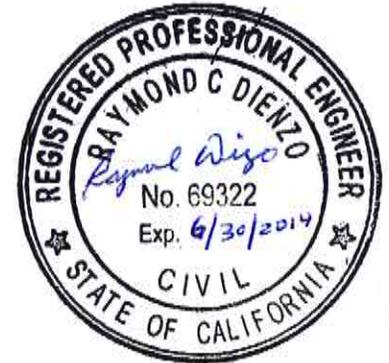


**Calculation of Agronomic Rates for Landscape Irrigation of
Recycled Water at Urban Landscaped Areas
by Los Osos Water Recycling Facility**

Prepared for
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Calculation of Agronomic Rates for Landscape Irrigation of Recycled Water at Urban Landscaped Areas by Los Osos Water Recycling Facility

1.0 Introduction

The County of San Luis Obispo is constructing the Los Osos Water Recycling Facility (LOWRF) to serve the unincorporated community of Los Osos. The LOWRF will provide tertiary treated recycled water for urban irrigation. This Landscape Irrigation Plan is prepared by the County of San Luis Obispo Public Works staff to describe the agronomic and nutrient loading rates from the urban irrigation of turf grass within the Los Osos groundwater basin.

2.0 Background

The community of Los Osos relies almost entirely on septic systems for wastewater disposal. Recognizing that septic system discharge was contributing to high nitrate levels within the upper aquifer, in 1983 the RWQCB issued Resolution 83-13, an amendment to its Basin Plan. This resolution prohibited waste discharge from septic systems within a Los Osos Wastewater Service Area (see Figure 1) effective January 1, 1988, halting new construction or major expansions until the water pollution problem was solved. Resolution No. 83-13 necessitated development of a community wastewater treatment which is finally being completed after 30 years of delay.

The LOWRF will provide wastewater collection, treatment, and water recycling services to the approximately 12,500 Los Osos residents within the wastewater service area. The new infrastructure and ongoing operations will enable the community to comply with Resolution 83-13. The RWQCB issued waste discharge requirements for the LOWRF as defined in Waste Discharge/Recycled Water Requirements (WDR) Order No. R3-2011-0001. The waste discharge requirements comply with the recycled water requirements of CCR Title 22 for unrestricted use. There will be periods in the year when recycled water is not used for irrigation and will be discharged to leach fields. This irrigation plan summarizes the agronomic and nutrient loading for the landscape irrigation permit and will cover the urban landscape irrigation areas. This analysis does not include agricultural irrigation. Urban irrigation areas include turf irrigation of four schools, a county park, the LOWRF site and a golf course.

3.0 Supporting analysis

This report references the analysis in a technical memorandum titled *Spray Field Evapotranspiration at Tonini Ranch* prepared by Cleath-Harris Geologistst, dated March 4, 2009. This technical memorandum analyzed pasture irrigation that was considered as a disposal alternative. Although this sprayfield alternative is no longer a disposal option for this project, background technical analysis for turf grass irrigation within the Los Osos vicinity is applicable to this project.

Data used from that analysis are the effective rainfall, and County precipitation gauge #727 at the former Los Osos landfill.

The evapotranspiration data used DWR CIMIS Reference Evapotranspiration Zone 2 which is describe as coastal mixed fog area.

4.0 Recycled Water Quality

Since the LOWRF is yet to be constructed, the effluent quality is based on the WDR Order R3-2011-0001, see summary Table 1.

Recycled water from the LOWRF will be delivered to both reuse and disposal sites in the same pipeline, so the more stringent requirements must be met including:

- Total Nitrogen Monthly Average limit of 7 mg/L.
- Total Nitrogen Maximum Day limit of 10 mg/L.
- California Title 22 standards for tertiary recycled water
- UV Disinfection

Table 1 Discharge and Recycled Water Limitations Water Recycling Facility Engineering Report Los Osos Wastewater Project Development San Luis Obispo County				
Constituent, units	Recycled Water Limitations⁽¹⁾⁽²⁾		Leach Field Discharge Limitations⁽¹⁾	
	Monthly Mean	Maximum	Monthly Average (30-day)	Daily Maximum
BOD, 5-day (mg/L)	30	90	60	100
Suspended Solids (mg/L)	30	90	60	100
Settleable Solids (mL/L)	n/a	n/a	0.1	0.5
Total Nitrogen (as N) (mg/L)	n/a	n/a	7	10
pH	6.5 – 8.4		n/a	n/a
Total Coliform (MPN/100 mL)	Shall not exceed median of 2.2 per last 7 days; 23 in more than one sample in any 30-day period; and shall not exceed 240 in any single sample		n/a	n/a
Turbidity (NTU)	Shall not exceed 2 NTU within a 24-hour period, 5 NTU's more than 5 percent of the time within a 24-hour period, and 10 NTU's at any time		n/a	n/a
Notes:				
1. Waste Discharge Requirements, Central Coast Regional Water Quality Control Board, May 2011.				
2. Recycled water limitations are in addition to the Leachfield Discharge Limitations.				

4.1 Producer – Distributor – User

The LOWRF will be owned and operated by the County of San Luis Obispo. This will include the collection system, treatment plant, and recycled water distribution system. The County will be the producer and distributor of the LOWRF recycled water. The County will also be one of several users. The following is a list of proposed urban recycled water users and the estimated irrigation areas:

User	Estimated Area (acres)
San Luis Obispo Coastal Unified School District	
1. Los Osos Middle School	10
2. Baywood Elementary School	3
3. Sunnyside Elementary School	2
4. Monarch Grove Elementary School	2
County of SLO - South Bay Community Center Park	2
Sea Pines Golf Course	7
Water Recycling Facility Site	8

4.2 Analysis Summary

The analysis of the landscape irrigation plan is summarized in Table 2.

The following assumptions are included in the analysis:

- Total irrigation at an agronomic rate is 34.21 inches per year.
- Effluent quality of average Total Nitrogen is 7 mg/L
- Estimated TDS is 620 mg/L – this estimate was obtained from the Water Recycling Facilities Plan

Although not part of this analysis, the anticipated influent quality are as follows:

5-day Biochemical Oxygen Demand (BOD) at Maximum Month = 2,500 lbs/day
 Total Suspended Solids (TSS) at Maximum Month = 2,250 lbs/day
 Nitrogen (as total N) at Maximum Month = 56 mg/L

Estimated Recycled Water Production and Use		
	Start-up	Buildout
Recycled Water Produced	700 AFY	1,117 AFY
Recycled Water to Urban Use	84 AFY	84 AFY
Recycled Water to Leach Field Disposal	480 AFY	480 AFY
Recycled Water to Agriculture Use	136 AFY	553 AFY

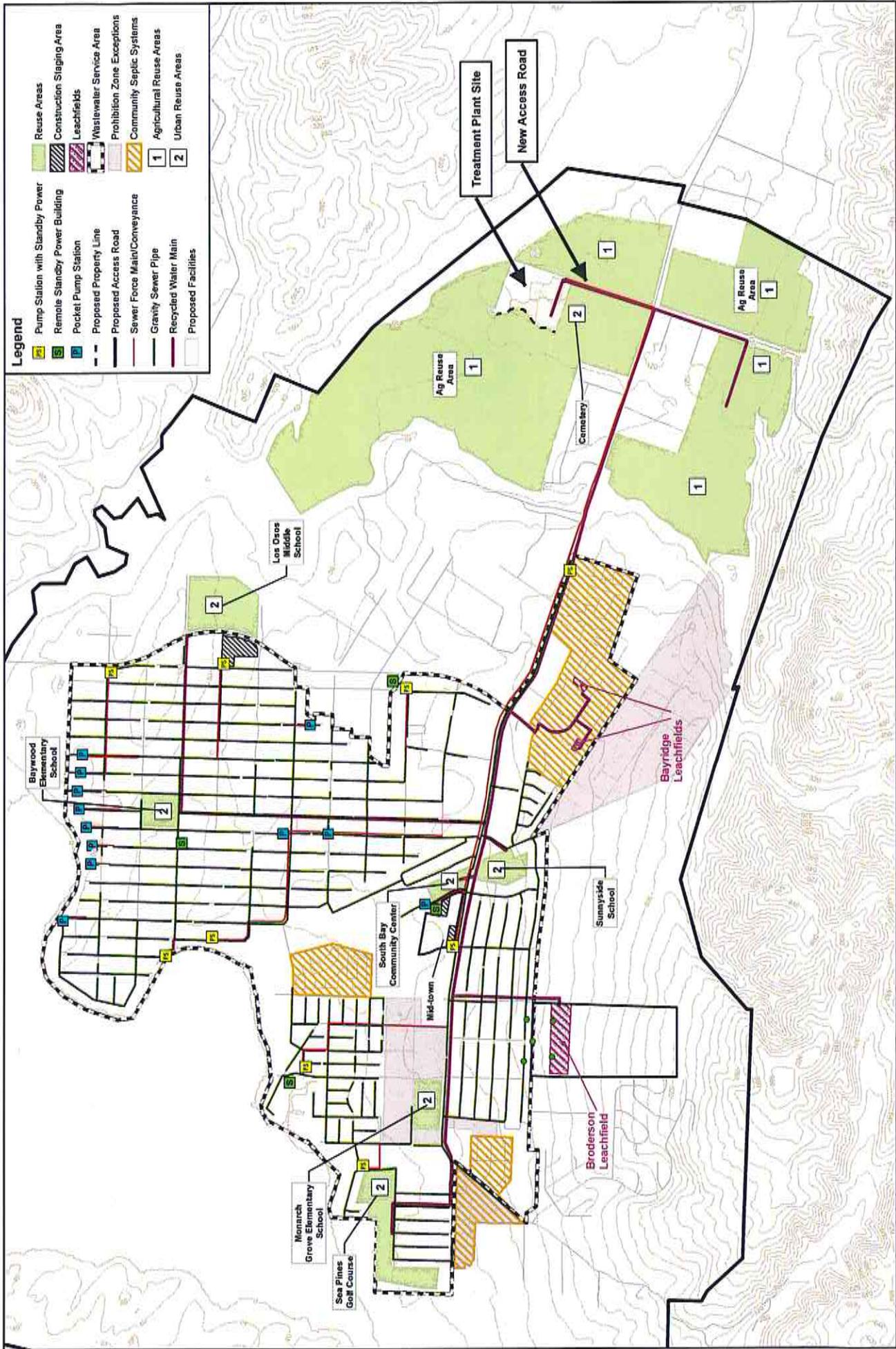
5.0 Conclusion

The results of the analysis show the maximum amount of nutrient loading:

Total Nitrogen Loading	54.3 lbs/acre/year
Total TDS loading	4,806 lbs/acre/year

The Title 22 engineering report estimated the amount of total irrigation for urban irrigation to be 30 in/year as opposed to the 34 in/year as the maximum total irrigation at an agronomic rate presented in this analysis.

Since some areas like the golf course and park may blend the recycled water with their onsite irrigation wells, this further supports that the amount of nutrient loading calculated would be the maximum limit.



Source: San Luis Obispo County GIS Data, Carollo Engineers, and MBA GIS Data.



Figure 1

Reuse/Disposal Site and Pipeline Routes

COUNTY OF SAN LUIS OBISPO - LOS OSOS WASTEWATER PROJECT

Revised: 5/15/2012

Table 2 - Los Osos Water Recycling Facility - Irrigation Management Plan - Agronomic Loading Rates

Month	Days	Evapotranspiration		Precipitation		Effective Rainfall		Total Acreage		Total Irrigation		Monthly Irrigation Volume		Nutrient Loading lbs/ac/month	
		A	B	C	D	E	F	G	H						
		Normal Year, ET0(in)	Precipitation (in)	in	acres	inches	acre-ft	Nitrogen	TDS						
October	31	2.79	0.41	0.00	34	2.79	7.91	4.4	392						
November	30	1.80	1.33	0.40	34	1.40	3.97	2.2	197						
December	31	1.24	2.95	0.89	34	0.35	0.99	0.6	49						
January	31	1.24	4.52	1.36	34	0.00	0.00	0.0	0						
February	28	1.68	4.34	1.30	34	0.38	1.08	0.6	53						
March	31	3.10	2.08	0.62	34	2.48	7.03	3.9	348						
April	30	3.90	1.17	0.35	34	3.55	10.06	5.6	499						
May	31	4.65	0.69	0.00	34	4.65	13.18	7.4	653						
June	30	5.10	0.03	0.00	34	5.10	14.45	8.1	717						
July	31	4.96	0.01	0.00	34	4.96	14.05	7.9	697						
August	31	4.65	0.00	0.00	34	4.65	13.18	7.4	653						
September	30	3.90	0.02	0.00	34	3.90	11.05	6.2	548						
Yearly Total	365	39.01	17.55	4.92	34	34.21	96.93	54.3	4806						

Notes:

- A - Evapotranspiration data from DWR CIMIS Reference Evapotranspiration Zone 2 - Coastal Mixed Fog Area
- B - Closest rainfall data at County gage #727 at the former Los Osos landfill
- C - From memorandum titled Spray Field Evapotranspiration at Tonini Ranch, provided by Cleath-Harris Geologist, March 4, 2009
- D - From Table 6 from Title 22 Engineering Report - total acreage of landscape irrigation sites
- E - Total irrigation = ET0 - Effective Rainfall
- F - Monthly Irrigation Volume = D x (E / 12)
- G - Total nitrogen load based on WDR R3-2011-0001, effluent quality for average Nitrogen = 7 mg/L
- H - Total TDS load based on Water Recycling Facilities Plan estimated effluent quality of TDS = 620 mg/L

Attachment 1

Spray Field Evapotranspiration at Tonini Ranch



Memorandum

Date: March 4, 2009
From: Spencer Harris
To: LOWWP Team

SUBJECT: Spray Field Evapotranspiration at Tonini Ranch

Tonini Ranch has been proposed as a location for wastewater disposal using spray fields. Prior work on spray field disposal capacity included nominal values of evapotranspiration developed during the fine screening process for the Los Osos Creek valley. This memorandum provides more detailed information on evapotranspiration (ET), effective rainfall, and associated spray field disposal capacity operations at Tonini Ranch.

ET draws water from the soil, which is replenished by irrigation and precipitation. Crop irrigation requirements depend primarily on the local ET and rainfall. For planning purposes, the volume of irrigation needed for maintaining a satisfactory soil water content can be estimated as the monthly crop ET minus the monthly effective rainfall.

The closest information on pasture or turfgrass ET for spray fields at Tonini is the California Irrigation Management Information Systems (CIMIS) Station #160, located at Chorro Regional Park on Highway 1. This CIMIS station is in the same climate zone as Tonini ranch (Zone 6) in the adjacent Chorro Valley. Station #160's reference surface is grass and is comparable to the future spray fields at Tonini. The closest rainfall data are precipitation records for County gage #727 at the former Los Osos landfill, west of Tonini ranch. Effective monthly rainfall is defined by the California Landscape Contractors Association as 30 percent of the precipitation in any month having more than one inch total precipitation. Using these sources of information, the evapotranspiration disposal capacity for spray fields at Tonini ranch is estimated at 47 inches (3.9 feet) during a normal year and 44 inches (3.7 feet) during a wet year. The following table summarizes the water budget information.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ETo (inches)	2.21	2.5	3.8	5.08	5.7	6.19	6.43	6.09	4.87	4.09	2.89	2.28	52.13
Normal Year (inches)													
Precip (ave.)	4.52	4.34	2.08	1.17	0.69	0.03	0.01	0	0.02	0.41	1.33	2.95	17.55
Eff. Rain	1.36	1.3	0.62	0.35	0	0	0	0	0	0	0.4	0.89	4.92
Irrigation	0.85	1.2	3.18	4.73	5.7	6.19	6.43	6.09	4.87	4.09	2.49	1.39	47.21
Wet Year (inches)													
Precip (1998)	4.45	11.26	2.84	1.22	1.77	0	0	0	0	0	4.29	5	30.83
Eff. Rain	1.34	3.38	0.85	0.37	0.53	0	0	0	0	0	1.29	1.5	9.26
Irrigation	0.87	0	2.95	4.71	5.17	6.19	6.43	6.09	4.87	4.09	1.6	0.78	43.75