Garing Taylor & Associates

Civil Engineering
Surveying
Project Development

Date: January 16, 2007

To: Larry Kraemer, Cannon Associates

From: Malcolm McEwen, Civil Engineer

Subject: Task 25 – Results of Screening Evaluation

Introduction

Task 25 calls for:

- performing a screening evaluation of potential additional up-gradient locations to recharge treated wastewater flows from the Southland WWTF based on ownership, distance from the WWTF and the available geotechnical data (no new testing);
- develop cost allowances for up to six locations for future examination; and
- propose the next steps for such examination.

Based on additional guidance from NCSD staff regarding the geographic scope of interest the initial screening was performed as described below.

Approach

1. Preliminary graphics were developed showing the study area (Figure 1a) and the underlying groundwater elevations in the Spring of 1995 – when a pumping depression was clearly evident (Figure 1b).
2. Parcels located within the study area that met the following criteria (based on public records) were identified:

- Land use was listed as "Vacant, Government" or "Open Space Easement";
- Listed as "0% developed", or "Vacant," or "AG," and 4 acres or larger;
- Appearing on the GIS aerial photos as either vacant or primarily agricultural land use, and 10 acres or larger; or
- Owned by the District and 5 acres or larger.

3. These parcels were plotted on Figure 2. (District staff advised not to present specific parcels in the report. See "blob" version following.)

4. NRCS Soil mapping data was obtained for the study area. The vast majority (98%) of the study area is mapped as Oceano Sand. This soil has a high infiltration rate (K_{sat} > 6"/hr). Therefore, in the absence of site-specific data, infiltration rate should not be a limiting factor.

5. Based on direction from District staff 3 areas were selected for further study, as shown on Figure 3. (This is the "blob" version and is suitable for presentation.)

6. Costs were estimated using the following assumptions:

   - 0.6 MG of treated wastewater would be pumped to the new infiltration basins from May 1 to October 31 each year for 30 years.
   - Treated wastewater would be pumped from a newly installed wet-well located at the southerly end of the Southland WWTP treatment ponds. The wet well and associated pumps and controls would cost $300,000.

- PVC pipe would be installed under existing paved roads with less than 3.5" of asphalt paving. I estimated piping costs as follows:

  8" $106.57/LF;

  12" $124.48/LF;

  complete with paving etc.

- The cost to acquire land was ignored, assuming the land would be dedicated for stormwater detention use.

- Capital costs would be financed with a 30-year bond at 5% annual interest.

- 3 alignments were investigated (Figure 4.)

- Electricity costs would be as listed on the attached rate sheet [Rate schedule E-19 (FTA Rates), effective 9/1/2006 to 12/31/2006].

- Two pumping scenarios were examined: pump 0.6 MGD 24-hours per day, and pump 1.2 MGD 12 hours per day (during non-peak times.)

- Combined motor/pump efficiency was estimated at 50%.

- I assumed 80% of the applied water would infiltrate to the District's aquifer. The remainder is lost to evaporation or "leakage" from the targeted aquifer.

- The sensitivity of the results to changes in energy costs was examined by increasing the energy costs by 50% and re-running the analyses.

Results (see attached spreadsheet.)

1. All costs are in 2006 dollars.

2. The least-cost alternative involves 24-hour per day pumping through an 8" pipe to the closest location (Area 3).

3. Capital costs total $2.33 million. Financed with a 30-year bond at 5% this equals $144,000 annually. The largest share of this cost (87%) is for the installation of the pipeline.

4. Energy costs are $5900 annually.

5. Cost of recharged water = $565 per acre-foot.

6. The most-cost alternative involves 12-hour per day pumping through a 12-inch pipe to the most distant location (Area 1), with a per-acre-foot cost of $907.

7. Increasing the energy cost by 50% does not change the choice of least-cost alternative.

Next Steps:

1. Select sites in Area 3 based on owner's intention to develop. (Assumption: New developments will be required to build on-site stormwater detention basins.)

2. Contact owners to determine likelihood of cooperation.

3. Perform an environmental assessment of the project. Evaluate hydrogeologic impacts including:

    - Impact to water quality within the aquifer (i.e., How will concentrations of salts, nitrates, and other constituents of concern change as the result of the proposed project?)

    - Potential for "mounding" of groundwater to reduce effectiveness of the "dual use" basins. (i.e., What is a conservative annual rate

of treated wastewater application that will not reduce each basin's ability to percolate stormwater?)

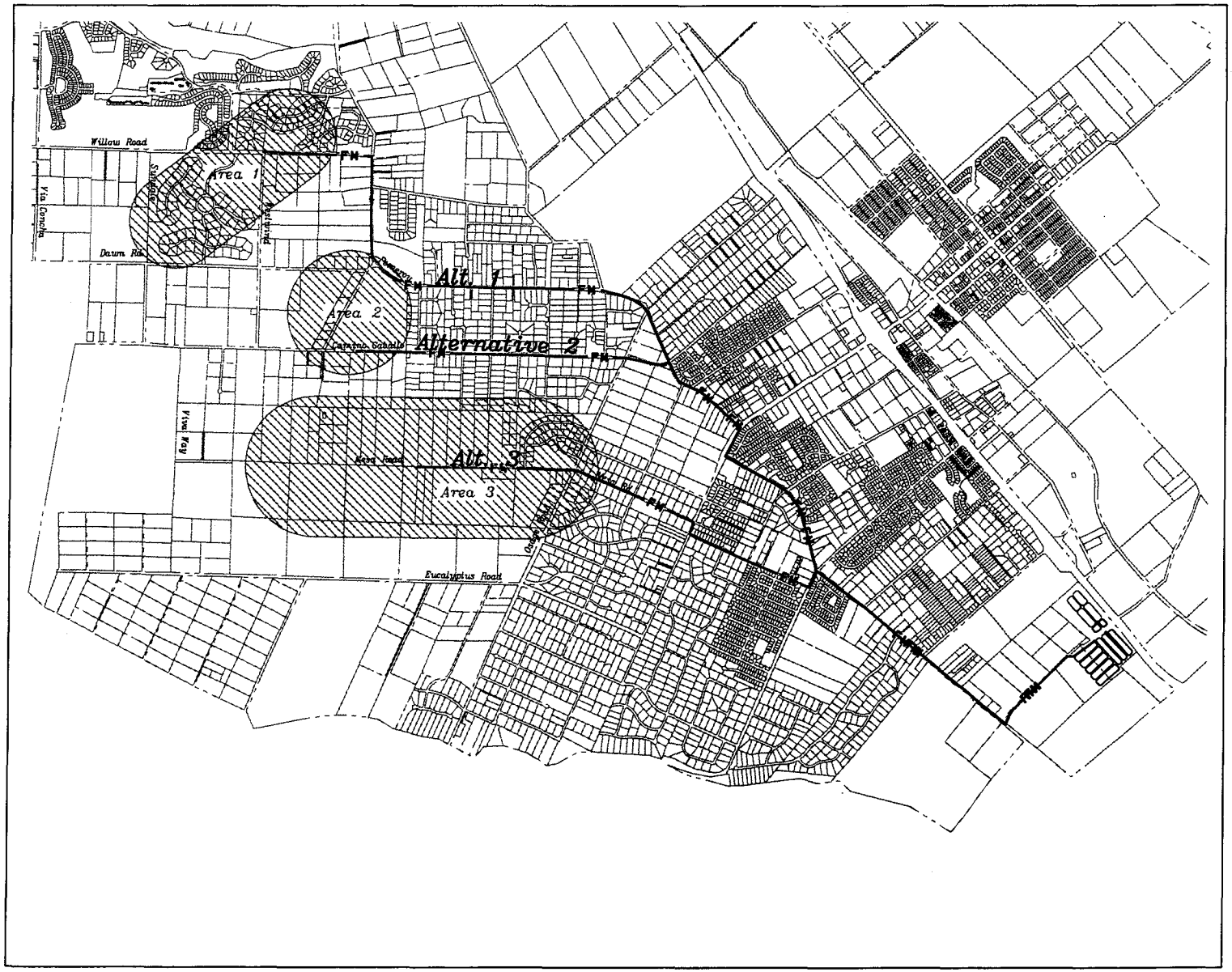
Information Sources :

USDA, 2006, Natural Resources Conservation Service, Soil Survey maps created via http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

DWR, 2002, Water Resources of the Arroyo Grande - Nipomo Mesa, California Department of Water Resources, Division of Planning and Local Assistance, Southern District, http://www.dpla.water.ca.gov/sd/water_quality/arroyo_grande/arroyo_grande-nipomo_mesa.html

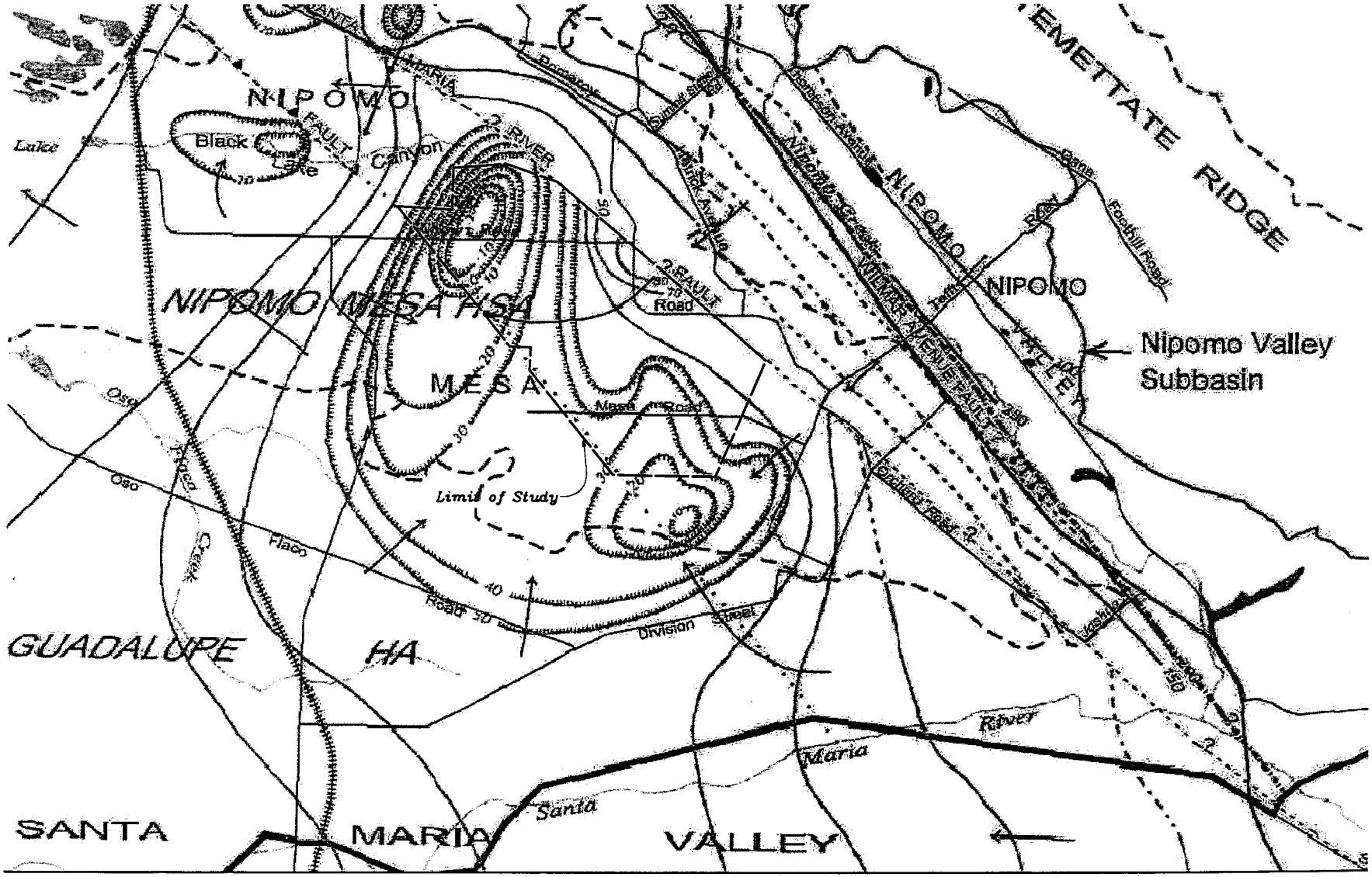
MetroScan, 2006, San Luis Obispo County Assessor's Data accessed through MetroScan (computer application), Version 3.7.0, First American Real Estate Solutions, L.P.

PG&E, 2006, Electrical rates from http://www.pge.com/tariffs/electric.shtml#COMMERCIAL, Comm'l_060901-061231.xls



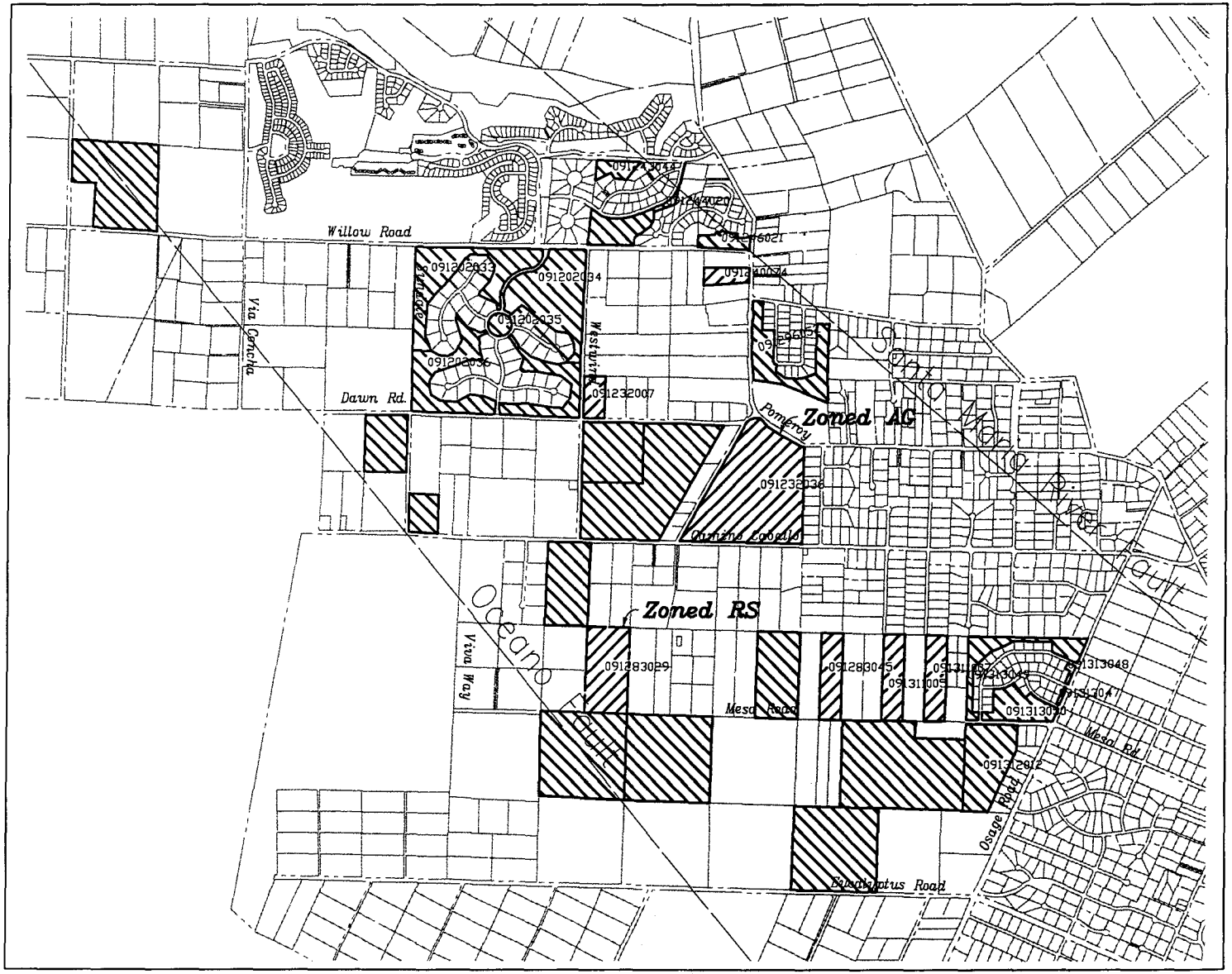
Screening for Additional Locations for Groundwater Recharge Pipe Alignment Alternatives.

Figure 4.



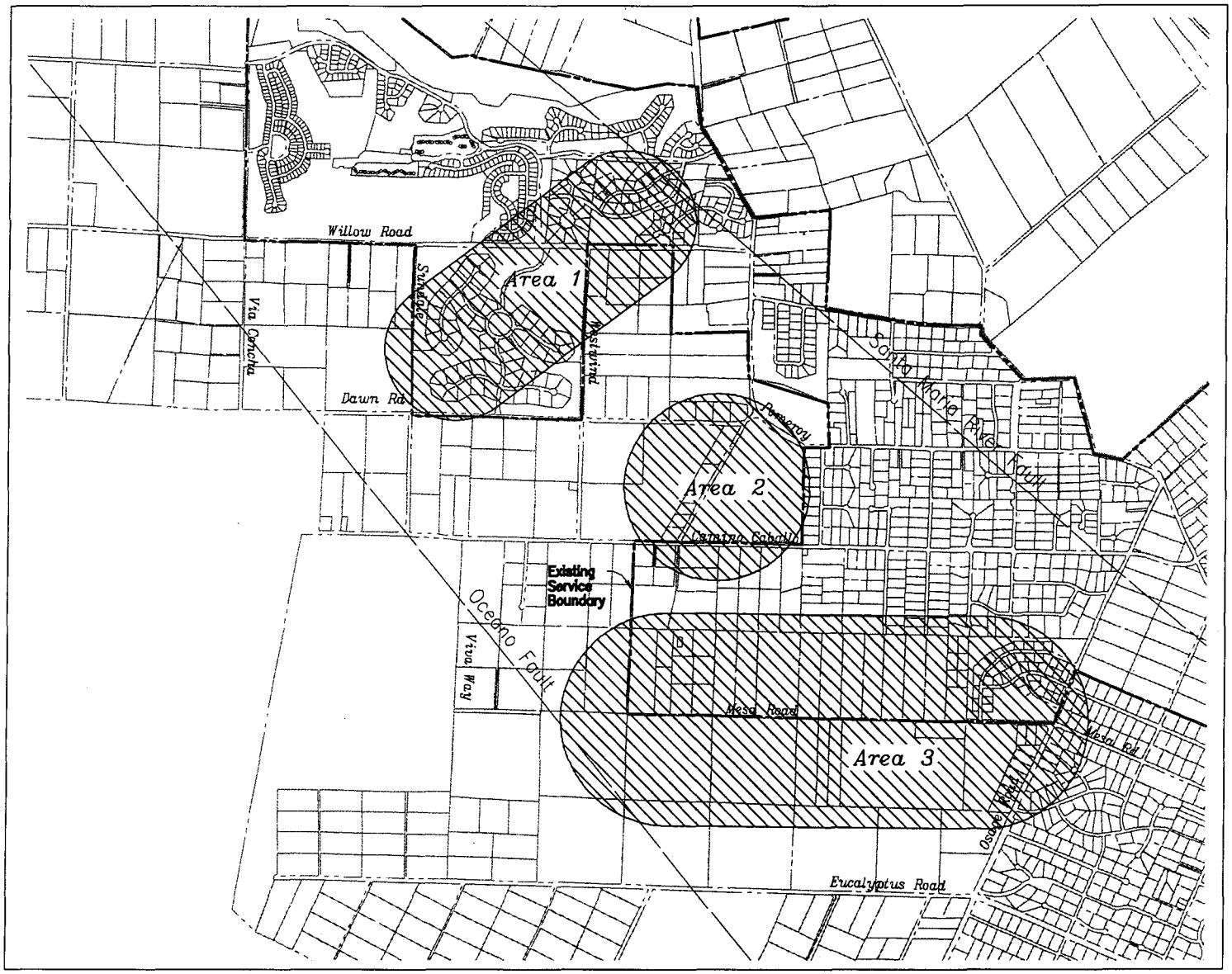
Screening for Additional Locations for Groundwater Recharge
Limit of Study Area in Relation to Spring 1995 Groundwater Elevations

Figure 1b.



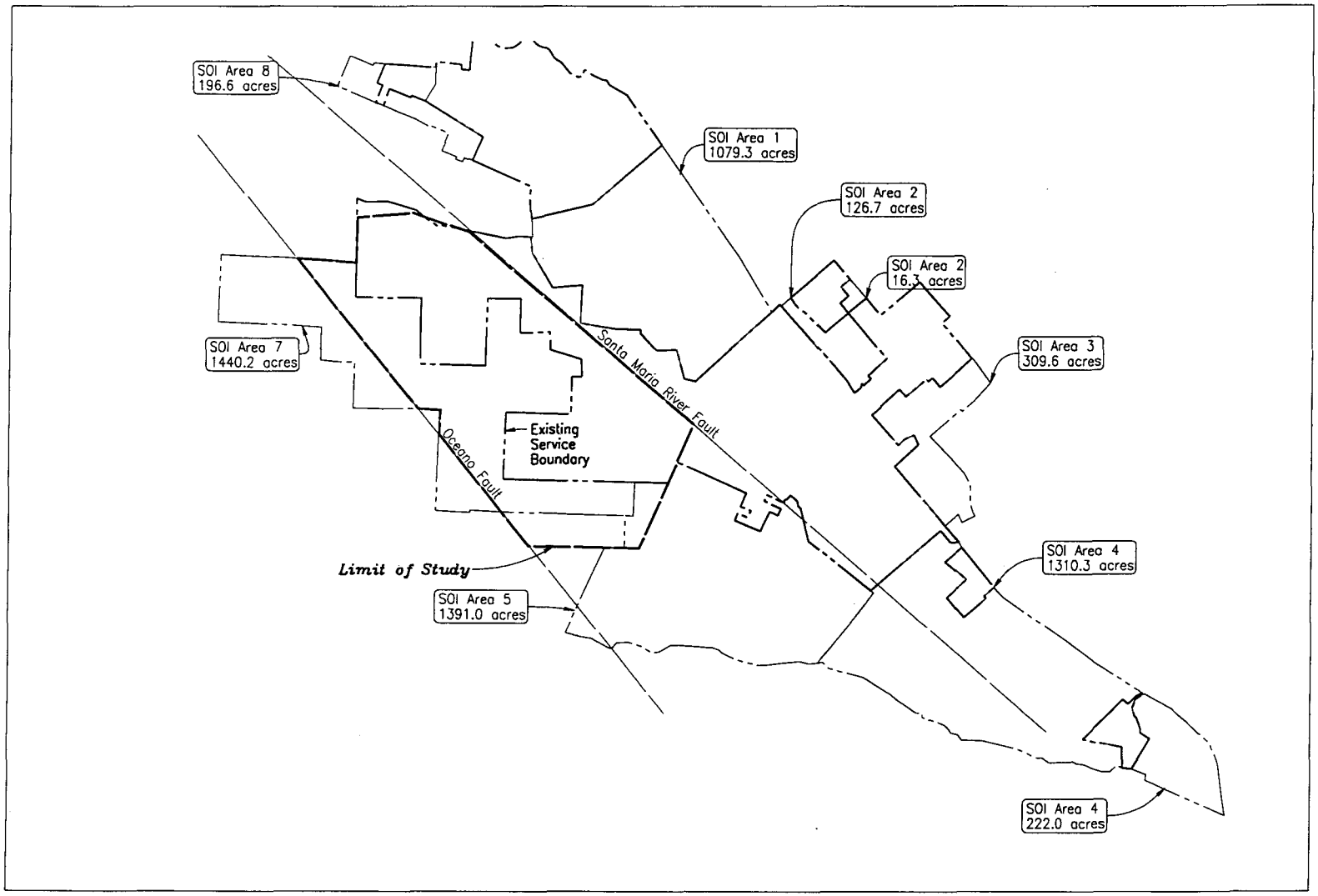
Screening for Additional Locations for Groundwater Recharge
Parcels appearing to satisfy size and land use criteria.

Figure 2.



Screening for Additional Locations for Groundwater Recharge
Locations where parcels appear to satisfy land use and size criteria.

Figure 3.



Screening for Additional Locations for Groundwater Recharge
Limit of Study Area in Relation to Existing Service Boundary and SOI Areas

Figure 1a.

Pacific Gas and Electric Company
Bundled Commercial/General Service Electric Rates at a Glance

Rates Effective:
September 1, 2006, to Present

Rate Schedule	Customer Charge	Optional Meter Data Access Charge	Season	Time-of-Use Period	Demand Charge (per kW)			Time-of-Use Period	Total Energy Charge[1] (per kWh)			Average Total Rate[2] (per kWh)
A-1 Basic general service rate. Generally optimal rate for customers with low electric use and low load factors, with most usage during PG&E's peak and partial peak TOU periods.	Single Phase Service per meter/day =$0.26612 Polyphase Service per meter/day =$0.39425		Summer						$0.18349			$0.16727
			Winter						$0.13456			
A-6 Rates vary according to the time of day electricity is used. Typically, the A-6 rate benefits customers who use a significant percentage of their electricity during the off peak period.	Single phase service per meter/day =$0.26612; Polyphase service per meter/day =$0.39425. Plus Meter charge =$0.20107per day for A6 or A6X; =$0.05914 per day for A6W[3]		Summer					On peak	$0.31618			$0.13918
								Part Peak	$0.15738			
								Off Peak	$0.09511			
			Winter					Part Peak	$0.13915			
								Off Peak	$0.10376			
					Secondary	Primary	Transmission		Secondary	Primary	Transmission	
A-10 (Non-FTA Rates) Customers with high electric use and medium to high load factors generally benefit under Schedule A-10. Part of a customer's bill varies according to the customer's maximum monthly	$3.05215 per meter per day	$0.98563 per meter per day	Summer		$10.83	$10.22	$7.25		$0.12410	$0.12446	$0.11701	$0.14299
			Winter		$5.64	$5.14	$3.31		$0.09423	$0.09381	$0.08998	
A-10 (FTA Rates) Customers with high electric use and medium to high load factors generally benefit under Schedule A-10. Part of a customer's bill varies according to the customer's maximum monthly electric			Summer		$10.83	$10.22	$7.25		$0.12899	$0.12935	$0.12190	
			Winter		$5.64	$5.14	$3.31		$0.09912	$0.09870	$0.09487	
A-10 TOU (Non-FTA Rates) Customers with high electric use and medium to high load factors generally benefit under Schedule A-10 TOU. Part of a customer's bill varies according to the customer's maximum monthly electric demand.			Summer		$10.83	$10.22	$7.25	Peak	$0.14300	$0.14280	$0.13619	Secondary $0.14305
								Part-Peak	$0.13185	$0.13275	$0.12566	
								Off-Peak	$0.10897	$0.10937	$0.10124	
			Winter		$5.64	$5.14	$3.31	Part-Peak	$0.10258	$0.10163	$0.09822	Primary $0.13678
								Off-Peak	$0.08596	$0.08606	$0.08182	
A-10 TOU (FTA Rates) Customers with high electric use and medium to high load factors generally benefit under Schedule A-10 TOU. Part of a customer's bill varies according to the customer's maximum monthly electric demand.			Summer		$10.83	$10.22	$7.25	Peak	$0.14789	$0.14769	$0.14108	Transmission $0.12490
								Part-Peak	$0.13674	$0.13764	$0.13055	
								Off-Peak	$0.11386	$0.11426	$0.10613	
			Winter		$5.64	$5.14	$3.31	Part-Peak	$0.10747	$0.10652	$0.10311	
								Off-Peak	$0.09085	$0.09095	$0.08671	
E-19 (Non-FTA Rates) Offers demand-metered time-of-use (TOU) service. Customers likely to benefit have high electric use and high load factors and are able to use significant percentages of their electricity during the off-peak period. There are optio	Meter charge: =$3.22956/day for E19 V or X; =$3.08763/day for E19W[3]; =$9.03491/day for E19S mandatory; =$13.14168/day for E19P mandatory; =$34.18086/day for E19T mandatory	$0.98563 per meter per day	Summer	Max. Peak	$14.72	$10.38	$10.46	Peak	$0.13799	$0.12912	$0.09893	Secondary $0.13196
				Part Peak	$3.51	$2.38	$2.42	Part Peak	$0.10016	$0.09652	$0.08980	
				Maximum	$7.03	$5.10	$3.58	Off Peak	$0.07097	$0.06909	$0.06864	
			Winter	Part Peak	$1.83	$0.75	$0.00	Part Peak	$0.09182	$0.08719	$0.08597	Primary $0.11630
				Maximum	$7.03	$5.10	$3.58	Off Peak	$0.07442	$0.07228	$0.07175	
E-19 (FTA Rates) Offers demand-metered time-of-use (TOU) service. Customers likely to benefit have high electric use and high load factors and are able to use significant percentages of their electricity during the off-peak period. There are optional			Summer	Max. Peak	$14.72	$10.38	$10.46	Peak	$0.14288	$0.13401	$0.10382	
				Part Peak	$3.51	$2.38	$2.42	Part Peak	$0.10505	$0.10141	$0.09469	
				Maximum	$7.03	$5.10	$3.58	Off Peak	$0.07586	$0.07398	$0.07353	Transmission $0.10818
			Winter	Part Peak	$1.83	$0.75	$0.00	Part Peak	$0.09671	$0.09208	$0.09086	
				Maximum	$7.03	$5.10	$3.58	Off Peak	$0.07931	$0.07717	$0.07664	

[1] Legislated 10% reduction on bill for A-1 and A-6 customers (and some A-10 customers) was discontinued effective January 1, 2006.

[2] Average rates based on estimated forecast. Average rates provided only for general reference, and individual customer's average rate will depend on its applicable kW, kWh, and TOU data.

[3] Effective May 1, 2006, the voluntary TOU one time reprogramming charge of $87 if there is a TOU meter already present, and one time $443 meter installation charge if there is no TOU meter, were eliminated. The lower daily TOU meter charge continues to apply to customers who were on Rate W as of May 1, 2006. Rate X applies to all other customers.

Note: **Summer** Season: May-October **Winter** Season: November-April

This table provided for comparative purposes only. See current tariffs for full information regarding rates, application, eligibility and additional options.

W/O WWTF upgrade ↓
W/O Land

8" @ .6 24 hrs/day

8" @ 1.2 12 hrs/day

12" @ .6 24 hrs/Day

12" @ 1.2 12 hrs/day

Alternatives Amortized Capital

Alternative	Alt loc-dia-Q Alt 1-8-6	Alt 2-8-6	Alt 3-8-6	Alt 1-8-12	Alt 2-8-12	Alt 3-8-12	Alt 1-12-6	Alt 2-12-6	Alt 3-12-6	Alt 1-12-12	Alt 2-12-12	Alt 3-12-12
length (ft)	28150	22529	19016	28150	22529	19016	28150	22529	19016	28150	22529	19016
inlet elevation	302	302	302	302	302	302	302	302	302	302	302	302
outlet elevation	325	310	316	325	310	316	325	310	316	325	310	316
diameter (in) →	8	8	8	8	8	8	12	12	12	12	12	12
flow rate (MGD)	0.6	0.6	0.6	1.2	1.2	1.2	0.6	0.6	0.6	1.2	1.2	1.2
kilowatts	17.43	12.735	12.105	98.265	75.615	67.59	6.915	4.155	4.95	22.62	15.375	15.87
hour per day	24	24	24	12	12	12	24	24	24	12	12	12
average energy price	$ 0.10113	$ 0.10113	$ 0.10113	$ 0.07829	$ 0.07829	$ 0.07829	$ 0.10113	$ 0.10113	$ 0.10113	$ 0.07829	$ 0.07829	$ 0.07829
Average demand charge	$ 7.93	$ 7.93	$ 7.93	$ 6.74	$ 6.74	$ 6.74	$ 7.93	$ 7.93	$ 7.93	$ 6.74	$ 6.74	$ 6.74
TDH (ft)	111	81	77	313	241	215	44	27	32	72	49	51
Wet Well Cost	240000	240000	240000	240000	240000	240000	240000	240000	240000	240000	240000	240000
Pump cost	60000	60000	60000	60000	60000	60000	60000	60000	60000	60000	60000	60000
pipe cost ($/foot)	$ 106.57	$ 106.57	$ 106.57	$ 106.57	$ 106.57	$ 106.57	$ 124.48	$ 124.48	$ 124.48	$ 124.48	$ 124.48	$ 124.48
Energy Costs												
energy cost per day	42.30	30.91	29.38	92.32	71.04	63.50	16.78	10.08	12.01	21.25	14.44	14.91
demand cost per month	$ 138.15	$ 100.94	$ 95.94	$ 661.98	$ 509.39	$ 455.33	$ 54.81	$ 32.93	$ 39.23	$ 152.38	$ 103.58	$ 106.91
Annual energy cost	$ 8,443.64	$ 6,169.23	$ 5,864.04	$ 20,589.64	$ 15,843.75	$ 14,162.25	$ 3,349.84	$ 2,012.81	$ 2,397.93	$ 4,739.61	$ 3,221.55	$ 3,325.27
30-year energy cost	$ 253,309.07	$ 185,076.94	$ 175,921.19	$ 617,689.27	$ 475,312.41	$ 424,867.63	$ 100,495.25	$ 60,384.35	$ 71,938.03	$ 142,188.28	$ 96,646.54	$ 99,758.09
Capital Costs												
Pipe	$ 3,000,059.61	$ 2,401,006.85	$ 2,026,612.20	$ 3,000,059.61	$ 2,401,006.85	$ 2,026,612.20	$ 3,504,067.85	$ 2,804,374.58	$ 2,367,081.85	$ 3,504,067.85	$ 2,804,374.58	$ 2,367,081.85
Wet well+Pumps	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00
Total Capital Cost	$ 3,300,059.61	$ 2,701,006.85	$ 2,326,612.20	$ 3,300,059.61	$ 2,701,006.85	$ 2,326,612.20	$ 3,804,067.85	$ 3,104,374.58	$ 2,667,081.85	$ 3,804,067.85	$ 3,104,374.58	$ 2,667,081.85
Bond Interest Rate	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Annual Bond Cost	$204,451.06	$167,337.50	$144,142.35	$204,451.06	$167,337.50	$144,142.35	$235,676.26	$192,327.64	$165,235.72	$235,676.26	$192,327.64	$165,235.72
Total Annual Cost	$ 212,894.70	$ 173,506.73	$ 150,006.39	$ 225,040.70	$ 183,181.24	$ 158,304.60	$ 239,026.10	$ 194,340.45	$ 167,633.65	$ 240,415.87	$ 195,549.19	$ 168,560.99
Total 30-year Cost	$ 6,386,840.89	$ 5,205,201.85	$ 4,500,191.55	$ 6,751,221.08	$ 5,495,437.33	$ 4,749,137.99	$ 7,170,783.04	$ 5,830,213.54	$ 5,029,009.52	$ 7,212,476.07	$ 5,866,475.73	$ 5,056,829.58
Recharge												
30 yr Water Pumped (MG)	3240	3240	3240	3240	3240	3240	3240	3240	3240	3240	3240	3240
30 yr water pumped (af)	9943	9943	9943	9943	9943	9943	9943	9943	9943	9943	9943	9943
percent infiltrated	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
af infiltrated	7955	7955	7955	7955	7955	7955	7955	7955	7955	7955	7955	7955
cost per acre-foot infiltrated	$ 802.92	$ 654.37	$ 565.74	$ 848.72	$ 690.85	$ 597.03	$ 901.47	$ 732.94	$ 632.22	$ 906.71	$ 737.50	$ 635.72
Minimum Cost			minimum									

Area 1 Willow 603
Area 2 Eclallo 654
Area 3 Mesa 566