent, as mentioned previously).

Summary of Relative Costs

Although detailed cost opinions were not developed in this evaluation, cost is considered one of the primary criteria for determining whether alternatives are feasible. The planning-level $/AFY costs developed in previous sections, along with notes identifying any unsubstantiated but expected costs, are summarized below.

Table 12-1 Relative Costs per Acre-Foot

	Alternative	Facilities and O&M	Water Purchase	Other	Total
1	**Santa Maria Valley Groundwater**	$520 to $770	$1,250 (1)	Site purchase at Hutton or Oso Flaco Road	$1,770 to $2,020 plus land cost
2	**CCWA, State, or "Other" Water**	$130 to $380	$1,500 (2)	$436/af (2) refinance past capital costs	$2,070 to $2,310
3	**Desalination of Sea Water/Cooling Water**	$2,200 to $2,600	0	Site purchase or lease cost	$2,200 to $2,600 plus land cost
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	$2,300 to $2,700	0	Site purchase or lease cost	$2,300 to $2,700 plus land cost
5	**Nacimiento Water Project Extension**	$1,100 (3)	$1,900 to $2,100 (4)	$1,000 + for storage, pumping and treatment	$4,000 or more
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	$1,100 to $2,320 per AF recycled (No new water supplied)		Site purchase for percolation basins	$1,100 to $2,320 plus land cost
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	$21,000 (80 AFY new water)			$21,000
8	**Waterline Intertie Project**	$470 to $850	$1,250		$1,720 to $2,100

(1) Assumed equal to MOU purchase price.
(2) Carpinteria sale to PXP (CVWD, 2006).
(3) Transmission main only from SLO City turnout.
(4) Assumed equal to estimated cost for delivery to SLO City turnout.

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