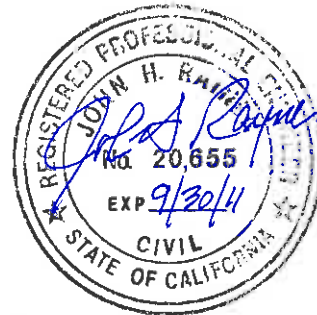


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**Final
Engineering Feasibility
Report for Recycled Water
Service to
Pasatiempo Golf Course**

March 2010



Prepared for

Scotts Valley Water District
P.O. Box 660006
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K/J Project No. 0988014*00

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Section 1: Introduction

1.1 General

This report evaluates the treatment and storage facilities necessary to provide Title 22 recycled water service, for unrestricted use, to the Pasatiempo golf course. In addition Pasatiempo has requested that the report address the additional treatment necessary to reduce the TDS (total dissolved solids) in the recycled water to a level approaching that of its existing potable water supply from the City of Santa Cruz.

The project includes intercepting flow in the outfall pipeline that conveys secondary treated effluent from the Scotts Valley Wastewater Treatment plant. The flow will be intercepted near the intersection of Graham Hill Road and Sims Road. The flow will then be piped to a site behind the 13th green where the treatment and storage facilities will be located. An irrigation pump station on the site will then pump the treated recycled water along with groundwater from an onsite well into the golf course irrigation system. The objective of this report is to develop the project in sufficient detail to allow the CEQA process to begin.

1.2 The Project

The Scotts Valley Water District (District) currently has a recycled water system in Scotts Valley that serves over 25 irrigation customers. The alternative of extending the District's system to Pasatiempo was initially considered but because of the high cost of the pipeline needed and the additional level of treatment required at Pasatiempo this alternative was not selected. Instead it was decided to treat secondary effluent from the Scotts Valley Wastewater Treatment Plant (WWTP).

The project will intercept secondary effluent from the outfall pipeline in Graham Hill Road for treatment at the site behind the 13th green. Because the flow of secondary effluent varies throughout the day an equalization tank will be provided to allow the treatment plant to operate at uniform flowrate to provide up to 200,000 gallons per day (gpd) of recycled water for irrigation. An additional 100,000 gpd of groundwater will be provided by a future well at Pasatiempo. Both the recycled water and the groundwater will be combined to deliver up to 300,000 gpd of water for irrigation. In addition there will be an emergency connection to the Santa Cruz potable water system.

The recycled water treatment process will include micro filtration for tertiary treatment of the secondary effluent, reverse osmosis (RO) to reduce TDS, followed by UV for disinfection. Depending on the desired TDS reduction, a portion of the tertiary treated water will bypass RO treatment.

The treated recycled water and groundwater from the well will be stored in underground tanks before being pumped to the golf course irrigation system.

Electrical service will provided from a PG&E power line on Graham Hill Road. Water service will be from a City of Santa Cruz water main in Sims Road. Sewer service will be provided by a new County of Santa Cruz sewer just constructed in Graham Hill Road.

The report discusses the reliance of both the District's existing recycled water system and the proposed Pasatiempo recycled water project on the Scotts Valley WWTP as their source of water. A review of current and future demand for recycled water revealed that there will be times during the peak summer irrigation season when the recycled water demand will out strip supply and the systems will have to be supplemented by potable water or Pasatiempo well water. The report addresses the desirability of being able to return the concentrate from the RO process back to the outfall pipeline. Because the outfall pipeline flows to the ocean, implementing this will require discussions with the Regional Water Quality Control Board and possibly a new discharge (NPDES) permit.

1.2.1 Creating an Economically Viable Project

The District is considering this project as an integral part of its proposed water exchange with the City of Santa Cruz. The water exchange would provide the District with potable water from Santa Cruz during the winter, when Santa Cruz has excess surface water available, in exchange for the District providing recycled water for irrigating the Pasatiempo golf course, one of Santa Cruz's largest potable water customers. In order to facilitate this exchange a Pasatiempo Recycled Water project would need to be implemented and an intertie pipeline and booster pump station would need to be constructed to connect the District's water system with the Santa Cruz water system.

To make the investment required to implement this exchange economically viable for the District, Pasatiempo will have agree to use a minimum amount annually of recycled water. Conversely to make the recycled water project economically viable for Pasatiempo, the District will need to assure Pasatiempo that it will provide a minimum amount of secondary effluent to Pasatiempo's recycled water treatment plant. Providing an agreement with these two "guarantees" will ensure that this project is a WIN-WIN for both the District and Pasatiempo. From a technical and engineering standpoint this is a feasible project that will benefit the District, Pasatiempo and the City of Santa Cruz.

Section 2: Source and Availability of Secondary Effluent and Permitting Considerations

The proposed source of water for the Pasatiempo Recycled Water Plant (RWP) is disinfected secondary effluent from the City of Scotts Valley Wastewater Reclamation Facility (WWTP). Disinfected secondary effluent from the Scotts Valley plant is pumped to the City of Santa Cruz via a pipeline located within Graham Hill Road where it is combined with disinfected secondary effluent from the City of Santa Cruz Wastewater Treatment Plant and discharged to the Pacific Ocean. The pipeline in Graham Hill Road is also known as the Scotts Valley force main or outfall. Secondary effluent would be brought to the site of the Pasatiempo RWP from the Scotts Valley force main via a new pipeline constructed in Sims Road. The new pipeline would connect to the existing Scotts Valley force main at the intersection of Sims Road and Graham Hill Road and would extend approximately 500 feet eastward up Sims Road to a point of connection with the RWP.

The Scotts Valley WWTP is owned and operated by the City of Scotts Valley (City). The WWTP is a conventional activated sludge wastewater treatment facility with a design dry weather treatment capacity of 1.5 million gallons per day (mgd) and a design peak wet weather treatment capacity of 5.0 mgd. Major facilities at the WWTP include an influent pump station, a flow equalization structure with 0.9 MG of storage capacity, two aeration basins with fine-bubble diffuser panels, two secondary clarifiers, a chlorine contact tank and an effluent pump station. The plant also includes a tertiary treatment facility with a design treatment capacity of 1.0 mgd. The facility is used to treat secondary effluent to California Department of Public Health (CDPH) Title 22 standards for distribution by the SVWD as tertiary disinfected recycled water for unrestricted use within the SVWD's service area. Tertiary treatment plant processes include chemical coagulation and flocculation, filtration, denitrification, and ultraviolet (UV) disinfection.

Only a portion of the plant's secondary effluent is currently treated for use as recycled water within the SVWD's service area. In 2008, the City of Scotts Valley's plant experienced an average influent flow of 0.80 mgd during the dry-weather months of May through September. During this time period, an average of 0.57 mgd was discharged as secondary effluent via the pipeline to Santa Cruz (71% of the average influent flow) and an average of 0.23 mgd was distributed as recycled water within the SVWD's service area (29% of the average influent flow). During the remainder of 2008, the WRF experienced an average influent flow of 0.93 mgd of which an average of 0.87 mgd was discharged as secondary effluent (94% of the average influent flow) and an average of 0.06 mgd was delivered as recycled water (6% of the average influent flow). Figure 2-1 shows the monthly inflows to the WRF, secondary effluent to the ocean outfall, and recycled water production for 2008.

The rate of flow through the Scotts Valley force main varies throughout the day. The variation is dependent on the rate of flow into the WRF, the use of the equalization tank at the WRF, and the rate of recycled water production for use within the SVWD's service area. Figure 2-2 shows a typical diurnal pattern for secondary effluent flowrates for early September 2008. As indicated in Table 2-1, the Scotts Valley WRF discharged an average of approximately 570,000 gallons per day of secondary effluent during the months of July through September 2008.

Table 2-1: Typical Secondary Effluent Flows During 2008 Irrigation Season

	Secondary Effluent Flow, MGD					
	Daily Total			Daily Peak		
	Min	Avg	Max	Min	Avg	Max
July 2008	0.24	0.52	0.72	1.06	1.49	2.23
August 2008	0.20	0.57	1.09	1.00	1.52	2.35
September 2008	0.41	0.61	0.79	0.99	1.56	3.40
Average	0.28	0.57	0.87	1.02	1.52	2.66

2.1 Evaluation of Availability of Secondary Effluent for Pasatiempo

As described in the May 2009 Facilities Planning Report for recycled water, the amount of wastewater processed at the City of Scotts Valley Wastewater Treatment Plant (WWTP) may be insufficient at times to continuously meet the irrigation needs of current and future recycled water customers.

It appears that this future limitation in supply could occur for brief periods when the existing recycled water system in Scotts Valley is extended to serve additional customers who could be economically served by the District (designated as Category A, B, C & D customers shown in the enclosed Table 2-2, which is an update of Table 8-1 from the Facilities Planning Report), and when the Pasatiempo recycled water project is implemented.

To minimize the possibility of periodic shortfalls of recycled water, Pasatiempo is planning to develop an irrigation well that would supply about 100,000 gpd of its irrigation demand and thereby reducing its need for recycled water during the peak irrigation season to about 200,000 gpd. Because the level of dissolved salts in recycled water would be significantly higher than in water the golf course has historically used for irrigation, supplied by the City of Santa Cruz, Pasatiempo has determined that it needs to have the level of dissolved salts lowered. Reverse osmosis (RO) treatment will be incorporated in the treatment process at Pasatiempo to lower the level of dissolved salts. RO treatment will require about 250,000 gpd of secondary effluent from the outfall pipeline to produce 200,000 gpd of water for irrigation (the additional 50,000 gpd will either be returned back to the outfall pipeline as higher salt concentrate from the RO treatment process or discharged to the sewer). During periods of high recycled water demand there may be less than 250,000 gpd of secondary effluent available in the outfall pipeline requiring Pasatiempo to either rely on water in its irrigation storage tanks to make up the difference or to add City of Santa Cruz potable water to its irrigation storage tanks.

As a part of this study we took a closer look at the demand of the District's existing recycled water customers. The enclosed Table 2-3, which is an update of Table 6-1 from the Facilities Planning Report, is based on metered recycled water use during August 2007 which totaled 317,000 gpd (included this figure is the estimated use for Vineyards Residential Association which was converted to recycled water after August 2007). We compared the figures in Table 2-3 with the monthly production of recycled water at the plant from 2006 to 2008 to determine that the highest month of recycled water production was in August 2007, with 8,574,000 gallons or

an average of 276,600 gpd of recycled water produced (even though Vineyards Residential Association was not a recycled water customer in August 2007). This indicates that the figures in Table 2-3 are either conservative and don't reflect the increased conservation of recycled water that has occurred since then or there are some issues related to metering recycled water. Since the Facilities Planning Report was prepared several new customers for the District's recycled water system have been identified and some past metering errors have been discovered and resolved. Accordingly Table 2-2 and 2-3 have been updated to reflect this new information.

Table 2-4 is a spreadsheet that estimates the future availability of recycled water for the District's recycled water system including the projected use of secondary effluent for RO treatment at Pasatiempo. As can be seen in the Table, the water resources at the City of Scotts Valley's WWTP appear to be sufficient to meet most of the needs of the District's future recycled water customers and of Pasatiempo. The supplement needed during the peak irrigation months of June and July can be met with groundwater from Pasatiempo's planned 100,000 gpd well. It should be recognized that this analysis is based on the projected average daily use during each month and that there will be peak days within each month with higher irrigation demands which could require supplementing the available supply of recycled water with recycled water in storage and/or by the addition of potable water.

Regarding the available supply of recycled water, it's noted that Spring Lakes the District's largest customer, using almost 30% of all recycled water currently produced, uses recycled water to fill its lake. This is seemingly not the highest and best use of recycled water since it does not result in an equivalent savings of potable water, unlike the District's other recycled water customers. Accordingly the District may want to consider restricting this customer's use of recycled water when supplies of recycled water are limited or requiring that the lake be lined.

Another major user of groundwater in the District and potential customer of recycled water is the Valley Gardens Golf Course. The golf course has its own well for irrigation. Using an aerial map we estimated that this 9 hole executive golf course irrigates about 8 acres of turf. To estimate its irrigation demand we took the estimated monthly water demand at Pasatiempo developed by BTG Golf, for irrigating Pasatiempo's 68 acres of turf and reduced the estimate proportionally for the 8 acres at Valley Gardens. When this estimated demand for Valley Gardens is added to the figures in the Table 2-1 it increases the shortfall of recycled water from two months to three (June, July & August). However the shortage could be easily offset by supplementing recycled water with groundwater from either the future well at Pasatiempo or the Valley Gardens well. Because Valley Gardens Golf Course is currently irrigated with its own well water its costs for irrigation are quite low (primarily the costs of power for the well pump). In order to make it attractive for the golf course to switch to recycled water the District would need to reduce its cost for recycled water to Valley Gardens Golf Course significantly. Also providing recycled water to Valley Gardens Golf Course may only be for the short term as this high value property could soon be developed for housing or other purposes.

The District is in the unique position of facing the possibility of having its recycled water demand exceed its ability to produce recycled water during short periods of high irrigation demand. This raises the question of should the District consider eventually connecting more customers to its recycled water system than it can reliably supply during peak irrigation periods or should it limit its recycled water customers to only those that can always be supplied with recycled water.

Providing recycled water service to more customers than there is supply requires the District to add potable water to its recycled water tank in order to continue providing service. However by adding potable water to meet these peak periods the District would still benefit by reducing its overall potable water demand. For instance, if serving additional customers required the District to supplement its recycled water supply to those customers 10% of the time, it would still be saving its potable water resources the other 90% of the time. Conversely if those customers were not served recycled water they would continue to use potable water 100% of the time. The question of how far to extend the recycled water system may actually be more of an economic question than a question of a limited supply.

2.2 Permitting Considerations

2.2.1 Relevant Existing Permits

The Scotts Valley WWTP is currently regulated under National Pollutant Discharge Elimination System (NPDES) Permit No. CA0048828 (Waste Discharge Requirements Order No. R3-2007-0013), for disposal of secondary treated effluent to the Pacific Ocean. Secondary effluent from the Scotts Valley WWTP is combined with secondary effluent from the City of Santa Cruz WWTP on land prior to being discharged to the Pacific Ocean via an ocean outfall. The City of Santa Cruz WWTP is currently regulated under NPDES Permit No. CA0048194 (Waste Discharge Requirements Order No. R3-2005-0003). The flow from the Scotts Valley WWTP is estimated to be less than 10 percent of the total flow in the outfall.

Effluent limitations included in the NPDES permit for the City of Scotts Valley plant are for typical parameters associated with secondary treatment of wastewater including Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS). Both of these parameters are limited to 30 mg/L on an average monthly basis and 90 mg/L on a maximum basis. Other effluent limitations are for parameters such as pH, settleable solids, turbidity, total and fecal coliform, and chronic and acute toxicity. Compliance with the effluent limitations is required at Discharge Point 001 (located at 36°56'08" N Latitude and 122°04'08" W Longitude or about 1 mile offshore and south west of Santa Cruz) via measurements at Monitoring Location EFF (identified to be the point of effluent discharge to the outfall). The City of Scotts Valley routinely monitors for compliance immediately ahead of the plant's effluent pumps located at the end of the Chlorine Contact Tank with the exception of chlorine; chlorine is monitored at the land-based junction box where effluent from the Scotts Valley plant is combined with effluent from the City of Santa Cruz WWTP.

Effluent limitations included in the NPDES permit for the City of Santa Cruz are for parameters similar to those included in the NPDES permit for the City of Scotts Valley. The City of Santa Cruz is required to monitor compliance with their NPDES permit by monitoring of the ocean at points upstream and downstream of the outfall pipeline, the terminus of which is located at 36°56'02.94" N Latitude and 122°04'23.05" W Longitude which is a point near the Scotts Valley WWTP Discharge Point 001.

In addition to the NPDES permit described above, the Regional Water Quality Control Board (RWQCB) has also issued Master Water Recycling Requirements (Producer) Order No. 01-066 to the City of Scotts Valley. The primary objectives of this order are to permit the reuse of tertiary treated domestic wastewater, develop discharge limits and develop a monitoring program to evaluate the impact to water quality. This permit was issued for the water recycling

facility located in the City of Scotts Valley used to treat secondary effluent to Title 22 standards for delivery to the SVWD distribution system.

Further, the RWQCB has issued Master Water Recycling Requirements (Distributor) Order No. 01-067 to the SVWD. The primary objectives of this order are to regulate the reuse of tertiary treated domestic wastewater, develop discharge limits and develop a monitoring program to evaluate potential impacts to water quality. The order was issued for the distribution of recycled water from the Scotts Valley WRF tertiary treatment facility to users throughout the City of Scotts Valley and its vicinity.

2.2.2 Potential Permitting Requirements

It is anticipated that the RWQCB will require that a new permit be obtained for the Pasatiempo recycled water facility for both the production and use of recycled water at Pasatiempo. It does not appear that either of the Master Water Recycling Requirements Orders issued to the City of Scotts Valley or the SVWD would be applicable to the separate treatment facility or to the use of the recycled water at Pasatiempo. In addition, the RWQCB may require modification of the existing NPDES permits for both the City of Scotts Valley and the City of Santa Cruz.

The City of Scotts Valley NPDES permit appears to require compliance at the end of the combined outfall as measured immediately ahead of the WRF effluent pumps prior to discharge to the Scotts Valley force main. The compliance point may need to be changed since the Pasatiempo facility will be located downstream of the Scotts Valley WRF Monitoring Point EFF. The potential exists for the characteristics of the secondary effluent in the Scotts Valley force main to change prior to being discharged at the combined outfall as a result of the operation of the Pasatiempo facility for the following reasons:

- The secondary effluent would be drawn from the Scotts Valley force main and routed through an onsite equalization facility with flow in excess of that used for recycled water returned to the force main. It is unlikely that the characteristics of the secondary effluent would change as a result, but the secondary effluent is no longer contained in a continuous pipe between the Scotts Valley WWTP and the ocean outfall.
- The discharge of reverse osmosis (RO) concentrate (estimated at 4,000 mg/L of total dissolved solids) to the Scotts Valley force main. The impact of this discharge is anticipated to be more pronounced as recycled water use in Scotts Valley and at Pasatiempo increases since the flow of secondary effluent in the Scotts Valley force main downstream of Pasatiempo will decrease, especially during the summertime irrigation season.

Since flow in the Scotts Valley force main is combined with effluent from the Santa Cruz WWTP prior to discharge via the combined ocean outfall, operation of the Pasatiempo facility would impact the characteristics of the effluent discharged, with the RO concentrate being returned to the Scotts Valley force main. The change in effluent by discharging RO concentrate to the force main would benefit the effluent being discharged to the ocean by increasing its salinity. Regardless, the RWQCB may require modification of the NPDES permit for the Santa Cruz WWTP since the Santa Cruz NPDES permit requires monitoring upstream and downstream of the outfall.

The City of Scotts Valley NPDES permit is currently scheduled for renewal in 2012. However, the City of Santa Cruz NPDES permit is currently scheduled for renewal in 2010.

Figure 2-1: Scotts Valley WWTP Flow during 2008

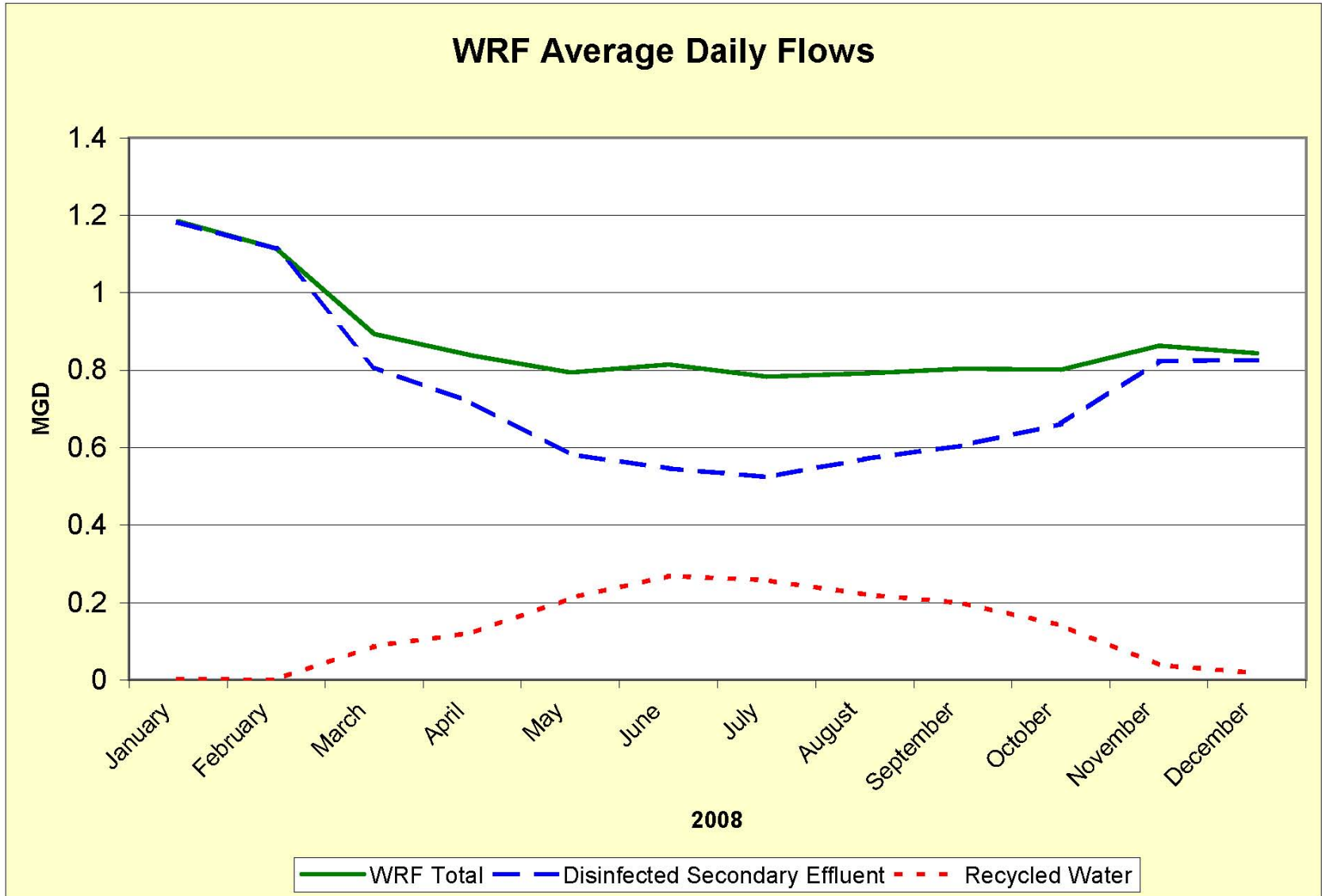


Figure 2-2: Secondary Effluent in Outfall Pipeline

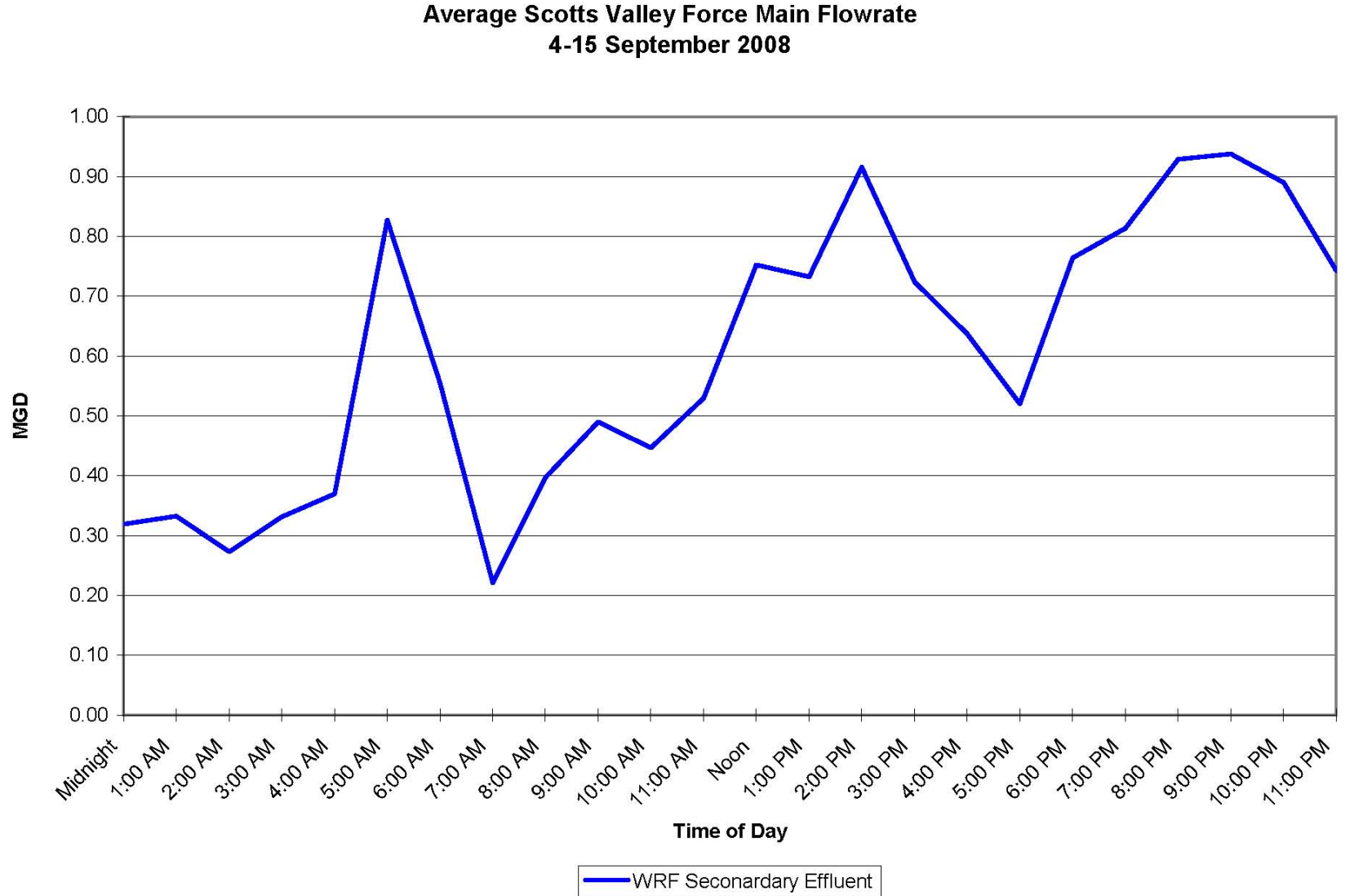


Figure ____

(Source: Facilities Planning Report, 2009)

Table 2-2: Summary of Estimated Potential Demands (Revised Table 8-1)

	Annual Demand ¹ (AFY)	Max Month Average Day (gpd)	Max Month Peak Day ² (gpd)	Peak Hourly ³ (gpm)
Existing Customers	195	317,100	476,000	992
Tier 1 - SVWD Customers				
Category A - Infill Customers	53	82,000	123,000	256
Category C – New Infrastructure (less than ½ mile)	51	86,000	129,000	269
Tier 2 - SVWD Customers				
Category B – Minor Extensions & Mt. Hermon Replacement	28	36,000	54,000	113
Tier 3 - SVWD Customers				
Category D – New Infrastructure (greater than ½ mile)	28	62,000	93,000	194
Category E - Distant and Future Customers	165	285,000	428,000	892
Tier 3 - Santa Cruz Customers				
Category F - Pasatiempo Golf Course ⁴	106	227,000	340,500	709
Category G - Other Santa Cruz Customers	93	121,000	181,500	378
Total	720	1,216,100	1,825,000	3,802

¹Based on Fiscal 07-08 meter data

²Based on max month average day multiplied by a 1.5 peaking factor

³Based on 8 hours of irrigation per day

⁴Recycled water requirement is 28.3 MG/yr (requires 34.4 MG/yr or 106 AFY of secondary effluent)

Table 2-3: Summary of Existing Customer Demands (Revised Table 6-1)

Site ID	Site Name	Annual Demand ¹ (AFY)	Max Month Average Daily Demands ² (gpd)
R1091	McDorsa Park	5.7	9,500
R1142	AOI parking lot	0.3	600
R1254, R3200, R3201	Enterprise Technology Center	24.5	38,300
R2115	Siltanen Park	18.4	22,100
R222	SVWD	0.0	0
R2771	Seagate Technology	0.8	1,400
R309	Vine Hill Elementary	4.9	5,900
R3258	Scotts Valley Square	2.9	3,800
R3633	Acron Cout Apartments	1.8	2,600
R3643	Santa Cruz Medical Clinic	0.4	700
R3645, R3645B	Windward Place HOA	0.3	500
R3656, R3657	Emerald Hills Apartments	3.1	4,400
R3677	Scotts Valley High School	28.3	44,000
R3706	Bean Creek, Erba Ln	0.4	900
R3707	Erba Ln/Civic Center	1.3	2,200
R3754	Mt. Hermon Rd	0.0	0
R3787- A	Skypark	24.6	39,200
R3790	Siltanen Booster - Vineyards	0.2	200
R3873	Spring Lakes	48.9	88,000
R3921, R3922	Glenwood-Scotts Valley HOA	7.7	11,500
R440	Scotts Valley Fire Dept	0.0	0
R457	San Augustine Catholic Church	1.6	2,800
R483	Baymonte Christian School	0.2	300
R960	Hocus Pocus Park	2.2	3,100
R2889, R3018, R3019, R3021	Vineyards Residential Association	16.2	35,100
Existing Customers Subtotal (25 Customers)		194.9	317,100

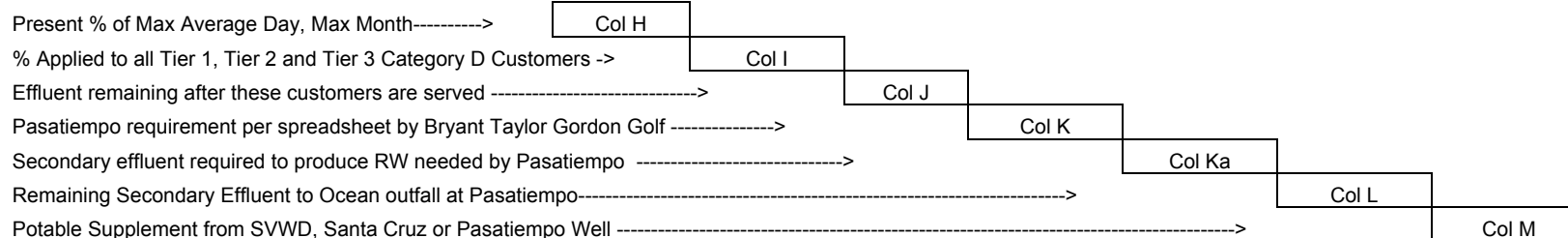
Notes: ¹The Vinyards Residential Association was converted to recycled water in 2008. Recycled water demand estimates are based on historical irrigation water meter data.
² Maximum month is August 2007

Table 2-4: Availability of Recycled Water Supply

2008 Conditions*						Projected Conditions							Column
B	C	D	E	F	G	H	I	J	K	Ka	L	M	
2008 WWTP Report	Total WWTP Flow	Effluent in Outfall	Total WWTP Flow	Total Recycled Flow	SVWD Recycled Flow	Percent of Present 0.317 MGD max	Projected Future 0.583 MGD ¹ max	Projected Future Available Effluent	Use at Pasatiempo	Secondary Effluent Needed for Pasatiempo	Excess Effluent to Ocean Outfall	Potable or Well Water Supplement	
	MG	MGD	MGD	MG	MGD	%	MGD	MGD	MGD	MGD	MGD	MGD	
Jan	36.731	1.182	1.185	0.102	0.003	1.04%	0.006	1.179	0.000	0.000	1.179		
Feb	32.330	1.114	1.115	0.021	0.001	0.24%	0.001	1.114	0.000	0.000	1.114		
Mar	27.709	0.807	0.894	2.680	0.086	27.27%	0.159	0.735	0.024	0.030	0.705		
Apr	25.133	0.716	0.838	3.656	0.122	38.44%	0.224	0.614	0.148	0.188	0.426		
May	24.616	0.583	0.794	6.556	0.211	66.71%	0.389	0.405	0.257	0.326	0.079		
Jun	24.457	0.547	0.815	8.047	0.260	81.89%	0.477	0.338	0.271	0.345	-0.007	0.005	
Jul	24.268	0.525	0.783	8.005	0.258	81.46%	0.475	0.308	0.286	0.363	-0.056	0.044	
Aug	24.566	0.571	0.792	6.879	0.222	70.00%	0.408	0.384	0.262	0.333	0.051		
Sep	24.131	0.606	0.804	5.962	0.199	62.69%	0.365	0.439	0.235	0.298	0.141		
Oct	24.857	0.661	0.802	4.382	0.141	44.59%	0.260	0.542	0.166	0.211	0.331		
Nov	25.883	0.824	0.863	1.156	0.039	12.16%	0.071	0.792	0.000	0.000	0.792		
Dec	26.176	0.826	0.844	0.579	0.019	5.89%	0.034	0.810	0.000	0.000	0.810		

*From SV WRF 2008 Annual Report

Projected Conditions:



Note: ¹ The future projection in column I of 0.583 MGD is the sum of the average daily flows for the maximum month shown in Table 2-2 for existing, Tier1, Tier 2 and Category D Tier 3 customers.

Section 3: Development of Recommended Treatment Process

3.1 Overview of Treatment Requirements

The main treatment objective of the Pasatiempo treatment facility is to produce low-TDS tertiary treated water that meets both Title 22 CCR requirements and Pasatiempo's golf course irrigation requirements. Treatment would include microfiltration (MF) followed by reverse osmosis (RO) to reduce total dissolved solids (TDS) of the recycled water. A portion of the MF filtrate would bypass the RO unit and be blended with the RO permeate to produce more water while still achieving treatment requirements.

3.1.1 Capacity

The treatment plant would be designed to produce 200,000 gpd of recycled water. An additional 100,000 gpd of potable or well water would be added to meet Pasatiempo's total irrigation demand of 300,000 gpd. The 200,000 gpd of recycled water produced would require about 255,000 gpd of secondary effluent from the Scotts Valley WWTP outfall, as discussed in Section 2.

3.1.2 Water Quality

The source water quality from the Scotts Valley WWTP secondary effluent has a high level of TDS that needs to be lowered to achieve golf course irrigation standards. The RO treatment process would remove salts and organic constituents and would significantly reduce TDS. This high quality RO permeate would be blended with MF filtrate to produce Title 22 recycled water that meets the treated water goals of the golf course. Table 1 below summarizes the source water, predicted RO permeate, calculated blended water quality, and treated water objectives for the Pasatiempo facility.

Table 3-1: Pasatiempo Treated Water Quality Objectives

Constituent	Unit	Design Source WQ ¹	Predicted Permeate WQ ²	Calculated Blended WQ ³	Treated Water Objective ⁴
Total Dissolved Solids (TDS)	mg/l	660	25	280	300
Specific Conductance	µmho/cm	1,100	--	--	--
pH	units	7.4	6	6.6	8.3
Total Organic Carbon (TOC)	mg/l	20	<1	12	--
Total Hardness	mg/l as CaCO ₃	190	2	77	120
Bicarbonate	mg/l as CaCO ₃	190	5.8	80	100
Chloride	mg/l	150	3.1	62	<70
Sodium	mg/l	120	5	51	<60

Constituent	Unit	Design Source WQ ¹	Predicted Permeate WQ ²	Calculated Blended WQ ³	Treated Water Objective ⁴
Sulfate	mg/l	110	0.6	44	<60
Iron	mg/l	0.031	--	--	<0.3
Manganese	mg/l	0.021	--	--	<0.05
Calcium	mg/l	53	0.47	21	--
Magnesium	mg/l	16	0.14	6	--
Nitrate	mg/l	38	5.5	18.5	--
Potassium	mg/l	37	1.9	15.9	--
Boron	mg/l	0.46	0.4	0.42	<0.5

Notes:

¹Source water quality based on sampling from the Scotts Valley WWTP in September 2009.

²Predicted permeate water quality is based on Hydranautics ESPA2 RO membranes at 80% recovery.

³Calculated blended water quality is based on a 60% RO permeate and 40% MF filtrate blend.

⁴Treated water quality objectives provided by Pasatiempo and its irrigation consultants which are based on closely replicating the quality of potable water from City of Santa Cruz.

3.2 Flow Equalization

Membrane systems operate most efficiently with a uniform flowrate. The purpose of the equalization tank is to provide for a uniform flowrate to the Pasatiempo recycled water treatment plant during operation while flow in the Scotts Valley effluent pipeline varies. The tank storage volume needs to be adequate to allow for a uniform pumping rate given the variation of flow in the effluent pipeline.

The required working storage volume for the equalization tank can be estimated using the following mass balance formula: $V_{n+1} = V_n + \text{Inflow} - \text{Outflow}$. This formula and the following were used to develop Table 3-2:

- i. Flow in the Scotts Valley effluent pipeline was assumed to vary commensurate with the typical diurnal flow pattern developed using the early September 2008 data shown in Figure 2-1. This was the only detailed flow information available. These data are believed to be representative of current typical flows during the driest time of the year (when secondary effluent flows will be lowest).
- ii. The recycled water treatment process was assumed to operate at a uniform flowrate of 235 gpm for 18 hours each day (=14,100 gal/hour). This equals 253,800 gallons of effluent daily, which is needed to produce 200,000 gallons of recycled water for irrigation.
- iii. The minimum required flow of secondary effluent into the tank needed to produce 200,000 gallons of recycled water a day was assumed to be 10,575 gallons/hour (253,800 ÷ 24 hours). This flow was compared to the assumed secondary flow rate in the effluent pipeline to assess the adequacy of available secondary effluent.
- iv. The amount of secondary effluent contained in the equalization tank was estimated on an hourly basis over 24 hours. The required working storage volume for the tank was calculated as the difference between the minimum and maximum volume of secondary effluent stored in the tank, plus a 25% contingency.

- v. The size of the equalization tank was estimated to be the working volume plus the following: 1 to 2 feet of depth at the bottom of the tank to provide adequate head for the pumps to operate properly plus 1 to 2 feet of depth above the maximum water level to allow for overflow of excess secondary effluent when the tank is full.

Table 3-2: Equalization Tank Flow Sizing Criteria

Time	Pasatiempo Recycled Water Equalization Tank			
	AVAILABLE	INFLOW ¹	OUTFLOW ²	STORAGE
	Scotts Valley WWTP Available Effluent (Gallons/Hour)	From Scotts Valley Force Main to Equalization Tank (Gallons/Hour)	From Equalization Tank to Recycled Water TP (Gallons/Hour)	Volume in Tank ³ (Gallons)
6:00 AM	34,500	10,575	0	10,575
7:00 AM	23,100	10,575	0	21,150
8:00 AM	9,200	10,575	0	31,725
9:00 AM	16,500	10,575	0	42,300
10:00 AM	20,400	10,575	0	52,875
11:00 AM	18,600	10,575	0	63,450
noon	22,100	10,575	14,100	59,925
1:00 PM	31,300	10,575	14,100	56,400
2:00 PM	30,500	10,575	14,100	52,875
3:00 PM	38,100	10,575	14,100	49,350
4:00 PM	30,200	10,575	14,100	45,825
5:00 PM	26,500	10,575	14,100	42,300
6:00 PM	21,700	10,575	14,100	38,775
7:00 PM	31,800	10,575	14,100	35,250
8:00 PM	33,900	10,575	14,100	31,725
9:00 PM	38,700	10,575	14,100	28,200
10:00 PM	39,100	10,575	14,100	24,675
11:00 PM	37,100	10,575	14,100	21,150
midnight	30,900	10,575	14,100	17,625
1:00 AM	13,300	10,575	14,100	14,100
2:00 AM	13,900	10,575	14,100	10,575
3:00 AM	11,400	10,575	14,100	7,050
4:00 AM	13,800	10,575	14,100	3,525
5:00 AM	15,400	10,575	14,100	0
Total (gal)	602,000	253,800	253,800	
Total (MG)	0.60	0.25	0.25	
Max Volume in Tank (gal)⁴				63,450

Notes:

¹ Inflows: Minimum hourly volume of secondary effluent required to meet 200,000 gallons of daily recycled water daily production (235,800 gallons ÷ 24 hours = 10,575 gallons/hour).

² Outflows: Based on 235 gpm design process flow for recycled water treatment plant (provides 185 gpm recycled water for irrigation) assuming operation 18 hours/day (235 gpm x 60 min = 14,100 gallons/hour) x 18 hours = 253,800 gallons/day).

³ Volume in tank is calculated as Vol = Vol(previous day) + Inflow – Outflow(s).

⁴ A 25% contingency is added to the maximum volume calculated during the peak month to size the tank.

Applying a 25% contingency to the maximum stored volume, the preliminary size for the equalization tank is 80,000 gallons of working storage.

3.3 Treatment Process

This section describes the recommendations for the proposed treatment process and equipment to meet the project objectives. The treatment process is comprised of the following main treatment elements:

- Feed Pumps
- MF Filtration
- Filtered Water Break Tank
- RO System
- Disinfection

A brief description of each process element is provided below. A process flow schematic for the system is shown in Drawing G-2.

3.3.1 Feed Pumps

The packaged MF skid requires a feed pressure of approximately 10 psi at the inlet flange of the skid. Two feed pumps, one primary and one standby, would draw secondary effluent from the equalization tank and pump it to the packaged MF unit. The water enters the MF skid and typically fills a small source water tank. The skid contains the required pumps, valves, membranes and instrumentation to produce the required capacity of filtered water with pressures suitable to go into an above grade break tank.

Chlorine at a dose of 7 to 10 mg/l would be added to the secondary effluent ahead of the MF skid to form chloramines to provide a disinfection residual through the system. This will help to reduce biofouling in the treatment processes. Coagulant at a dose of 7 to 10 mg/l also would be added to the secondary effluent ahead of the MF skid.

3.3.2 MF Filtration

MF is a membrane treatment process that utilizes physical straining to remove particulate matter from water. The typical pore size associated with MF (0.1 microns) provides an absolute barrier to larger particles and microbes, including bacteria, *Giardia lamblia* cysts, and *Cryptosporidium* oocysts. The small pore size allows membrane treatment processes to consistently produce high quality filtered water over a wide range of source water quality and turbidity. For secondary effluent filtration applications, filtrate turbidity is typically about 0.03 NTU.

The MF unit also includes strainers, which remove particles with approximately 200 microns nominal particle size. These strainers are suitable to protect the membranes from damage by large particles or debris in the water such as leaves or twigs. The unit backwashes the strainers about every 30 minutes and discharges an estimated 48,000 gpd of backwash water to the sanitary sewer for disposal.

To meet the treated water objectives and capacity of the project and to save costs, Kennedy/Jenks recommends installing one, 225-gpm MF skid, while providing space for a second 225-gpm unit that could be installed at a later date to provide redundancy and additional capacity.

3.3.3 Filtered Water Break Tank

Kennedy/Jenks recommends providing a break tank between the MF system and the RO system. This greatly simplifies the operations and controls of the overall process, and more easily permits continuous operation of the RO system while the MF system is starting and stopping for backwash and maintenance clean operations. The break tank would be an opaque, HDPE or fiberglass tank that would have an operational storage of approximately 4,000 gallons. This would permit operation of the full RO system capacity for over 20 minutes.

Kennedy/Jenks recommends an opaque tank to avoid sunlight stimulated bio-growth in the tank. The chloramine residual in the water should also help to minimize potential bio-growth in the break tank.

3.3.4 Reverse Osmosis System

RO is a pressure driven membrane separation process that separates TDS and organic molecules from water. With RO, a high TDS source water is pressurized and water then passes through the semi-permeable membrane leaving the salt in the feed water. The RO system produces a low-salt, high quality product water (called permeate) and a concentrated, high-salt stream (called concentrate).

The packaged RO skid requires a feed pressure of approximately 30 to 40 psi at the inlet flange of the skid to move the water through the cartridge filters and to provide a suction pressure for the RO high pressure pumps on the skid. Kennedy/Jenks proposes two RO feed pumps, one primary and one backup, that would draw water from the Filtered Water Break Tank and provide feed water for the RO system. The RO feed pumps would be controlled by the RO system and level in the Filtered Water Break Tank.

Antiscalant would be dosed at approximately 2 to 3 mg/l ahead of the RO units to prevent scale formation in the RO membrane system.

To produce more water while still achieving water quality objectives, approximately 40% of the filtered water from the MF unit would bypass the RO system and be sent directly from the Filtered Water Break Tank to the disinfection system through an RO bypass line.

Kennedy/Jenks recommends installing one 110-gpm RO unit to meet capacity and water quality objectives.

3.3.5 MF Clean-in-Place (CIP)

Membrane system cleaning operations and recommended target cleaning frequency objectives are defined as:

1. Chemically Enhanced Backwash (CEB) periodically introduces a cleaning chemical (typically hypochlorite) to the backwash water described in section 3.3.2 to provide a shock cleaning.
2. Maintenance Clean (MC) is typically performed with hypochlorite or citric acid, in which the membrane unit is soaked for a short period to reduce the rate of membrane fouling. The fully-automated MC typically does not exceed approximately 30 minutes from initiation to completion and occurs no more frequently than once every 3 days.
3. Clean-In-Place Chemical Clean (CIP), is typically performed with 2-percent hypochlorite or citric acid, in which the membrane systems are cleaned with chemical solutions for an extended period of time to restore membrane permeability. The operator-initiated CIP chemical clean typically requires 6 to 8 hours to complete and occurs no more frequently than once every 30 days of operation.

The MF system includes a packaged CIP skid with a tank, pumps that would be used to perform automated maintenance cleans and manually initiated CIP cleanings. Potable water or RO permeate would be used as make-up water for the cleaning solutions. MC and CIP cleaning solutions of citric acid are used to dissolve iron, manganese or calcium carbonate scales. Sodium hypochlorite solutions are used to remove organic foulants. The cleaning solutions are batched, and the cleaning chemicals are circulated through an off-line, isolated membrane unit for several hours. The membranes are then rinsed before being brought back in service. The spent cleaning solution is drained to the spent washwater pump station.

3.3.6 RO Clean-in-Place (CIP)

RO Membrane system cleaning operations and recommended target cleaning frequency objectives are described below. Unlike MF membranes, RO systems are not backwashed.

1. Clean-In-Place Chemical Clean (CIP) is typically performed with 2-percent caustic, citric acid or detergent solution, in which the membrane systems are cleaned with chemical solutions for an extended period of time to restore membrane permeability and performance. The operator-initiated typically requires 3 to 4 hours to complete and occurs no more frequently than once every 4 months of operation.

The RO system includes a packaged CIP skid with a tank, pumps that would be used to perform manually initiated CIP cleanings for the RO skids. RO permeate would be used as make-up water for the cleaning solutions. CIP cleaning solutions of citric acid are used to dissolve iron, manganese or calcium carbonate scales. Caustic and detergent solutions are used to remove organic foulants. The cleaning solutions are batched, and the cleaning chemicals are circulated through an off-line, isolated membrane unit for several hours. The membranes are then rinsed before being brought back in service. Similar to the MF system, the RO system spent cleaning solutions are discharged to the spent washwater pump station.

The RO CIP system also serves as a permeate flushing system. When an RO unit shuts down, RO permeate is flushed through the system to displace the secondary effluent feed water and minimize fouling and bio-growth in the RO membranes. Also, following a CIP, the RO system performs a system “flush to waste” to remove any residual cleaning solution. This flush water is directed to the spent washwater system.

3.3.7 Spent Washwater Pump Station

The washwater recovery system consists of a wet well sized to accept waste flows from backwashes and membrane cleanings and pumps for discharging to the sanitary sewer system. The wet well serves as a detention basin to allow for dilution of chemical cleaning solution with washwater to neutralize the pH of chemical cleaning waste.

3.4 Disinfection Alternatives

Chlorine and UV disinfection are two alternatives that could be applied at Pasatiempo to meet Title 22 disinfection requirements.

Chlorine disinfection would require treated water to pass through a chlorine contact tank with a large enough capacity and hydraulic retention time to achieve a CT of at least 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes per Title 22 requirements. Using these minimum design parameters would provide a chlorine residual of 5 mg/L, which may be too high for golf course application. The size of the chlorine contact tank could be increased to achieve a lower chlorine residual while still meeting the CT and modal contact time requirements. However, the size of the chlorine contact tank needed to achieve a chlorine residual of approximately 0.5 to 1 mg/L, which is the target of the golf course, would be between 100,000 and 250,000 gallons, which is not cost-efficient or ideal for the site.

UV disinfection meets the alternative Title 22 requirements of a disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999% of the plaque-forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. UV disinfection requires a smaller footprint and is more cost efficient than a large chlorine contact tank. Kennedy/Jenks recommends installing two pressure in-line UV reactors to provide full redundancy.

3.5 Design Criteria

The proposed preliminary design criteria for the Pasatiempo treatment facility are presented in Table 3-3 below.

Table 3-3: Pasatiempo Treatment Facility Preliminary Design Criteria

	Unit	Value
TERTIARY TREATED WATER OBJECTIVES		
Total Tertiary Treated Water Production	gpd	200,000
Operation Time	hrs	18

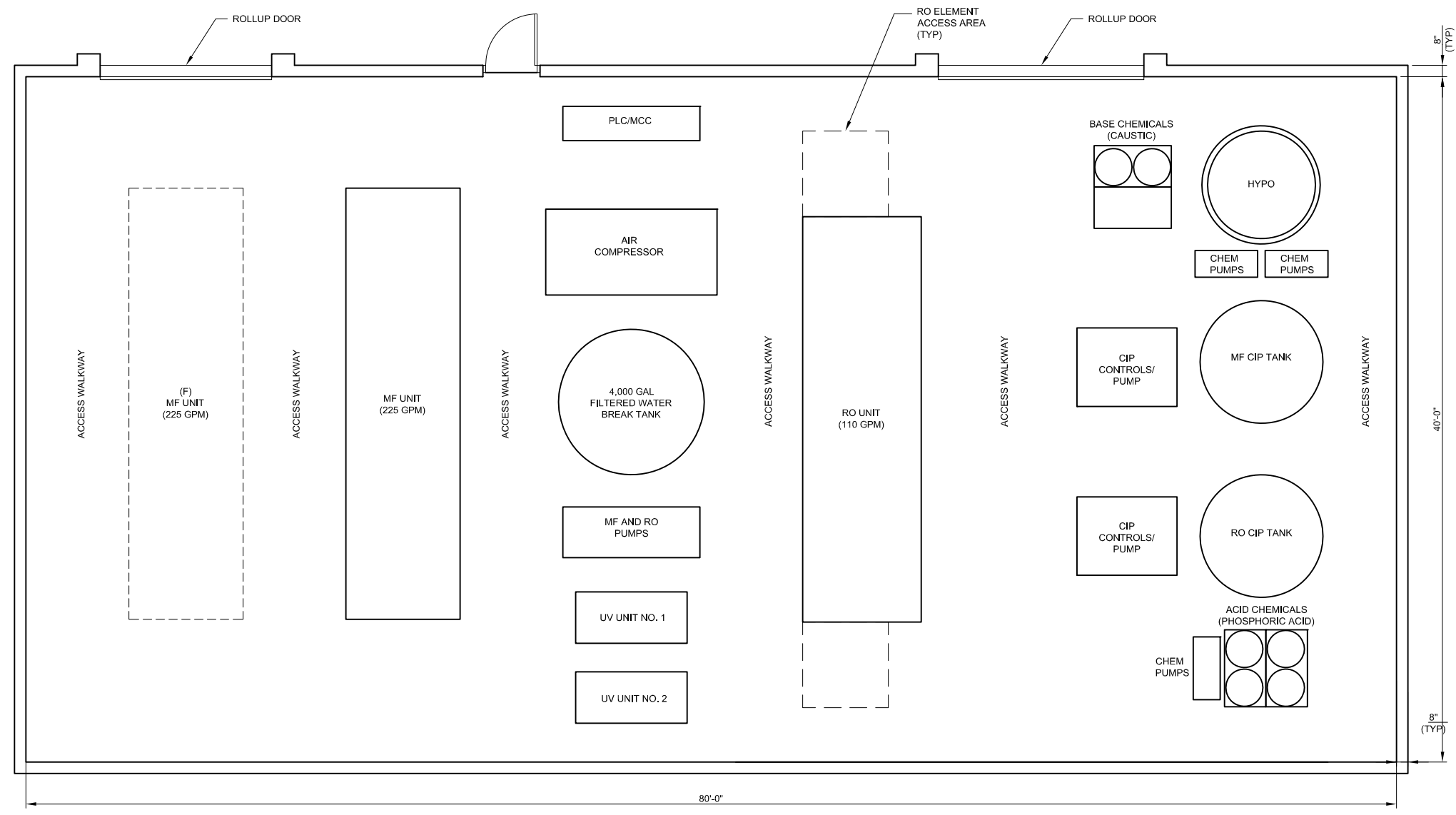
AWT RO Permeate TDS	mg/L	~ 50
Blended Tertiary Effluent Total Dissolved Solids	mg/L	~ 250
Irrigation Water Total Dissolved Solids	mg/L	~ 300
Title 22 Disinfection Requirements		
Effluent Total Coliform (7-Day Median)	MPN/100 mL	2.2
Maximum Effluent Total Coliform	MPN/100 mL	22
AVERAGE FLOW RATES SUMMARY		
Secondary Effluent Feed Water	gpm	225
MF Filtrate	gpm	215
MF Backwash	gpm	10
RO Bypass	gpm	75
RO Influent	gpm	140
RO Permeate	gpm	110
RO Concentrate	gpm	30
Blended MF-RO Product Water	gpm	185
Percent RO in Blend	%	60%
SECONDARY EFFLUENT SOURCE WATER		
Secondary Effluent from Outfall	gpd	254,000
	gph	14,100
	gpm	225
Operation Time	hrs	18
Minimum Design Temperature	°C	15
Total Dissolved Solids	mg/L	750
SECONDARY EFFLUENT EQUALIZATION TANK		
Quantity	#	1
Capacity	gal	80,000
MF FEED PUMPS		
Average Source Water Flow	gpm	225
Quantity	#	2
Pump Design Capacity (each)	gpm @ TDH	225 @ 40
Motor	HP	5
Speed Control	type	Fixed
PACKAGED MF SYSTEM		
MF Instantaneous Feed	gpm	225
MF Production	gpm	215
Primary Process Units	number	1
Membrane Classification	--	MF
Packaged Membrane System Type	--	Pressure
Hollow Fiber Flow Configuration	--	Outside-In
Membrane Material	--	PVDF

Design Capacity	gpm	225
Minimum System Recovery	%	95
System Instantaneous Flux Rate at Design Capacity	gfd	20 to 25
MF SYSTEM BACKWASH		
Backwash Frequency	minutes	25 to 30
Backwash Source	--	Air and Filtered Water
Approx. Backwash Volume per Unit Wash	gal	500
Approximate Backwash Flowrate	gpm	10
Approx. Daily Backwash Volume	gpd	48,000
MF SYSTEM CLEAN-IN-PLACE (CIP)		
Maintenance Clean Frequency	days	≥ 3
CIP Frequency	days	≥ 30
Typical CIP Chemicals and Storage	--	
12.5% Sodium Hypochlorite	gal	55
Phosphoric Acid	gal	55
Waste/Flush Volume per CIP per Unit	gal	500
Waste Discharge Location	--	Sanitary sewer
FILTERED WATER BREAK TANK		
Quantity	#	1
Nominal Capacity	gal	4,000
Approx. HRT with MF unit offline	min	20
RO BOOSTER PUMPS		
Quantity	#	2
Average RO Feed Water Flow	gpm	140
RO Feed Pressure	psi	40
RO Bypass Flow, Average	gpm	75
Pump Design Capacity	gpm @ TDH	215 @ 115
Motor	HP	10
Speed Control	type	Fixed
RO SYSTEM		
Average Feed Flow @ 75% Recovery (1 unit)	gpm	140
Average Product Flow	gpm	110
Concentrate Flow (Max @ 75%)	gpm	30
RO Process Skids	number	1
Design Flux Rate	gfd	<12
Design Recovery	%	75
RO Membrane Array	--	2 Stage
RO Membrane Material	--	TFC
RO Membrane Element Diameter	inches	8
Nominal Cartridge Filter Rating	micron	5
Approximate Antiscalant Dose	mg/l	3.0

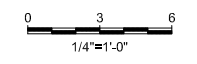
High Pressure Pump within skid	HP	30
RO SYSTEM CLEAN-IN-PLACE (CIP)		
CIP Frequency	months	> 3
Typical CIP Chemicals and Storage	--	
Caustic Soda	gal	55
Phosphoric Acid	gal	55
Surfactant	gal	Dry Bucket
Waste/Flush Volume per CIP per Unit	gal	500
Waste Discharge Location	--	Sanitary sewer
SPENT WASHWATER PUMP STATION		
Design Instantaneous Volume to Sump at Max Flow (3 Strainer + 2 MF Unit Backwashes)	gal	1000
Typical Backwash Volume per Day at Max Flow (Strainer + UF)	gal	48,000
Average Washwater Flowrate	gpm	10
Backwash Wet Well Volume	gal	4000
Return Water Pumps (Lead and Standby)	number	2
Pump Type	--	Submerged
Capacity (each pump)	gpm @ TDH ft	60 gpm @ 20 ft
Motor	HP	3
Speed Control	type	Fixed
UV REACTORS		
UV System Initial Design Capacity	gpm	365
UV Reactor Type	--	Closed Pipe Reactor
Initial Number of Reactor(s)	--	1
Standby Ractor	--	1
Capacity per Reactor	gpm	365
Total Number of Banks – Reactors in Parallel		2
Minimum dosage	mJ/cm2	80
Design UV Transmittance	%	65
Lamp Type	--	LP – High Intensity
CHLORINE		
Pre-Treatment		
Process Water Flow	gpm	225
Dosage (Solution)	mg/l	10
Use	ppd	30
Chemical Solution Conc. (Solution)	lbs/gal	0.92
Metering Pumps		
Number of Pumps (Lead and Standby)	-	2
Pump manufacturer and model, or equal	--	LMI

Pump Capacity	gph	1.27
Pump Capacity	mL/min	80
Storage Tank		
Number	-	1
Capacity	gallons	1,500
Supply at Avg Use	days	83
COAGULANT		
Process Water Flow	gpm	225
Dosage (Solution)	mg/l	10
Use	ppd	28
Chemical Solution Conc. (Solution)	lbs/gal	11.2
Metering Pumps		
Number of Pumps (Lead and Standby)	-	2
Pump manufacturer and model, or equal	--	LMI
Pump Capacity	gph	0.10
Pump Capacity	mL/min	7
Storage Tank		
Type	-	Tote
Number	-	1
Operational Capacity (Each)	gallons	250
Overall (Nominal) Capacity (Each)	gallons	330
Supply at Max. Use	days	100
ANTISCALANT		
Process Water Flow	gpm	140
Dosage (Solution)	mg/l	3
Use	ppd	6.8
Chemical Solution Conc. (Solution)	lbs/gal	9.2
Metering Pumps		
Number of Pumps (Lead and Standby)	-	2
Pump manufacturer and model, or equal	--	LMI
Pump Capacity	gph	0.03
Pump Capacity	mL/min	1.9
Storage Tank		
Number	-	1
Capacity	gallons	55
Supply at Max. Use	days	75

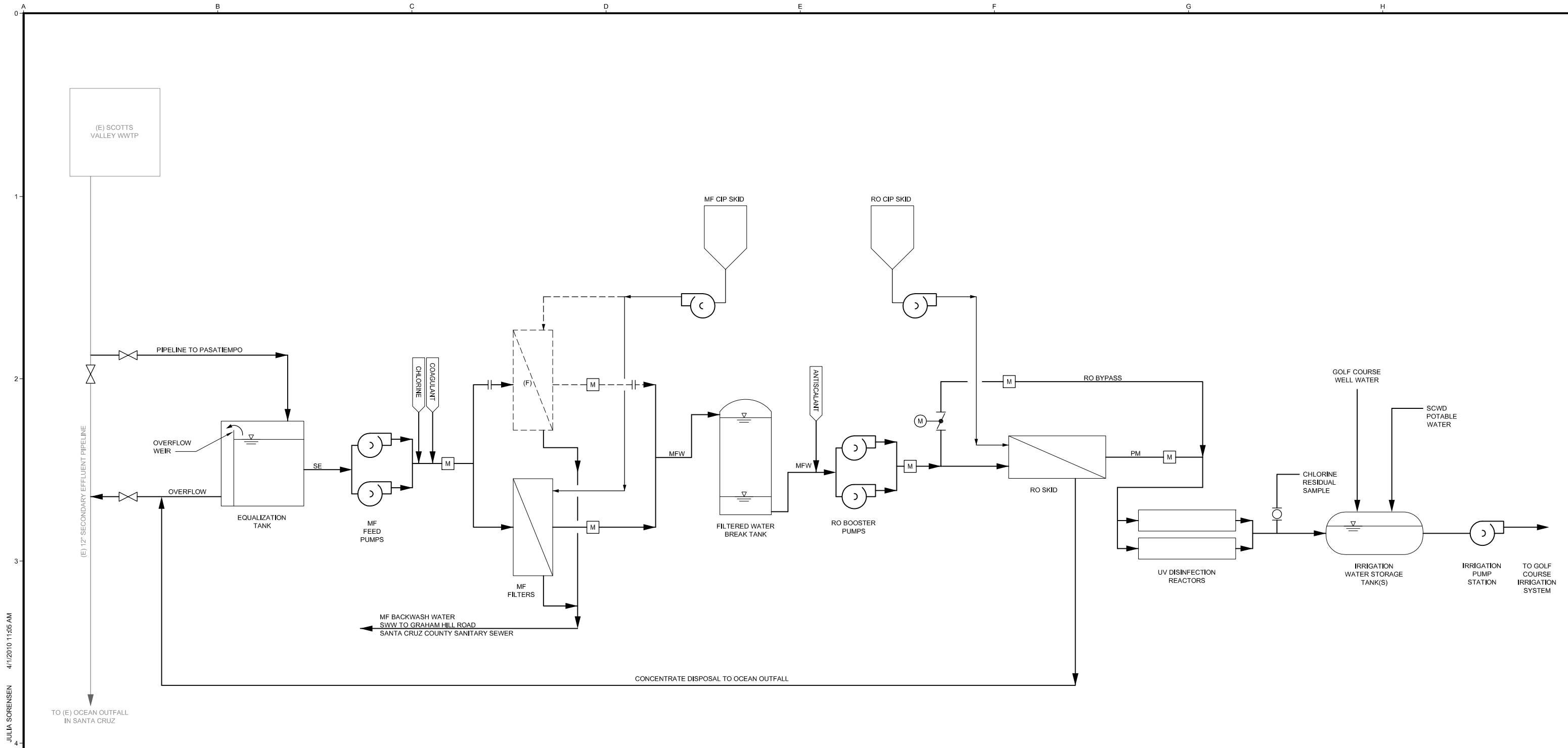
N:\2009\0988014_00_SVWD Pasatiempo RW\0988014-M1.dwg 3/11/2010 10:48 AM JULIA SORENSEN



PLAN
SCALE 1/4" = 1'-0"



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	NO.	REVISION	DATE					BY



LEGEND

- AWT - ADVANCED WASTEWATER TREATMENT
- BR - BRINE
- (E) - EXISTING
- FW - FILTERED WATER
- MFW - MICROFILTRATION FILTRATE WATER
- (N) - NEW
- PM - PERMEATE
- NPW - NON POTABLE WATER
- RO - REVERSE OSMOSIS
- SE - SECONDARY EFFLUENT
- SWW - SPENT WASHWATER
- UV - ULTRAVIOLET LIGHT

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SCOTTS VALLEY WATER DISTRICT
SCOTTS VALLEY, CALIFORNIA
**RECYCLED WATER SERVICE FOR
THE PASATIEMPO GOLF COURSE**

Kennedy/Jenks Consultants ©
303 SECOND STREET, SUITE 300 SOUTH, SAN FRANCISCO, CA 94107

PROCESS FLOW SCHEMATIC

FILE NAME	-
JOB NO.	0988014.00
DATE	MARCH 2010
SHEET OF	G-2 X

JULIA SORENSEN 4/1/2010 11:05 AM

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Section 4: Recycled Water Storage and Irrigation Pump Station

4.1 Overview

Following treatment the recycled water will need to be stored on site to be available for nighttime irrigation of the golf course. An irrigation pump station will be used to pump water from storage to the golf course irrigation system. This section provides information on the facilities for both recycled water storage and the irrigation pump station.

4.2 Capacity

Pasatiempo irrigation consultant, Bryant Taylor Gordon Golf (BTG Golf), has determined that 420,000 gallons of storage is required as shown on the enclosed "Tank Drawdown" calculations from BTG Golf. BTG Golf has been working with Watertronics on the design of a 1,500 gallon per minute (gpm) irrigation pump station for Pasatiempo. We have based the sizing of facilities in our report on these capacities.

4.3 Recycled Water Storage

The recycled water facilities are located on a site behind the 13th green and east of the 14th tee and adjacent to residences. Because of the nearby residences, the proposed facilities have to the extent possible been located to avoid obscuring the neighbors' views. Accordingly an above ground storage tank was considered to be inappropriate for the site. Pasatiempo provided information on the type of tanks they want to consider, which are 40,000 gallon underground fiberglass tanks manufactured by Containment Solutions. The tanks would be connected together hydraulically by piping and provide 420,000 gallons of storage capacity for a combination of recycled water and groundwater from an onsite well. Enclosed is a drawing by Containment Solutions of their underground fiberglass tank.

Storage using these tanks would require ten, 10' diameter 70' long tanks plus a shorter 35' long eleventh tank. Each tank would be buried with 3' of cover and vented to the atmosphere. If shallow groundwater is found to be present at the site, the tanks would have to be anchored to prevent them from floating when the tanks are empty.

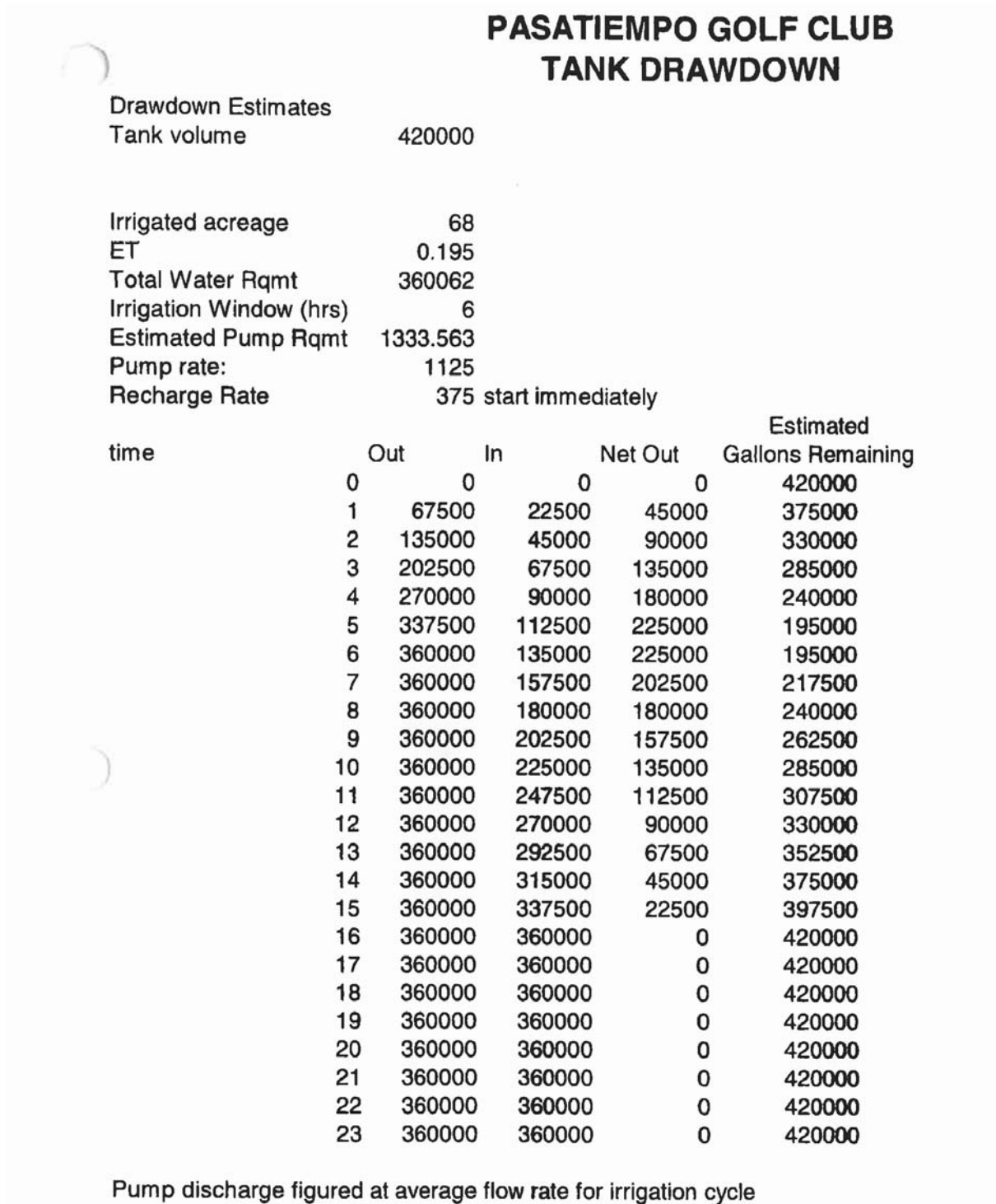
An underground concrete tank may be cost competitive with the fiberglass tanks as long as the tank's roof is slightly above ground and not subject to traffic loads. It's recommended that the decision on type of storage should be made during preliminary design, following completion of the CEQA process.

4.4 Irrigation Pump Station

The proposed Watertronics irrigation pump station includes two 750 gpm turbine pumps in a 5' diameter wet well that will discharge up to 1,500 gpm when both pumps are operating. The pump station also includes an above ground pump house for the pump motors, discharge piping, electrical panels and controls. A typical municipal pump station would require a third standby pump however after discussing this with a representative of Watertronics, the manufacturer of the pump station, it's standard practice in the golf course industry to just

provide two pumps for this application. Drawings of the Watertronics pump station, with 2 pumps, are enclosed.

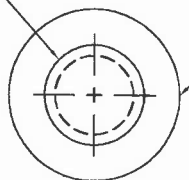
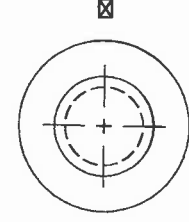
Figure 4-1: Tank Drawdown



SHELL CODES: 2-EXS10SD

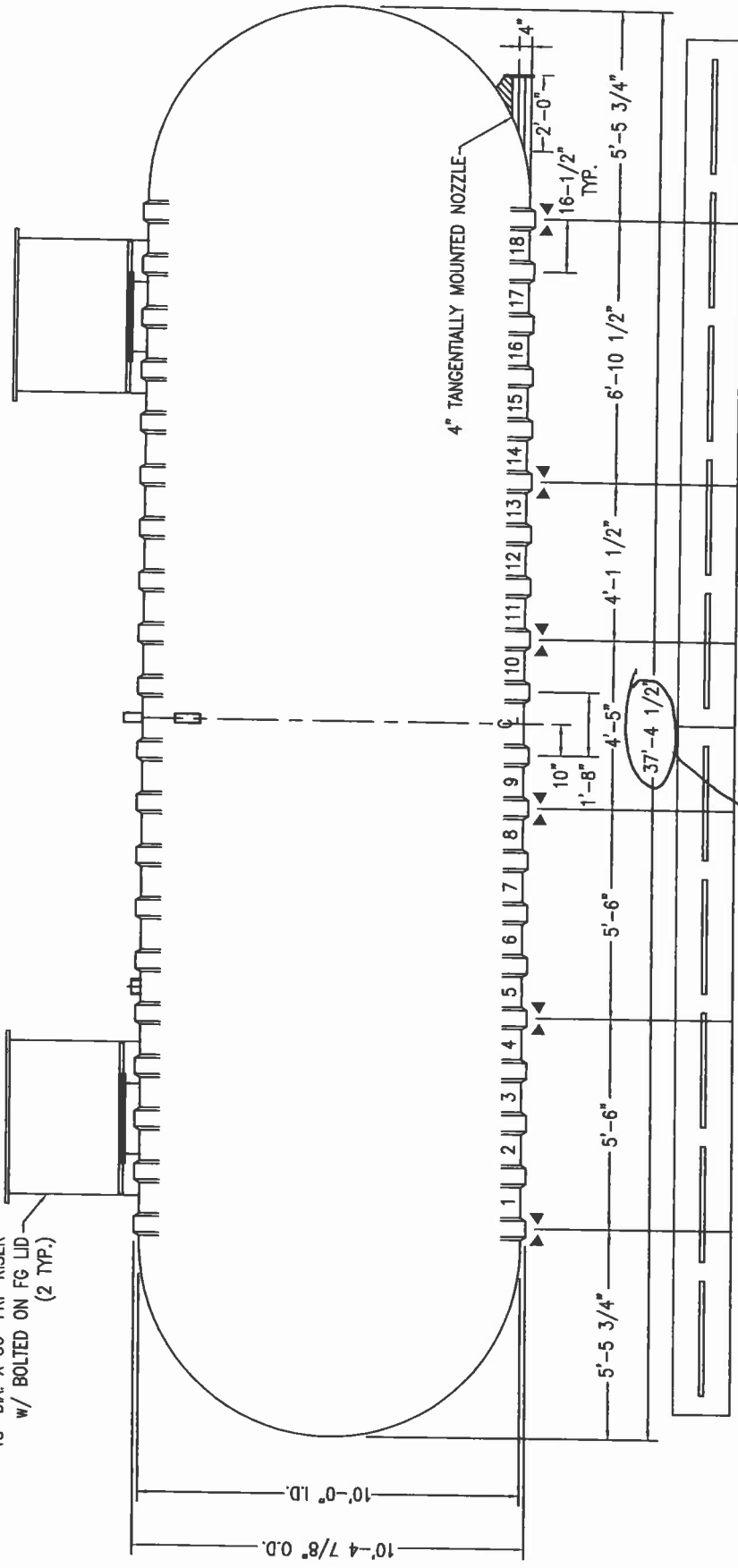
FLOWTITE PRODUCTS
 NON - POTABLE WATER
 NOTE: CUSTOMER SUPPLIED FLEXIBLE PIPING COUPLING REQUIRED ON TANGENTIALLY MTD. NOZZLES, STUB-OUTS & NPT FITTINGS.

22" FLGD. MANWAY w/ BLANK COVER (2 TYP.)



- 48" CONTAINMENT COLLAR(2 TYP.)
- 4" NPT FIG.
-
-
-
-
-
-
-
-

48" DIA. X 36" FRP RISER w/ BOLTED ON FG LID (2 TYP.)



OPTIONAL 18"x 8"x 18' DEADMAN

OPTIONAL 18"x 8"x 18' DEADMAN

71'-4 1/2" Long

"SECONDARY TANKS #2 & 3"

Product Code: # XS20SDCV	Active Date: 02/02/09
Order #:	Qty:
City:	State:
Delivery Date:	Rep:

DATE: 01/21/09	DRAWN BY: R.MOEN
REVISION: 01/30/09-C	DWG NUMBER: 12813.DWG
CAPACITY: 19,951	
WEIGHT: DRY/NET 6100	
SWT D-6 (10')-20000	
LAWRENCE LIVERMORE NAT. LAB.	

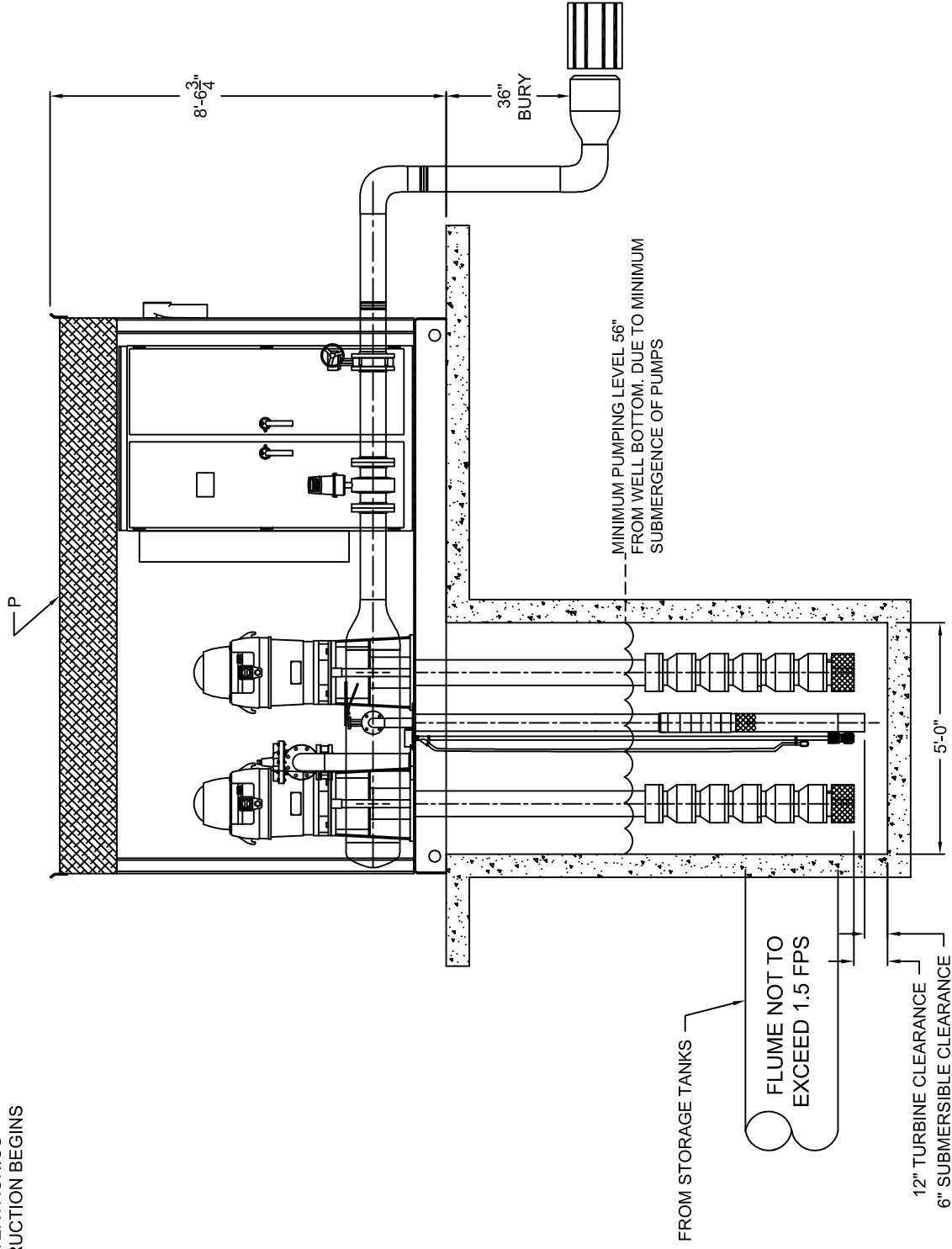


- NOTES:
- HOLD DOWN STRAP CLIP
 - HOLD DOWN STRAP LOCATION
 - TYPE "13" LIFT LUG - SD
 - TYPE "13" LIFT LUG - HD

PASATIEMPO

CONCEPT DRAWING ONLY
 DRAWING NOT TO SCALE
 DIMENSIONS AND SIZES OF EXISTING
 STRUCTURES, AND/OR COMPONENTS
 MUST BE VERIFIED TO WATERTRONICS
 BEFORE STATION CONSTRUCTION BEGINS

PUMP HOUSE/CONCRETE SLAB
 DIMENSIONS ARE RECOMMENDED
 MINIMUMS FOR NEC AND SERVICE CLEARANCE, AND
 ARE FOR ILLUSTRATION PURPOSES ONLY. PROJECT
 MANAGER SHALL BE CONSULTED ON FINAL DESIGN.



ELEVATION VIEW

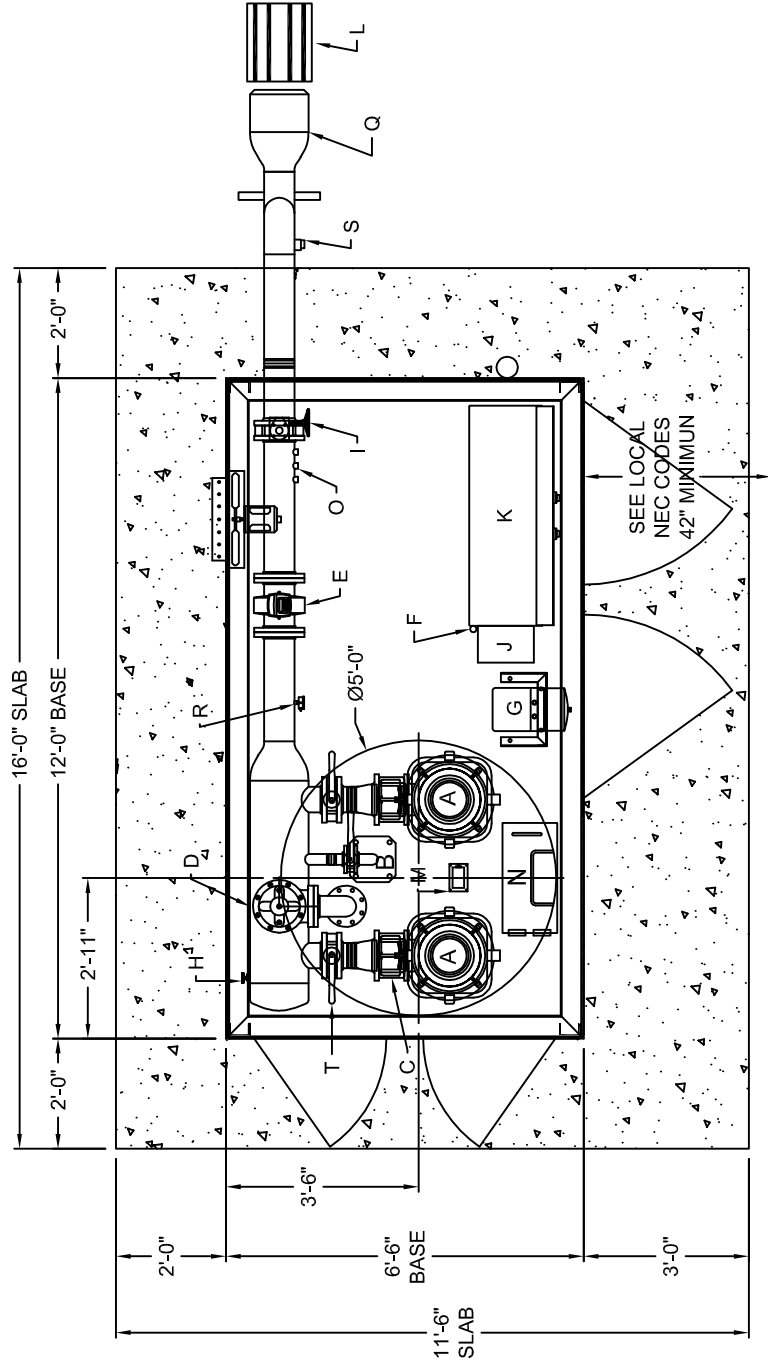
SCALE: NONE
 DRWN BY: MJW
 THIS DRAWING AND DESIGN, IS
 THE PROPERTY OF WATERTRONICS
 AND IS NOT TO BE REPRODUCED IN
 WHOLE OR PART, NOR EMPLOYED
 FOR ANY PURPOSE OTHER THAN
 SPECIFICALLY PERMITTED IN
 WRITING BY WATERTRONICS. THIS
 DRAWING LOANED AND SUBJECT TO
 RETURN ON DEMAND

TITLE: PASATIEMPO
 IRRIGATION PUMP STATION
WATERTRONICS
 ELECTRONICALLY CONTROLLED PUMPING SYSTEMS
 HARTLAND, WISCONSIN
 DATE: 11/17/09
 SHEET 3 OF 3 SHEETS
 JOB NO.: DRAWING NO. PRSH10052

CUSTOMER APPROVAL SIGNATURE	NO.	DATE	BY	DESCRIPTION
<input type="checkbox"/> APPROVED AS SUBMITTED	7			
<input type="checkbox"/> MAKE INDICATED CHANGES AND RESUBMIT	6			
	5			
	4			
	3			
	2			
	1			

CONCEPT DRAWING ONLY
 DRAWING NOT TO SCALE
 DIMENSIONS AND SIZES OF EXISTING
 STRUCTURES, AND/OR COMPONENTS
 MUST BE VERIFIED TO WATERTRONICS
 BEFORE STATION CONSTRUCTION BEGINS

PUMP HOUSE/CONCRETE SLAB
 DIMENSIONS ARE RECOMMENDED
 MINIMUMS FOR NEC AND SERVICE CLEARANCE, AND
 ARE FOR ILLUSTRATION PURPOSES ONLY. PROJECT
 MANAGER SHALL BE CONSULTED ON FINAL DESIGN.



PLAN VIEW

SCALE: NONE

DRWN BY: MJW

TITLE: PASATIEMPO

IRRIGATION PUMP STATION
 ELECTRONICALLY CONTROLLED PUMPING SYSTEMS
 HARTLAND, WISCONSIN

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 WRITING BY WATERTRONICS. THIS
 DRAWING LOANED AND SUBJECT TO
 RETURN ON DEMAND

DATE: 11/17/09

JOB NO.:

SHEET 2 OF 3 SHEETS

DRAWING NO. PRSH10052

CUSTOMER APPROVAL SIGNATURE

NO. DATE BY DESCRIPTION

7

6

5

4

3

APPROVED AS SUBMITTED

MAKE INDICATED CHANGES AND RESUBMIT

Section 5: Site Piping and Utilities

5.1 Overview

The previous sections described the equalization tank, treatment plant, a chlorine contact tank (only needed if hypochlorite is used to disinfect instead of UV), storage tanks and the irrigation pump station. This section describes where these facilities would be located on the site and the necessary connections to offsite utilities and the outfall pipeline from the Scotts Valley WWTP.

5.2 Site Plan

The site for the recycled water facilities is located on unused Pasatiempo property behind the 13th green and east of the 14th tee. To the north is Sims Road and to the east are single family homes. The background for enclosed Figure 5-1 is from a May 2009 aerial photo on Google Earth showing the project site and its surroundings. The neighboring homes to the east are positioned for a view of the 13th green so the equalization tank and treatment plant are located along the north boundary, adjacent to Sims Road, to not obscure the neighbors view of the golf course.

Enclosed are proposed site layouts for both types of storage tanks; underground fiberglass tanks (Figure 5-2) and a concrete tank (Figure 5-3). We have also shown a restroom for golfers on the west end of the treatment plant building, near the 14th tee. The treatment plant will have a connection to the sewer so adding a restroom to the building would be relatively economical. Potable water and electricity would also be available to serve the restroom.

5.3 Utility Connections

The recycled water facility will require utility connections for electrical power, potable water and sewer. It will also need two connections to the outfall pipeline from the Scotts Valley WWTP. The upstream connection will pipe the secondary effluent from the outfall pipeline, to the equalization tank and then a second pipeline will return excess flow from the equalization tank back to the outfall. These connection points are shown on Figure 5-1. Following are brief descriptions of the utility connections.

5.3.1 Electrical Power

The source of electrical power will be a PG&E transmission line on Graham Hill Road. Power will be provided to the site as described below.

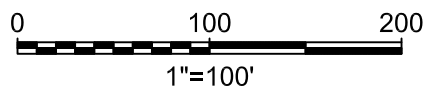
Based on the attached load study an 800-amp service will be required. Electrical service will be rated at 277/480 volts, 3 phase, 4 wire grounded from a pad mounted transformer provided by PG&E. The transformer will be located near the facility and underground conduits from the transformer to the PG&E point of connection on Graham Hill Road will be provided.

5.3.2 Potable Water

Potable water will be provided by the City of Santa Cruz Water Department through an existing 4" metered service to the golf course. The project will require potable water for the treatment plant and also to serve as an emergency or supplemental source of irrigation water. The connection of potable water to the irrigation water storage tanks will be provided through an "air gap" connection, in conformance with State of California, Department of Public Health (DPH) requirements.

5.3.3 Sewer

Sewer service will be provided by the County of Santa Cruz. Fortunately the County of Santa Cruz just completed construction of a 10" sewer in Graham Hill Road at Sims Road. The sewer will be used for sanitary wastewater and washwater from the treatment processes. The sewer may also be used to dispose of the concentrate from reverse osmosis treatment if the Regional Water Quality Control Board does not allow it to be discharged back to the outfall pipeline from the Scotts Valley WWTP.



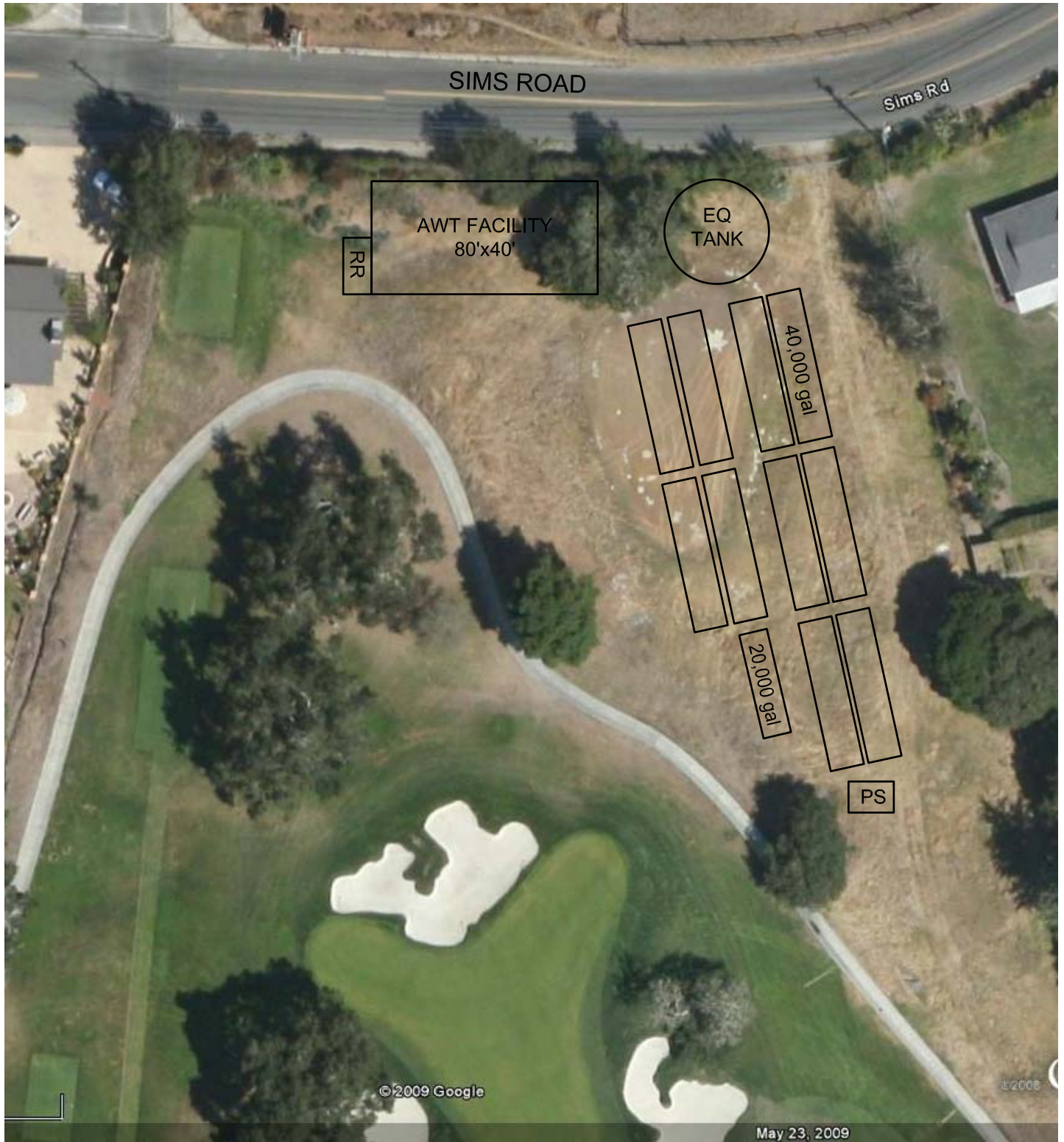
Kennedy/Jenks Consultants

SCOTTS VALLEY WATER DISTRICT
RECYCLED WATER SERVICE FOR
PASATIEMPO GOLF COURSE

FIGURE 5-1

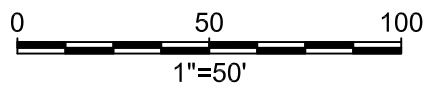
KJ 0988014.00
MARCH 2010

UTILITY PLAN



ABBREVIATIONS

AWT	ADVANCED WATER TREATMENT
EQ TANK	EQUILIZATION TANK
gal	GALLON
PS	PUMP STATION
RR	RESTROOM (10' x 20')



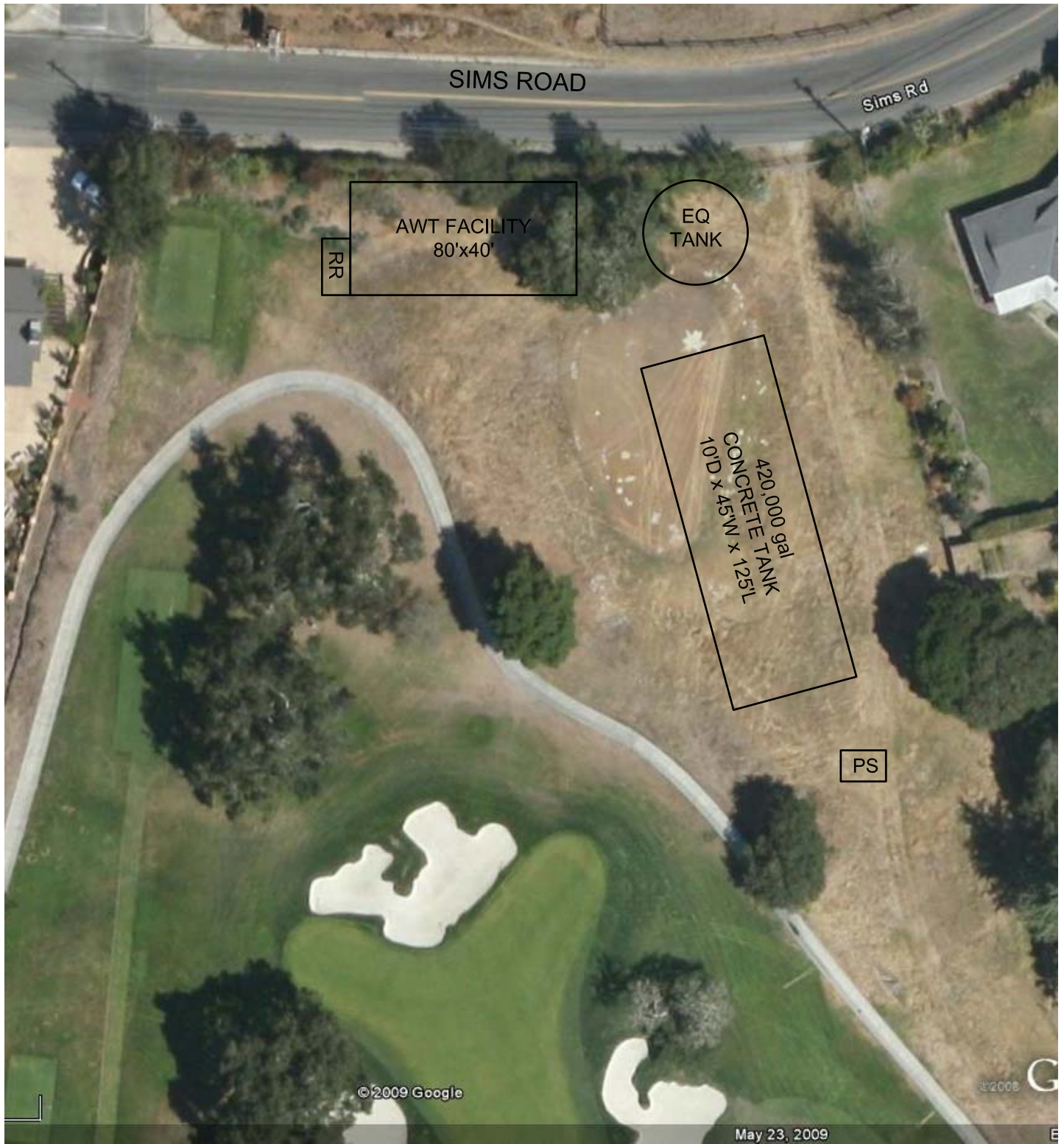
Kennedy/Jenks Consultants

SCOTTS VALLEY WATER DISTRICT
RECYCLED WATER SERVICE FOR
PASATIEMPO GOLF COURSE

FIGURE 5-2

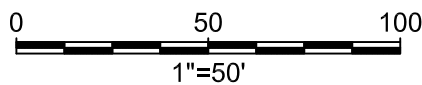
KJ 0988014.00
MARCH 2010

PROPOSED SITE PLAN - ALT A



ABBREVIATIONS

AWT	ADVANCED WATER TREATMENT
EQ TANK	EQUILIZATION TANK
gal	GALLON
PS	PUMP STATION
RR	RESTROOM (10' x 20')



Kennedy/Jenks Consultants

SCOTTS VALLEY WATER DISTRICT
RECYCLED WATER SERVICE FOR
PASATIEMPO GOLF COURSE

FIGURE 5-3

KJ 0988014.00
MARCH 2010

PROPOSED SITE PLAN - ALT B

Section 6: Facility Operations

This section evaluates the operational considerations of the proposed Pasatiempo recycled water project. The project includes four facilities; the recycled water treatment plant, the storage tanks, the irrigation pump station and Pasatiempo's future 100,000 gpd irrigation well. Since there is no information available on the irrigation well we have limited the review to the facilities located on the treatment plant site which includes the plant, storage tanks and irrigation pump station.

Table 6-1 includes the volume of water needed to irrigate the golf course and separates the required flow between that supplied by the irrigation well and the recycled water produced by the treatment plant. Since the cost of operating the well will be significantly less than the cost of the treatment plant its assumed in the table that recycled water from the plant would only be used when demand exceeds the 100,000 gpd supplied by the well. As shown in Table 6-1 the recycled water treatment plant would need to be operated from April through October. However because the demand for recycled water is relatively low during April and October, 48,000 gpd and 66,000 gpd respectively, it may be more cost effective to utilize City water during those two months rather than operating the treatment plant. Since we don't know at this time if that would be acceptable to the City, we have based our analysis on the more cost conservative basis of operating the plant from April through October.

The costs of operating the recycled water project can be divided into fixed and variable costs. Fixed costs are primarily those related to labor and certain equipment maintenance costs that are related more to time than the amount of recycled water produced. Variable costs, such as power and chemicals, are based on the volume of water treated or pumped into the irrigation system.

Operation of the recycled water treatment plant comes under the jurisdiction of the State Water Resources Control Board which will require that its operation be under the supervision of a Class III or higher wastewater treatment plant operator. Because Pasatiempo is not in the wastewater treatment business several public and private entities were contacted regarding operating the Pasatiempo plant. Public agencies contacted included the City of Santa Cruz, the City of Scotts Valley and Scotts Valley Water District. Private entities contacted included Cal-American Water and United Water. Based on those initial contacts those considered most likely to submit a proposal to operate the Pasatiempo plant are the City of Santa Cruz, The City of Scotts Valley and Cal-American Water in Monterey. Although interested, none of these potential operators would provide a budget estimate of what they might charge. Consequently we have had to put together our own estimate for the cost of contract operations. Because the facilities will be designed such that they can be remotely monitored and operated, an operator will not need to be continuously on site when the plant is operating. The estimated annual costs of plant and irrigation pump station operation are shown on the enclosed spreadsheet. The cost of operating the storage tanks is considered to be negligible so is not included.

Table 6-1: Pasatiempo Irrigation Water

Average Daily Flow, gpd (000)			
Month	Water Supplied by Irrigation Well ¹	Water Supplied by Recycled Water Plant ²	Irrigation Pump Station ³
January	0	0	0
February	0	0	0
March	24	0	24
April	100	48	148
May	100	157	257
June	100	171	271
July	100	186	286
August	100	162	262
September	100	134	234
October	100	66	166
November	0	0	0
December	0	0	0

Notes: ¹ The estimated production from a future Pasatiempo well is 100,000 gpd

² The capacity of the recycled water treatment plant is 200,000 gpd when the plant operates 16 hours/day

³ The estimated volume of water required to irrigate Pasatiempo golf course is from a table prepared on 7/29/09 by BTG Golf which includes the rain credit

Table 6-2: Estimated Annual O&M Costs for Treatment Plant

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Project: SVWD - Pasatiempo Recycled Water Feasibility Study

Prepared By: JHS/JHR

Building, Area: Estimated Annual O&M Costs for Treatment Plant

Date Prepared: 2/8/2010

K/J Proj. No. 0988014

Current at ENR _____

Escalated to ENR _____

Estimate Type:	x	Conceptual	Construction
		Preliminary (w/o plans)	Change Order
		Design Development @ _____	% Complete

Item No.	Description	Qty	Units	Materials		Installation		Sub-contractor		Total	\$/MG
				\$/Unit	Total	\$/Unit	Total	\$/Unit	Total		
Variable O&M Costs (depends upon MG produced)											
	<u>Power</u>										
	Treatment Plant (MF and RO Pumps & Skids)	114,978	kWh	0.16	18,397					18,397	650
	UV System	49,306	kWh	0.16	7,889					7,889	279
	Other (lighting, instrumentation, etc.) - 10% of subtotal	16,428	kWh	0.16	2,629					2,629	93
	<u>Chemicals</u>										
	Antiscalant	1,455	lbs	7.04	10,245	1.76	2,561			12,806	453
	Coagulant Polymer	5,992	lbs	1.01	6,052	0.03	168			6,220	220

Total Variable Costs (based on producing 28.3 MG/yr of recycled water)										47,939	1,694
--	--	--	--	--	--	--	--	--	--	---------------	--------------

Fixed O&M Costs											
	<u>Membrane Replacement</u>										
	MF Skids (Annualized over 7 years)	36	elements	100.00	3,600					3,600	
	RO Skids (Annualized over 5 years)	54	elements	120.00	6,480					6,480	
	CIP Chemicals (annual cleaning)	1	LS	2,240	2,240	560	560			2,800	
	Annual allowance for maintenance and replacement of equipment	1	LS	15,000.00	15,000					15,000	
	<u>Labor (includes overhead costs)</u>										
	Operator (\$60/hr @ 80 hrs/month)	8	months	4,800.00	38,400					38,400	
	Supervisor (\$100/hr @ 20 hrs/month)	8	months	2,000.00	16,000					16,000	
	Water Quality Testing	8	months	625.00	5,000					5,000	
Total Fixed Costs (based on producing 28.3 MG/yr of recycled water)										87,280	3,084

Total Estimate											
Total Fixed & Variable Annual O&M Costs										135,219	4,778
Contingency @ 15%										20,283	1,195
Total Estimate (based on producing 28.3 MG/yr of recycled water during 8 months of operation)										155,502	5,973

Table 6-3: Estimated Annual O&M Costs for Irrigation Pump Station

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Project: SVWD - Pasatiempo Recycled Water Feasibility Study

Prepared By: JHS/JHR

Building, Area: Estimated Annual O&M Costs for Irrigation Pump Station (pumping 50.5 MG/yr to golf course irrigation system)

Date Prepared: 2/8/2010

K/J Proj. No. 0988014

Current at ENR _____

Escalated to ENR _____

Estimate Type: x Tt
 Conceptual Construction
 Preliminary (w/o plans) Change Order
 Design Development @ _____ % Complete

Item No.	Description	Qty	Units	Materials		Installation		Sub-contractor		Total	\$/MG
				\$/Unit	Total	\$/Unit	Total	\$/Unit	Total		
Variable O&M Costs (depends upon MG produced)											
	<u>Power</u>										
	Irrigation Pumps (1156 kWh/MG x 50.5 MG)	58,356	kWh	0.16	9,337					9,337	185
	Pressure Sustaining Pumps (3 HP pump operating 16 hr/day, 214 days/yr)	6,848	kWh	0.16	1,096					1,096	22
	Total Variable Costs (based on pumping 50.53 MG/yr to golf course irrigation system)									10,433	207
Fixed O&M Costs											
	Annual allowance for maintenance and replacement of equipment	1	LS	2,000.00	2,000					2,000	
	Pump & Motor Rehab (\$30,000@ 15 years)	1	LS	2,000.00	2,000					2,000	
	Labor (included in treatment plant costs)										
	Total Fixed Costs (based on producing 28.3 MG/yr of recycled water)									4,000	79
Total Estimate											
	Total Fixed & Variable Annual O&M Costs									14,433	286
	Contingency @ 15%									2,165	71
	Total Estimate (based pumping 50.5 MG/yr to golf course irrigation system)									16,597	357

Table 6-3: Estimated Power and Chemical Usage

POWER											
Item	#	gpm	HP	kW	gal/hr	kwh/1 hr	kwh/MG	\$/kwh	\$/MG	MG/yr	\$/yr
MF Feed Pumps	2	225	5	8	13,500	8	556	0.16	89	28.3	\$ 2,516
RO Feed Pumps	2	215	10	15	12,900	15	1,163	0.16	186	28.3	\$ 5,265
RO Skid (high-pressure pumps contained within skid)	1	140	30	23	8,400	23	1,607	0.16	257	29.3	\$ 7,534
Irrigation Pumps	2	750	70	52	45,000	52	1,156	0.16	185	50.5	\$ 9,337
Pressure Sustaining Pump @ Irrig PS	1		3	2		2		0.16			\$ 1,096
Item	#	kwh/24 hrs	kwh/hr	kwh/day	kwh/yr	\$/kwh	\$/yr				
MF Skid (pumps contained within skid)	1	135	5.6	90	19,260	0.16	\$ 3,082	Memcor, 2009			
Item	#	kW	kwh/1 hr	hrs/yr	kWh/yr	\$/kwh	\$/yr				
UV System	1	14.4	14.4	3,424	49,306	0.16	\$ 7,889	ITT Flowtronex, 2009			
Item	\$/yr										
Other Energy Requirements (lighting, instrumentation, etc.) - 10% of subtotal	\$ 3,562										
Total											39,185

CHEMICALS					
O&M Cost Category	ppd	days/yr	lbs/gal	lbs/yr	gal/yr
Antiscalant	6.8	214	--	1,455	--
Coagulant Polymer	28	214	--	5,992	--

Section 7: Cost Estimates

7.1 Overview

This section includes conceptual level budgeting costs for the Pasatiempo recycled water project. The cost estimates are broken down into construction and non-construction categories.

7.2 Estimated Project Costs

The development of the conceptual construction cost estimate is shown in Table 7-1. Because the project is only at the feasibility level of development the estimates include probable ranges of costs, which for construction is \$4.5 to \$5.6. million.

Project costs also include non-construction or support costs for items such as permitting, engineering design, construction support, start-up and operator training. Permitting includes CEQA compliance, an engineering report to the RWQCB and DPH for the treatment plant operating permit, an NPDES permit, on-site validation testing of the UV disinfection equipment and a building permit. Engineering design includes the preparation of plans, specifications and contract documents for construction. Support during construction includes assistance during bidding and contract award, construction inspection, submittal review, responding to RFIs and general construction management. Following construction assistance will be required to start-up the treatment plant, to provide training of plant operators and to prepare and operations and maintenance manual. Budgeting estimates for these non-construction costs are shown on the enclosed spreadsheet and are estimated to range between \$1.0 and \$1.3 million.

Combining the projected ranges of both construction and non-construction costs yields a probable range of \$5.5 to \$6.9 million for the total project.

Table 7-1: Cost Estimate

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Project: SVWD Engineering Feasibility Report for Recycled Water Delivery to Pasatiempo Golf Course

Prepared By: JHS/JHR

Building, Area: Pasatiempo Equalization Tank, Treatment Plant, Storage Tanks and Irrigation Pump Station

Date Prepared: 9-Mar-10

K/J Proj. No. 0988014

Estimate Type: Conceptual Construction
 Preliminary (w/o plans) Change Order
 Design Development @ % Complete

Current at ENR 9728

Escalated to ENR n/a

Spec. Section	Item No.	Description	Qty	Units	Materials \$/Unit	Materials Total	Installation \$/Unit	Installation Total	Sub-contractor \$/Unit	Sub-contractor Total	Total
---------------	----------	-------------	-----	-------	-------------------	-----------------	----------------------	--------------------	------------------------	----------------------	-------

DIVISION 1 - GENERAL REQUIREMENTS

		Mobilization & Demobilization is 6% included in Markups									
--	--	---	--	--	--	--	--	--	--	--	--

SUBTOTAL - DIVISION 1

DIVISION 2 - SITE WORK

		Demo	1	LS			10,000.00	10,000			10,000
		Earthwork	5,000	SF	4.00	20,000	10.00	50,000			70,000
		Paving and Resurfacing	2,500	SF	2.00	5,000	2.00	5,000			10,000
		Site Piping									
		12" Secondary Effluent Diversion Pipeline to Equalization Tank	500	LF	65.00	32,500	100.00	50,000			82,500
		12" Overflow Pipeline	500	LF	65.00	32,500	100.00	50,000			82,500
		6" PVC Spent Washwater Pipe to Sewer	500	LF	40.00	20,000	80.00	40,000			60,000
		4" Potable Water Service	1	LS	4,000.00	4,000	6,000.00	6,000			10,000
		8" PVC From Tanks to Common Header	150	LF	12.00	1,800	10.00	1,500			3,300
		8" Gate Valves	11	EA	1,200.00	13,200	400.00	4,400			17,600
		12" PVC Header to Pump Station	100	LF	24.00	2,400	12.00	1,200			3,600
		14" PVC Header to Pump Station	100	LF	30.00	3,000	18.00	1,800			4,800
		20" PVC Header to Pump Station	150	LF	60.00	9,000	20.00	3,000			12,000
		Tank Excavation	8,100	CY			4.00	32,400			32,400
		Tank Backfill	5,100	CY			7.00	35,700			35,700
		Offhaul	3,100	CY			8.00	24,800			24,800
SUBTOTAL - DIVISION 2						143,400		315,800			459,200

DIVISION 3 - CONCRETE

		Slab on Grade	200	CY	250.00	50,000	300.00	60,000			110,000
		Access Manholes	3	EA	2,500.00	7,500	2,500.00	7,500			15,000
SUBTOTAL - DIVISION 3						50,000		60,000			110,000

DIVISION 4 - MASONRY

		CMU Type 2 - Scored	2,500	SF	15.00	37,500	12.00	30,000			67,500
SUBTOTAL - DIVISION 4						37,500		30,000			67,500

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Project: SVWD Engineering Feasibility Report for Recycled Water Delivery to Pasatiempo Golf Course

Prepared By: JHS/JHR

Building, Area: Pasatiempo Equalization Tank, Treatment Plant, Storage Tanks and Irrigation Pump Station

Date Prepared: 9-Mar-10

K/J Proj. No. 0988014

Estimate Type: Conceptual Construction
 Preliminary (w/o plans) Change Order
 Design Development @ _____ % Complete

Current at ENR 9728

Escalated to ENR n/a

Spec. Section	Item No.	Description	Qty	Units	Materials \$/Unit	Materials Total	Installation \$/Unit	Installation Total	Sub-contractor \$/Unit	Sub-contractor Total	Total
DIVISION 5 - METALS											
		Structural Metal Framing	1	LS	10,000.00	10,000	25,000.00	25,000			35,000
		Standing Seam Metal Roof	3,200	SF	7.00	22,400	5.00	16,000			38,400
		Grating, Aluminum	200	SF	25.00	5,000	25.00	5,000			10,000
		Pipe Supports	1	LS	10,000.00	10,000	5,000.00	5,000			15,000
SUBTOTAL - DIVISION 5						47,400		51,000			98,400
DIVISION 7 - THERMAL AND MOISTURE PROTECTION											
		Gutters	100	LF	5.00	500	5.00	500			1,000
SUBTOTAL - DIVISION 7						500		500			1,000
DIVISION 8 - DOORS											
		Roll-up Door	2	EA	3,000.00	6,000	1,000.00	2,000			8,000
		Door	1	EA	1,000.00	1,000	500.00	500			1,500
SUBTOTAL - DIVISION 8						7,000		2,500			9,500
DIVISION 9 - FINISHES											
		Protective Coatings	1	LS	8,000.00	8,000	8,000.00	8,000			16,000
SUBTOTAL - DIVISION 9						8,000		8,000			16,000
DIVISION 11 - EQUIPMENT											
		MF Feed Pump, 10-HP	2	EA	5,000.00	10,000	1,000.00	2,000			12,000
		MF Packaged System (one AP-4 skids, 1 CIP skid and 1 air compressor system)	1	LS	360,000.00	360,000	45,000.00	45,000			405,000
		RO Booster Pump, 225 gpm @ 115 TDH, 7.5 HP	2	EA	4,326.00	8,652	1,000.00	2,000			10,652
		RO Packaged System (1 110-gpm unit, 1 CIP system)	1	LS	300,000.00	300,000	37,500.00	37,500			337,500
		UV Disinfection System, 2 units	1	LS	143,300.00	143,300	18,000.00	18,000			161,300
		AWT Spent Washwater Pump, 3 HP	2	EA	1,000.00	2,000	1,000.00	2,000			4,000
		Chemical Metering Pumps	5	EA	1,000.00	5,000	600.00	3,000			8,000
SUBTOTAL - DIVISION 11						828,952		109,500			938,452
DIVISION 13 - SPECIAL CONSTRUCTION											
		Above-grade Steel Equalization Tank	80,000	Gal	1.50	120,000	0.50	40,000			160,000
		MF Filtrate Tank, 4000-Gallon	1	EA	8,000.00	8,000	2,000.00	2,000			10,000
		Hypochlorite Secondary Containment Tank, 2000-Gallon	1	EA	7,000.00	7,000	1,750.00	1,750			8,750
		Secondary Containment for 300-Gallon Tote Bin (Coagulant)	1	EA	1,000.00	1,000	1,000.00	1,000			2,000

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Project: SVWD Engineering Feasibility Report for Recycled Water Delivery to Pasatiempo Golf Course

Prepared By: JHS/JHR

Building, Area: Pasatiempo Equalization Tank, Treatment Plant, Storage Tanks and Irrigation Pump Station

Date Prepared: 9-Mar-10

K/J Proj. No. 0988014

Estimate Type: Conceptual Construction
 Preliminary (w/o plans) Change Order
 Design Development @ _____ % Complete

Current at ENR 9728

Escalated to ENR n/a

Spec. Section	Item No.	Description	Qty	Units	Materials		Installation		Sub-contractor		Total
					\$/Unit	Total	\$/Unit	Total	\$/Unit	Total	
		Spill Containment for 55-Gallon Chemical Tank (Antiscalant)	1	EA	500.00	500	500.00	500			1,000
		40,000 gallon tank and accessories	10	EA	72,000.00	720,000	23,760.00	237,600			957,600
		20,000 gallon tank and accessories	1	EA	36,300.00	36,300	11,979.00	11,979			48,279
		Pump Station Package	1	EA	110,000.00	110,000	25,000.00	25,000			135,000
		Pump Station Building	120	SF	150.00	18,000	150.00	18,000			36,000
SUBTOTAL - DIVISION 13						1,020,800		337,829			1,358,629
DIVISION 15 - MECHANICAL											
		Pipes, Fittings and Accessories	1	LS	25,000.00	25,000	25,000.00	25,000			50,000
SUBTOTAL - DIVISION 15						25,000		25,000			50,000
DIVISION 16 - ELECTRICAL											
		Electrical and Instrumentation	1	LS	200,000.00	200,000	160,000.00	160,000			360,000
SUBTOTAL - DIVISION 16						200,000		160,000			360,000
Subtotals						2,368,552		1,100,129			3,468,681
Contractor Mob/Demob			@	6%							208,121
Contractor OH&P			@	15%							520,302
Subtotals											4,197,104
Estimate Contingency			@	15%							629,566
Taxes			@	9.25%		219,091					219,091
Estimated Bid Cost											5,045,800

Estimated Probable Range of Construction Cost: **\$4.5 - \$5.6 million**

	Description	Budget Est
Permits & Regulatory	CEQA	70,000
	Engineering Report to RWQCB & DPH	50,000
	On Site UV Validation	60,000
	NPDES Discharge Permit	25,000
	Building Permit	5,000
Design to Start-up	Plans & Specs for Construction (incl soils & survey)	450,000
	Bidding Support	20,000
	Construction Management	400,000
	Start up, Operator Training & O&M Manual	50,000
SVWD & Pasatiempo	Administration & Legal	30,000
	TOTAL	1,160,000

Estimated Probable Range of Non-Construction Costs: **\$1.0 - \$1.3 million**

Estimated Probable Range of Total Project Costs: **\$5.5 - \$6.9 million**