March 2016

City of Atascadero
Water Reclamation Facility

Master Plan Update

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City of Atascadero
Water Reclamation Facility Master Plan Update, 2016

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List of Acronyms

ADF	Average Daily Flow
ADWF	Average Dry Weather Flow
AMWC	Atascadero Mutual Water Company
AWWF	Average Wet Weather Flow
AFY	Acre Feet per Year
APN	Assessor's Parcel Number
BFP	Belt Filter Press
BOD	Biological Oxygen Demand
BOD_5	5-day Biological Oxygen Demand
CDHS	California Department of Health Services
CF	Cubic Foot / Cubic Feet
CIP	Capital Improvement Plan
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
FRM	Fluid Resource Management
FT	Feet / Foot
Gal	Gallon
GBT	Gravity Belt Thickener
GIS	Geographic Information System
GISP	Geographic Information System Professional
GPCD	Gallons per Capita per Day
GPD	Gallons per Day
GPDU	Gallons per Day per Unit
GPM	Gallons per Minute
HDPE	High Density Polyethylene
HP	Horsepower
Hr	Hour
HRT	Hydraulic Retention Time
I/I	Infiltration and Inflow
Kw-hr	Kilowatt-hour

LB	Pound
MFR	Multi-Family Residential
MG	Million Gallons
MGD	Million Gallons per Day
Mg/L	Milligram per liter
MKN	Michael K. Nunley & Associates, Inc
Ml/L	Milliliter per liter
MMF	Maximum Month Flow
PDDWF	Peak Day Dry Weather Flow
PDWWF	Peak Day Wet Weather Flow
PDF	Peak Daily Flow
PE	Professional Engineer
PHDWF	Peak Hour Dry Weather Flow
PHF	Peak Hour Flow
PHWWF	Peak Hour Wet Weather Flow
PPD	Pounds per day
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
PWWF	Peak Wet Weather Flow
RDT	Rotary Drum Thickener
RV	Recreational Vehicle
RWQCB	Regional Water Quality Control Board
$SBOD_5$	5-day Soluble Biological Oxygen Demand
SF / SQFT	Square Foot
SFR	Single-family Residential
SRT	Solids Retention Time
TDS	Total Dissolved Solids
TN	Total Nitrogen
TSS	Total Suspended Solids
WCSA	Wastewater Collection Service Area
WDR	Waste Discharge Requirements
WRF	Water Reclamation Facility
WWTP	Wastewater Treatment Plant
Yr	Year

EXECUTIVE SUMMARY

Overview

The City of Atascadero (City) is located in San Luis Obispo County and is surrounded by the cities of San Luis Obispo, Morro Bay, Paso Robles and the communities of Templeton and Creston. The City has a population of over 26,000, including several commercial areas and some light industrial development. Approximately 11,000 parcels and an estimated 15,000 acres are located within City limits. Currently wastewater service is limited to approximately 5,000 parcels that cover an estimated 1,900 acres.

The City owns and operates a wastewater collection system and water reclamation facility (WRF) that treats the collected wastewater. The WRF is permitted for a maximum month flow (MMF) of 2.39 MGD and discharges to onsite percolation ponds that recharges the underlying groundwater basin. The WRF treats incoming sewage using screens and biological treatment ponds. Settled solids are collected from the bottom of the facultative lagoon periodically and dried onsite in concrete-lined sludge drying beds before hauling for disposal. Treated effluent is percolated in basins onsite for final polishing treatment through the soil. An irrigation well sited downstream of the percolation basins extracts a mix of treated effluent and groundwater for reuse as irrigation at Chalk Mountain Golf Course.

The purpose of the Water Reclamation Facility Master Plan is to provide an evaluation of the existing treatment, sludge handling and disposal facilities under existing and future conditions and offer recommendations for meeting the City's wastewater treatment needs.

Population

The planning horizon for this Water Reclamation Facility Master Plan Update is intended to be consistent with the City's current General Plan which has a target date of 2025 for the future condition. The population within the current City limits is approximately 28,814 persons, based on 2012 data from the United States Census Bureau. The City's General Plan 2025 population projection is estimated at 36,030 people. The City does not provide wastewater services to the entire City population as mentioned in the land use section and at this time no information is available to determine the existing population within the WCSA.

The City cannot reliably forecast when they will meet the future General Plan population of 36,030 people. While the Master Plan is based on the General Plan future land use, it is recommended that the City base their future wastewater demands on the number of approved residential projects and the vacant parcels that could be served in the future.

There are developed parcels within the Atascadero Colony Boundary which currently manage wastewater with onsite septic or other small scale treatment systems. In the future, some of these developed parcels may be connected to the sewer system. These parcels have not been included in this planning effort, as the timeline and impact of connecting developed parcels to the community sewer system is unknown and difficult to predict. If there is a driver for these existing (septic) facilities to tie-in to the community sewer system in the future, the Master Plan will need to be revisited to estimate potential impacts.

To determine future wastewater customer population, MKN coordinated with the City's Community Development Department to identify approved future residential development projects and estimate future wastewater service customers. Based on the future unit counts developed through review of approved projects and vacant properties and assuming a population density factor of 2.65 people/unit from the City's General Plan, it is anticipated the WSCA population will increase by 3,543 people by 2025.

Wastewater Flows

MKN reviewed the WRF's daily and monthly influent flow records from the City's annual reports and annual rainfall data collected by the City from January 2008 to December 2013. The average annual flow varies by more than ten percent from year to year, with the highest flows seen in 2011. Flows from 2011 were used for planning purposes in this report (**Table ES-1**).

Table ES-1: Existing Wastewater Flows			
Flow Condition	**Flow (MGD)**	**Peaking Factor**	**Source**
Average Daily Flow (ADF)	1.38	--	City of Atascadero WRF 2011 Daily Flow Records
Maximum Month Flow (MMF)	1.77	1.3	City of Atascadero WRF 2011 Daily Flow Records
Peak Day Dry Weather Flow (PDDWF)	1.55	1.1	City of Atascadero WRF 2011 Daily Flow Records
Peak Day Wet Weather Flow (PDWWF)	3.01	2.2	City of Atascadero WRF 2011 Daily Flow Records
Peak Hour Dry Weather Flow (PHDWF)	5.24	3.8	Dry Weather Flow Monitoring from July 2, 2013 to August 7, 2013
Peak Hour Wet Weather Flow (PHWWF)	4.97	3.6	Wet Weather Flow Monitoring from March 11, 2014 to April 8, 2014
Peak Hour Flow (PHF)	5.24	3.8	Flow Monitoring Study

Flow factors were developed and used to estimate potential future wastewater flows resulting from future development and infill of vacant lots. These flow factors were applied to the estimated development projects and added up to create a future estimated average daily flow. Peaking factors found for existing conditions were assumed to estimate future flow conditions. The future wastewater flow conditions are summarized in **Table ES-2** below, and were used to analyze the capacity of the existing collection system during future wastewater flow conditions.

Table ES-2: Projected Future Wastewater Flows		
Flow Condition	**Flow (MGD)**	**Peaking Factor**
Average Daily Flow (ADF)	1.75	--
Maximum Month Flow (MMF)	2.28	1.3
Peak Day Dry Weather Flow (PDDWF)	1.92	1.1
Peak Day Wet Weather Flow (PDWWF)	3.85	2.2
Peak Hour Flow (PHF)	6.65	3.8

Ability of Existing System to Treat Existing and Future Flows and Loadings

The existing WRF is reliably meeting effluent requirements at existing flows and loadings. However, the average influent flows and loadings are near the original design values for the water reclamation facility, as summarized in the table below.

Table ES-3: Comparison of Current Values to Original Design			
	Current Value	Original Design	% of Original Design
Average Daily Flow (MGD)	1.38	1.40	99%
Average Influent BOD_5 (mg/L)	153	185	83%
Average BOD_5 Loading (ppd)	1,651	2,161	76%
Average Influent TSS (mg/L)	230	250	92%
Average TSS Loading (ppd)	2,477	2,921	85%

Based on the design capacity, the existing operational challenges, theoretical modeling and comparison to typical design parameters, adequate additional capacity in the existing pond system cannot be assumed at this time. It is recommended that the City plan for facility improvements to increase capacity and reliability of the secondary treatment system.

Several alternatives were explored for the future water reclamation facility, including expansion of the existing pond system with and without various aeration improvements (brush aerators, diffused aeration, etc.), and conversion of the treatment process to an extended aeration system. Potential drivers for changing the main process include meeting future flows and loadings; reducing energy requirements; improving the efficiency of sludge processing; and reducing potential for odor as land around the treatment facility continues to develop. Additionally, expanding the pond system does not appear feasible based on the land requirement and bounds of the existing WRF site.

Capital Improvements Program

A capital improvements plan was developed summarizing the recommendations to meet existing and future deficiencies at the WRF. As described in this report, the existing WRF is at its design capacity for dry weather flow conditions and approaching the loading (TSS and BOD) capacity. The capital improvements projects (CIPs) were split into two categories based on whether they are recommended to meet existing or future needs. A priority was assigned to each project as summarized in **Table ES-4**.

Table ES-4: Capital Improvements Projects Priority Scale	
Priority	**Description**
1	Required to meet existing deficiency and recommended for implementation within the next 0 – 5 years
2	Required to meet future deficiency and recommended for implementation within the next 5 – 10 years
3	Recommended to improve efficiency and or operations

The CIPs recommended to meet existing and future deficiencies are summarized in **Table 15-2** and **Table 15-3**, respectively (**Section 15).**

The future CIPs are in part driven by anticipated new development. Based on estimated existing and future flow rates, new development will be contributing approximately 21% of the future estimated wastewater flows.

Recommendations

The main recommendations are summarized below:

- Perform a rate study to plan and budget for the Capital Improvements Program and the existing and future operations and maintenance costs. The recommended Capital Improvements Program is summarized in **Table ES-5**.
- Develop and maintain an annual replacement reserve fund of $130,000 for the existing facility's major equipment (**Section 13**). Continue to reevaluate and update this reserve fund amount on an annual or biannual basis.
- Continue to improve influent monitoring and within the next year, perform a re-rating study (EWRFCIP-1) to estimate flow and loading capacity at the existing plant and confirm the timeframe for the WRF process improvements (FWRFCIP-1 and -2).
- Within the next five years, perform a percolation basin capacity evaluation (EWRFCIP-2) and percolation pond discharge piping improvements (EWRFCIP-3), Public Works service lateral realignment (EWRFCIP-6), and install a permanent standby generator (EWRFCIP-8).
- Within the next five years begin planning, permitting, and engineering for a plant upgrade to an extended aeration system (FWRFCIP-1) with sludge dewatering (FWRFCIP-2) and the new administration building/laboratory (EWRFCIP-7).

Table ES-5: Recommended Capital Improvements Program

Project	Project Name	Priority	Opinion of Cost (2014 $)
EWRFCIP-1	WRF Re-Rating study	1	$ 50,000
EWRFCIP-2	Percolation Basin Capacity Evaluation	1	$ 30,000
EWRFCIP-3	Percolation Pond Discharge Piping Improvements	1	$ 180,000
EWRFCIP-6	Public Works Building Service Lateral Realignment	1	$ 100,000
EWRFCIP-7	WRF Administrative Building and Laboratory	3	$ 450,000
EWRFCIP-8	Permanent Standby Generator	1	$ 150,000
FWRFCIP-1	WRF Process Improvements	2	$ 15,780,000
FWRFCIP-2	Solids Dewatering Improvements	2	$ 1,300,000
		Total	**$ 17,960,000**

SECTION 1 INTRODUCTION

1.1 Overview

The City of Atascadero (City) is located in San Luis Obispo County and is surrounded by the cities of San Luis Obispo, Morro Bay, Paso Robles and the communities of Templeton and Creston. The City has a population of over 26,000, including several commercial areas and some light industrial development. Approximately 11,000 parcels and an estimated 15,000 acres are located within City limits. Currently wastewater service is limited to approximately 5,000 parcels that cover an estimated 1,900 acres, including a majority of the businesses within City limits. Land uses served by the City's sewer system include residential, retail, office, commercial and light industrial developments. Privately owned and maintained on-site septic systems are utilized by the remainder of the City.

The City owns and operates a wastewater collection system and water reclamation facility (WRF) that is permitted under Waste Discharge Requirements Order No. 01-014 (**Appendix A**). The WRF is permitted for a maximum month flow (MMF) of 2.39 MGD and discharge to onsite percolation ponds that recharges the underlying groundwater basin. The WRF treats incoming sewage using screens and biological treatment ponds. Treatment process components include mechanical headworks screens, an aeration lagoon with mechanical surface aerators, a facultative lagoon, a polishing pond, and a post-aeration system (originally a chlorine contact chamber) (**Figure 1-1**). Settled solids are collected from the bottom of the facultative lagoon periodically and dried onsite in concrete-lined sludge drying beds before hauling for disposal. Treated effluent is percolated in basins onsite for final polishing treatment through the soil. An irrigation well sited downstream of the percolation basins extracts a mix of treated effluent and groundwater for reuse as irrigation at Chalk Mountain Golf Course. The reclamation program reduces reliance on groundwater.

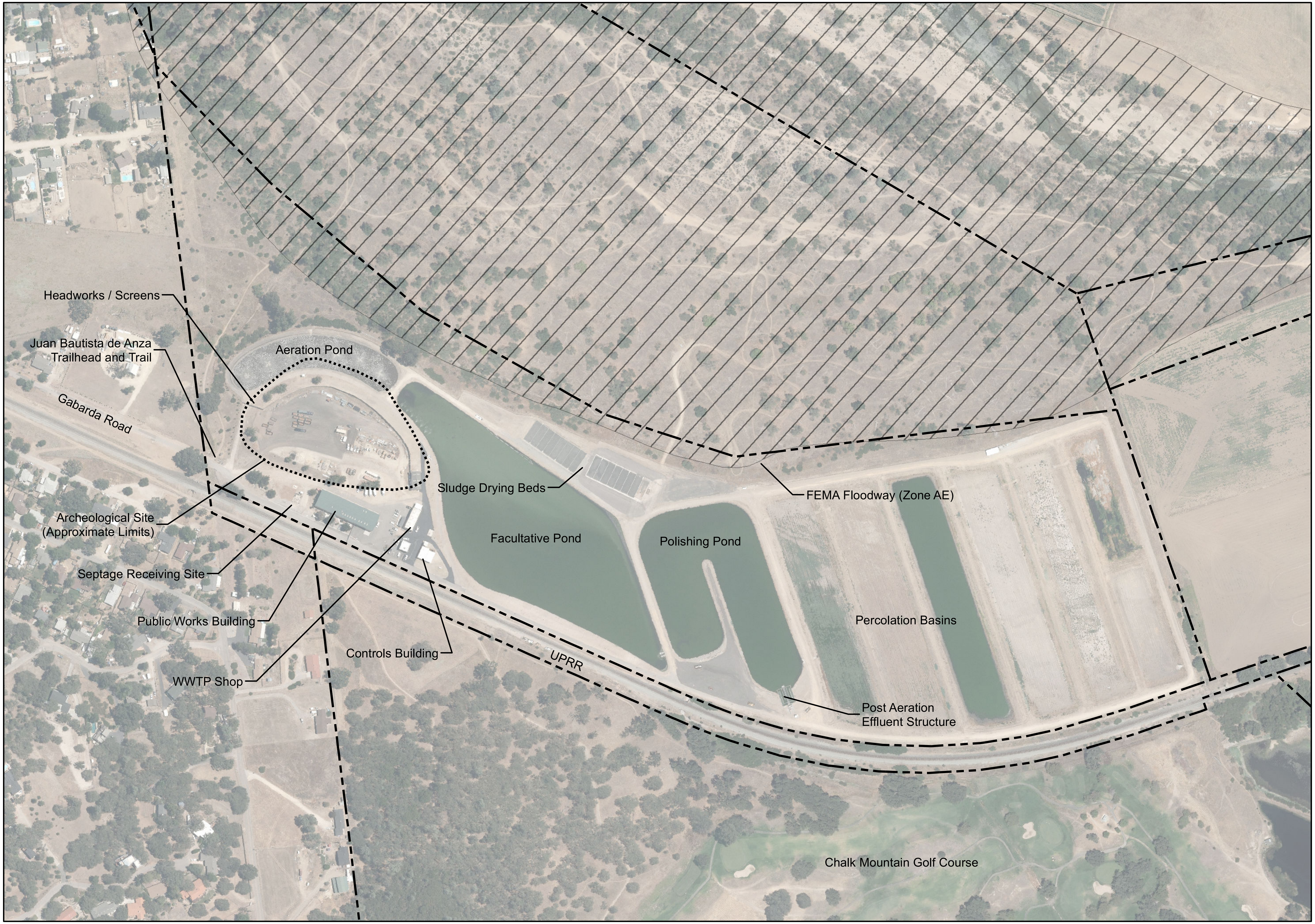
Prior to this report, the treatment plant capacity was most recently evaluated in the Wastewater Treatment Plant Audit (AECOM, July 2011). The Plant Audit estimated that the treatment system could meet its rated capacity, but concluded neither hydraulic not treatment capacity can be significantly increased through improvement of the existing process. A detailed Wastewater Treatment Facility Master Plan was recommended. The Plant Audit also provided several recommendations to improve performance, reliability, and reduce operating costs. These improvements were related to plant hydraulics, treatment performance, odor management, and solids removal/pretreatment. The City has addressed several of the recommendations related to hydraulics, and recently addressed the pretreatment recommendations through installation of the new headworks with mechanical screens and bypassing capability. The City also plans to construct a new septage receiving facility.

1.2 Scope of Work

The purpose of the Water Reclamation Facility Master Plan is to provide an evaluation of the existing treatment, sludge handling and disposal facilities under existing and future conditions and offer recommendations for meeting the City's wastewater treatment needs.

To achieve the goals of this study, the scope includes the following:

A. Review of previous reports, conclusions and recommendations, and assessment of projects that were considered but not implemented.
B. Evaluation of current flows and loadings and estimation of future flows and loadings based on projected growth in the City's wastewater service area
C. Evaluation of the wastewater treatment and disposal process, including treatment and hydraulic capacity, power usage, and sludge handling and management
D. Analyses of potential future treatment and discharge requirements
E. Evaluation of opportunities for reuse or expanded reuse of wastewater, and review of potential funding sources
F. Review of solar energy production costs and space requirements
G. Staffing evaluation (included in the Collection System Master Plan Update)
H. Recommendations for wastewater treatment plant repair and replacement reserves
I. Water Reclamation Facility Master Plan capital improvements plan



City of Atascadero
Water Reclamation Facility Master Plan Update

Figure 1-1:
Existing Wastewater Treatment Plant

Legend

- Archeological Site (Approximate Limits)
- Property Boundary
- FEMA Floodway (Zone AE)

1 inch = 300 feet

0 150 300

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SECTION 2 BACKGROUND

2.1 Summary of 1997 Preliminary Design Report

The 1997 Preliminary Design Report (Brown & Caldwell) outlined design criteria, presented a conceptual layout, and provided construction cost opinions for improvements to the City's WRF required to accommodate wastewater flows beyond the original design capacity and increase operational effectiveness. The original treatment plant, constructed in 1980, was designed for a maximum monthly average flow (MMF) of 1.4 MGD and a peak wet weather flow (PWWF) of 2.55 MGD. The improvements and modifications to the WRF were planned for three stages.

Table 2-1: Summary of 1997 Preliminary Design Report Recommended Improvements

	Stage 1	Stage 2	Stage 3
Flow Capacity	ADWF = 1.4 MGD	ADWF = 1.8 MGD	ADWF = 1.8 MGD
Project Goals	Increase hydraulic and aeration capacity, provide improved solids management, allow treated effluent to flow by gravity to percolation ponds.	Increase treatment capacity and add septage handling system	Complete solids handling, treatment, and dewatering facilities
Project Components	• Floating aerators (add 3 25 hp each) • Effluent distribution pipeline (24 inch) • Percolation pond excavation • Recirculate effluent • Administration building • Sludge drying beds (1 – 4) • Sludge dredging system • Reuse well 2	• Aerated lagoon effluent screening system • Intermediate pumping station • Parshall flume • Floating aerators (add 2 25 hp each) • Intermediate sedimentation tank 1 • RAS/WAS pumping system • Polishing pond effluent pump 3 • Septage handling system	• Intermediate sedimentation tank 2 • Gravity belt thickener • Aerobic digester and biosolids • Storage tank • Sludge drying beds (5 – 8)

Additional details for the project components and an update of the recommendations from the Preliminary Design Report are summarized below:

Table 2-2: Status Update for 1997 Preliminary Design Report Recommended Improvements

Project Component	Recommended Improvements	Status Update
Septage receiving station	Add automated septage receiving and screening system to existing system. New facilities will wash and compact screening and add dilution water to screened septage.	• Septage and RV waste receiving station consists of a holding tank to receive waste and a pump periodically transport it to the aerated lagoon. • 2013: City completed installation of headworks screens to screen influent sewage prior to the

Table 2-2: Status Update for 1997 Preliminary Design Report Recommended Improvements		
Project Component	**Recommended Improvements**	**Status Update**
		aerated lagoon. • City currently does not accept septage and has plans to move RV waste receiving station near aerated lagoon and upstream of the headworks screens.
Floating aerators	Add floating aerators to increase aeration in the aerated lagoon	• Aerated lagoon currently has five 25 hp and two 15 hp surface aerators for a total of 155 hp.
Aerated lagoon effluent screening system	Add rotary drum screen to screen aerated lagoon effluent. Screenings will be washed and compacted to remove organics. The wastewater would then be pumped to intermediate sedimentation tanks.	• Not completed. No current installation plans.
Intermediate sedimentation system	Sedimentation system would be added after the aerated lagoon effluent screening to collect and remove suspended solids, eliminating the need for the facultative lagoon and improving efficiency of sludge removal. The system would consist of two sedimentation tanks, sludge withdrawal system, return activated sludge and waste activated sludge pumps	• Not completed. No current installation plans.
Waste activated sludge thickening	Add a gravity belt thickener to thicken waste activated sludge before sending the thickened sludge to aerobic digesters.	• Not completed. No current installation plans.
Thickened waste activated sludge stabilization	Add two aerobic digesters with coarse bubble diffused air and centrifugal blowers to further stabilized the waste sludge. Add a digested sludge storage tank.	• Not completed. No current installation plans.
Facultative lagoon sludge dredging system	Interim sludge management used until the sedimentation tank and sludge handling facilities are added	• City installed a sludge dredging system with guide cables in the facultative lagoon. The guide cables were removed after determining the dredge was incompatible with the cable layout. City currently uses the dredge to remove sludge from the facultative lagoon three times per year. This is a manual operation that requires weeks of staff attention to prepare, operate, and decommission the dredge.
Sludge drying beds	Install eight sludge drying beds for dewatering the thickened digested sludge	• Completed. Eight sludge drying beds were installed.
Administration building	Construct new administration building with laboratory	• Not completed. No current installation plans.
Effluent distribution pipeline	• Add 24 inch pipeline to the percolation basins to accommodate peak wet weather flows	• Completed. The effluent pipe was upgraded to 24 inch diameter in 2001.

Table 2-2: Status Update for 1997 Preliminary Design Report Recommended Improvements		
Project Component	**Recommended Improvements**	**Status Update**
Percolation pond excavation	• Lower percolation ponds (and install 24 inch effluent pipe) to allow gravity flow from the polishing pond	• 2001: Percolation ponds were excavated to depth of 10 feet.
Recirculate effluent	• Use excess effluent pumping capacity from the polishing pond to recirculate oxygen-rich treated effluent to the front of the facultative lagoon to help reduce potential for odors.	• City currently recirculates treated effluent from the polishing pond to the front of the facultative lagoon, except during wet weather.
Reuse Well 2	• Install second irrigation well to provide redundancy for reclamation	• Not completed. City has plans to design and construct.

2.2 Summary of 2011 Wastewater Treatment Plant Audit

In 2011, the City performed an audit of the WRF. The City of Atascadero Wastewater Treatment Plant Audit (AECOM, July 2011) ("Plant Audit") provided an evaluation of the wastewater flows and loading, plant hydraulics and treatment capacity, and recommendations for addressing issues and improving operations at the plant. At the time, the main issues at the plant were operational challenges during wet weather seasons and storm events, frequent ragging of mechanical surface aerators, uneven accumulation of sludge in treatment ponds, and complaints of odors received from nearby residents.

The Plant Audit reviewed plant records between January 2007 and December 2009 and found that organics and solids loadings were typically lower than design loading for the original plant, but periodically high oxygen demands were occurring, likely resulting from the infrequent septage processing at the plant. The average influent BOD_5 concentration was 131.5 mg/L and average TSS was 227 mg/L. The flow records showed that the plant was operating near the original design flow rate, and experiencing elevated flow rates during wet seasons. Additionally, it was estimated that plant flow rates may reach the peak design flow during storm events due to the impact of direct contribution of precipitation to the flow stream via open surfaces of the treatment ponds and potential inflow and infiltration adding to the flow rates in the collection system.

Hydraulic calculations from the Plant Audit indicated that the hydraulic capacity of the treatment plant and upstream water levels in process ponds are critically affected by high percolation basin water levels and head losses between the effluent station and the percolation basins.

A review of theoretical aeration requirements indicated that treatment capacity at the plant is limited by hydraulic retention time, and additional capacity cannot be obtained from the existing treatment process by increasing or enhancing aeration. Additional volume would be required to significantly increase hydraulic retention time. The Plant Audit concluded that "the current maximum discharge limit of 2.39 MGD was … (a) reasonable limit in terms of treatment capacity and, without expansion or upgrade, significantly greater treatment capacity would be difficult to achieve from the pond system while continuing to consistently operate within compliance goals". The Plant Audit also noted that "… hydraulic retention time in the aerated pond is lower than typically recommended for design, and organic loading relative to pond areas is very high. Prolonged operation of pond systems at low retention times could result in significant operational problems…" A detailed Wastewater Treatment Facility Master Plan was recommended to evaluate future upgrades to the plant processes.

Odor management and potential odor sources at the plant were reviewed. Recommendations for improving buffer distances and implementing a passive odor barrier were provided for consideration if odor issues or complaints from nearby residents occurred in the future.

The Plant Audit also provided recommendations for siting and equipment for the headworks project for pretreatment of influent wastewater.

The following table is a summary of the recommended improvements from the Plant Audit, and the status according to City staff during an operator's meeting with MKN.

Table 2-3 Status of Recommended Improvements from 2011 Plant Audit

2011 PLANT AUDIT			MARCH 2016 STATUS UPDATE
Category	**Recommendation**	**Description**	
Hydraulics	REC-1	Discharge to empty percolation basin	Performed when possible
	REC-2	Simultaneous discharge to two percolation basins (riser installation)	Utilizing 2 basins during wet weather
	REC-3	Temporary elimination of recirculation	Eliminate recirculation during wet weather
	REC-4	Discharge line maintenance	Pending
	REC-5	Upsize percolation pond discharge lines	Pending
	REC-6	Inflow and Infiltration Study (2-yr)	In Progress. Dry weather during the Master Plan study period delayed this work.
Treatment	REC-7	Treatment Facility Plan/ Master Plan	In Progress
Odor Management	REC-8	Septage processing buffer distance	City no longer receives septage, RV waste receiving station relocation is planned
	REC-9	Pond Dredging	City dredges about 3 times per year
	REC-10	Operational Changes	City has ceased septage processing; Operators generally spread & turn sludge on days with low winds
Solids Removal/ Pretreatment	REC-11	Construct headworks and relocation of septage receiving station	Headworks constructed, relocation of RV waste receiving station planned

SECTION 3 LAND USE AND POPULATION

3.1 Land Use

The City of Atascadero includes approximately 11,000 parcels and an estimated 15,000 acres. **Figure 3-1** shows the existing General Plan land uses throughout the City, the City's Urban Reserve Boundary, Sphere of Influence Boundary and Atascadero Colony Boundary. With respect to wastewater collection and treatment, the City does not provide wastewater service to the entire City. Residential parcels one acre and larger are allowed to operate onsite collection and disposal systems. Currently wastewater service is limited to approximately 5,000 parcels that cover an estimated 1,900 acres. Wastewater revenue is collected by fees incorporated into property taxes. Wastewater customers are recorded during issuance of final building occupancy permits and are identified in a Geographic Information System (GIS) layer called "Sewered Parcels" within the City's enterprise GIS.

For the purpose of this Water Reclamation Facility Master Plan Update, land use review and analysis was limited to the Sewered Parcels areas referred to as the "Wastewater Collection Service Area" (WCSA) in this report and shown in **Figure 3-2**. Future estimated expansion of the WCSA was based on approved residential and commercial development projects identified by the City's Community Development Department, potential residential and commercial development projects identified by the City's Community Development Department, and residential and commercial vacant parcels identified to receive wastewater services based on their General Plan designation. **Table 3-1** below provides an overview of the existing and future land uses within the WCSA.

Table 3-1: Existing and Future Land Uses within Wastewater Service Area

Land Use	Designation	Existing Acres	City Approved Projects (Acres)	Future General Plan Area (without approved projects)	Additional Future Acreage for WCSA
Commercial Park	CPK	42	7	15	22
Commercial Recreation	CREC	1	0	0	0
Downtown	D	24	4	1	5
General Commercial	GC	186	44	29	73
High Density Residential (16 units /ac)	HDR	190	35	9	44
Industrial	I	15	0	9	9
Medium Density Residential (10 units /ac)	MDR	166	12	3	15
Mixed Use	MU-PD	16	11	0	11
Open Space	OS	2	0	0	0
Public Facilities	P	14	0	0	0
Rural Estates (2.5 - 10 acre lot min)	RE	71	0	0	0
Public Recreation	REC	2	0	0	0
Service Commercial	SC	37	0	2	2
Suburban Estates (2.5 - 10 acre min)	SE	9	2	0	2
Single Family Residential (0.5 acre min)	SFR-X	369	26	10	36
Single Family Residential (1.0 acre min)	SFR-Y	736	33	0	33
Single Family Residential (1.5 - 2.5 acre min)	SFR-Z	46	1	0	1
Unincorporated	Unincorporated	0	520	0	520
	Total Existing Acreage	**1,926**			
	Total Future Additional Acreage				**773**

According to the General Plan, the WCSA will consist of approximately 2,700 acres in the future.

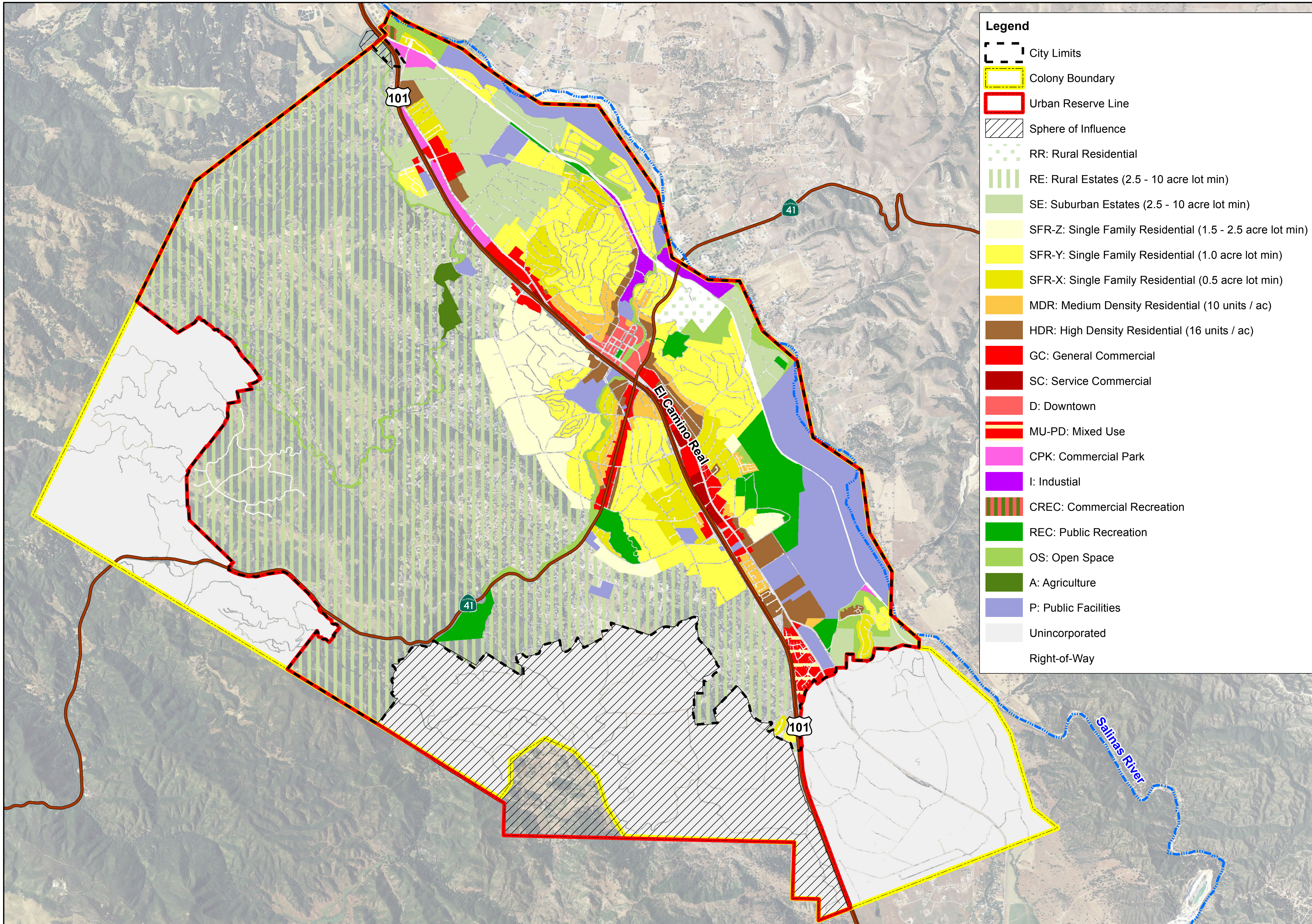

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Figure 3-1: Existing Land Use

Scale: NTS

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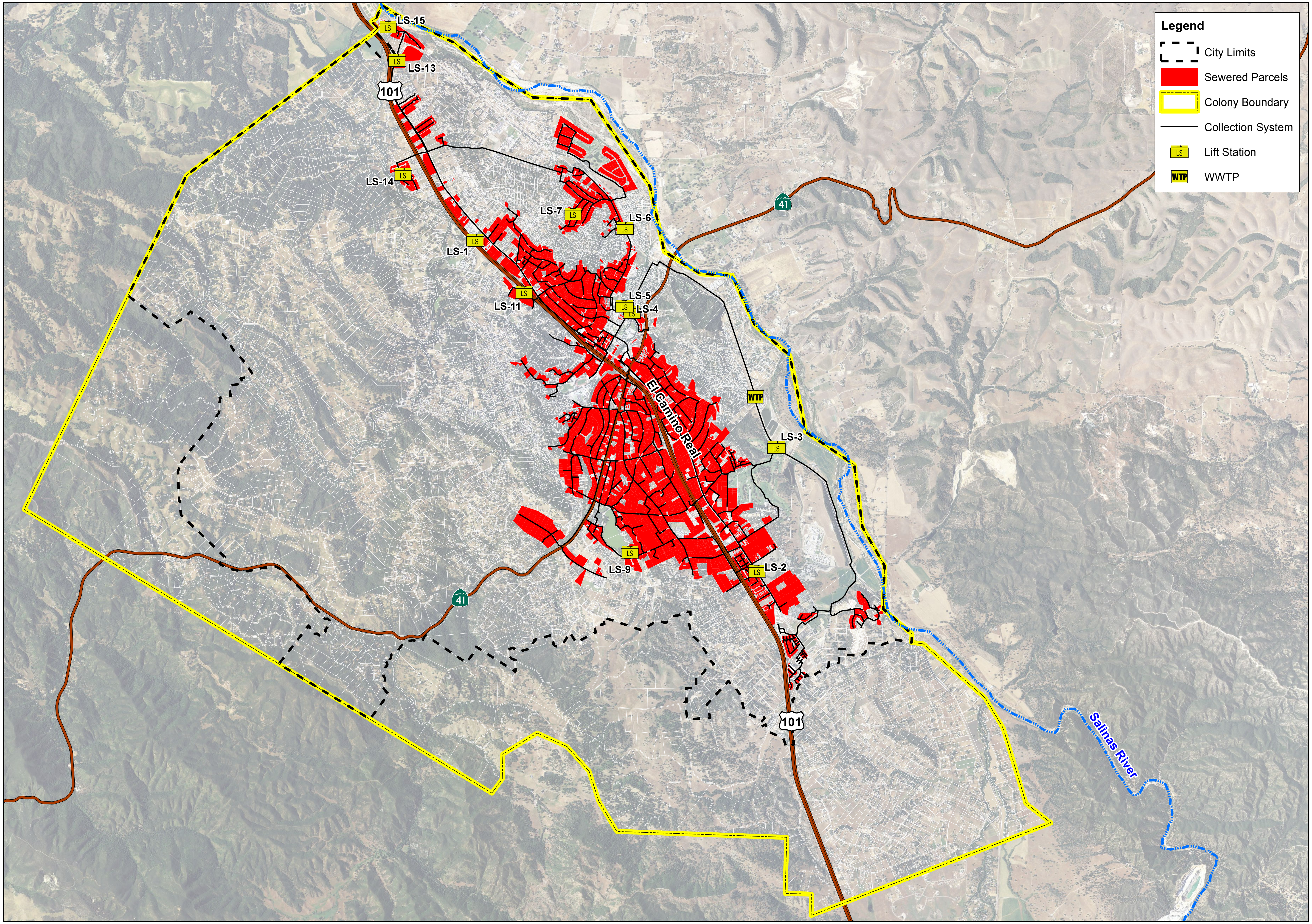

City of Atascadero Water Reclamation Facility Master Plan Update

Figure 3-2: Wastewater Service Area

Scale: NTS

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3.2 Population

The planning horizon for this Water Reclamation Facility Master Plan Update is intended to be consistent with the City's current General Plan which has a target date of 2025 for the future condition. The population within the current City limits is approximately 28,814 persons, based on 2012 data from the United States Census Bureau. The City's General Plan 2025 population projection is estimated at 36,030 people. The City does not provide wastewater services to the entire City population as mentioned in the land use section and at this time no information is available to determine the existing population within the WCSA.

The City cannot reliably forecast when they will meet the future General Plan population of 36,030 people. While the Master Plan is based on the General Plan future land use, it is recommended that the City base their future wastewater demands on the following:

- Number of approved residential projects
- Vacant parcels that could be served in the future

These are based on General Plan land use and development requirements in order to ensure general conformance with the plan. However, it will result in slightly lower population projections since some of the approved residential projects may not allow the full density permitted by the General Plan. This will provide a more conservative future population and future number of wastewater connections for developing impact fee and user charges in order to fund the wastewater enterprise. If an overly high population or number of connections is used, revenue per connection or customer will be lower and may not fund the City's Capital Improvement Program.

There are developed parcels within the Atascadero Colony Boundary which currently manage wastewater with onsite septic or other small scale treatment systems. In the future, some of these developed parcels may be connected to the sewer system. These parcels have not been included in this planning effort, as the timeline and impact of connecting developed parcels to the community sewer system is unknown and difficult to predict. If there is a driver for these existing (septic) facilities to tie-in to the community sewer system in the future, the Master Plan will need to be revisited to estimate potential impacts.

To determine future wastewater customer population, MKN coordinated with the City's Community Development Department to identify approved future residential development projects and estimate future wastewater service customers. **Table 3-2** provides an overview of residential development projects currently approved by the City. This table identifies the status of the residential development projects as of June 2013 and the number of remaining units to be built. Units built and approved prior to June 2013 were included in the existing wastewater flow estimates, while remaining units to be built will be included in the future wastewater flow projections and analysis. All residential development identified in **Table 3-2** will receive wastewater service from the City in the future.

***Table 3-2: Future City Approved Residential Developments**

Project Name		Location	Total Approved Residential (Units)	Total Built as of June 2013 (Units)	Total Remaining as of June 2013 (Units)
1	Woodridge/Las Lomas Specific Plan: SFR lots	Halcon Road	156	52	104
2	Woodridge/Las Lomas Specific Plan: MFR lots	Halcon Road	135	0	135
3	Villas at Montecito PD-18	Montecito/Las Lomas	28	12	16
4	Dove Creek PD-12	ECR and Santa Barbara	279	213	66
5	Oak Grove Phase II : Peoples Self Help PD-17	1225 ECR	24	0	24
6	Tunitas PD-7	5516 Tunitas	4	0	4

*Table 3-2: Future City Approved Residential Developments					
Project Name		Location	Total Approved Residential (Units)	Total Built as of June 2013 (Units)	Total Remaining as of June 2013 (Units)
7	Southside Villas Apartments CUP	9190 San Diego Way	74	16	58
8	Emerald Ridge Homes	2705 ECR	42	0	42
9	Emerald Ridge II	2555 ECR	89	0	89
10	5310 Carrizo Road PD-17 (Machado)	5310 Carrizo	12	0	12
11	Westpac Mixed Use	9105 Principal	45	0	45
12	Westpac Mixed Use Phase II	9300 Pino Solo	4	0	4
13	Atascadero Ave-Vintage Homes	6540-6870 Serra	12	0	12
14	Atascadero Christian Home	8455 Santa Rosa	20	0	20
15	5802 Traffic Way: Downtown Mixed Use	5802 Traffic Way	5	0	5
16	1565 El Camino Real PD-17 (Alvarez)	1565 El Camino Real	6	0	6
17	Oak Haven	1155 ECR	62	0	62
18	Colony Square	6905 ECR	67	0	67
19	West Front Village	9000 West Front	32	0	32
20	The Acacias	4705 & 4713 El Camino Real	40	0	40
21	Navajoa PD 25	7705 & 7735 Navajoa Ave.	5	0	5
22	Ridgeway Court PD -29 (Beck)	5825 Ridgeway Court	8	0	8
23	7298 Santa Ysabel PD-25 (Patel)	7298 & 7312 Santa Ysabel	12	0	12
24	El Corte Planned Development (Eddings)	8570 El Corte	7	0	7
25	Triangle Park PD (Gearhart)	6905 Navajoa Ave	11	0	11
26	Rosario Historic PD (Ravatt)	5735 Rosario	10	0	10
27	Olmeda Condos (R. Emmons)	5435-5439 Olmeda	3	0	3
28	Spanish Ridge PD-7 (old Charnley tract map)	9425-9495 La Quinta	8	0	8
29	San Andres (Barre)	8255 San Andres	5	0	5
30	Curbaril Ave Condos	8760 Curbaril	3	0	3
31	Del Rio Road Commercial Area Specific Plan	2405 El Camino Real	42	0	42
		Total	**1,250**	**293**	**957**
*Approved residential development projects list provided by City of Atascadero Planning Department					

In addition to the City approved residential projects identified above, the proposed Eagle Ranch Development may be considered for annexation by the City. City staff has directed MKN to include the proposed development for analysis in this Master Plan Update.

The Development is a proposed housing and commercial development located in the southwest portion of the City. The Development is currently in the planning and permitting process, and according to the Notice of Intent to subdivide, the development will subdivide the 3,430 acre project site, and is anticipated to include:

- 494 single-family residential lots

- Up to 63 second units
- 93 multi-family, senior housing, workforce housing and mixed-use units
- Resort Hotel: 42.4 +/- acres; 100 rooms and associated amenities
- Village Center: 1.8 +/- acres; 15,000 sq. ft. retail, offices, postal facilities, meeting space
- Highway Commercial: 15.2 +/- acres; sit down restaurant; 200-room hotel & facilities
- Public Park: 10.7 +/- acres; includes small amphitheater
- Equestrian Staging Area: 1.5 +/- acres
- Roads: 19.8 +/- miles internal network of roads
- Trails: 16.2 +/- miles of Class 1 multi-use paths, unpaved trails, and trail easement(s)
- Open Space: 2,585.1 +/- acres; consisting of agricultural, private & public open space

Residential estimates provided by the project developer have been included in **Table 3-3**.

Table 3-3: Proposed Eagle Ranch Project (Residential)

Project Name	Total Proposed Residential (Units)
Eagle Ranch MFR/senior/workforce (proposed)	93
Eagle Ranch SFR to connect to sewer (proposed)	100
Total	**193**

MKN also reviewed the vacant residential parcels, which would receive wastewater services in the future according to the General Plan and included those parcels in the future wastewater projections. These land uses, as identified by the City's Community Development Department, include: Single Family (0.5 acre lot min), Medium Density Residential (10 units/acre), and High Density Residential (16 units/ac). **Table 3-4** identifies the potential future residential units from these properties.

Table 3-4: Future Residential Units based on City General Plan

Land Use	Designation	Future Acres Based on City's General Plan	General Plan Units
High Density Residential (20 units / ac)	HDR	7.6	152
Medium Density Residential (10 units / ac)	MDR	2.7	27
Single Family Residential (0.5 acre lot min)	SFR-X	5.5	8
	Total	**15.8**	**187**

Based on the future unit counts from **Tables 3-2 through 3-4** and assuming a population density factor of 2.65 people/unit from the City's General Plan, it is anticipated the WSCA population will increase by 3,543 people by 2025.

3.3 Commercial Development

To determine the future commercial wastewater flows, MKN met with the City's Community Development Department to identify approved future commercial projects. **Table 3-5** provides an overview of commercial development projects currently approved. This table identifies the status of the projects as of June 2013 and estimates the square footage of commercial development that remains to be built. Commercial projects built and approved prior to June 2013 were included in the existing wastewater flow estimates, while remaining square footage to be built will be included in the future wastewater flow projections and analysis. All commercial development identified in **Table 3-5** would receive wastewater services.

*Table 3-5: Future City Approved Commercial Developments							
Project Name		Location	Lot Size (Acres)	Total Project Area (Sq Ft)	Project Type	Total Project Built as of June 2013 (Sq Ft)	Total Remaining as of June 2013 (Sq Ft)
1	Colony Square	6901-6917 El Camino Real	8.14	66,780	Retail/Restaurant	13,000	53,780
				35,000	Theater	35,000	0
				31,436	Office- Creekside City Hall	31,436	0
2	West Front	9010 West Front	9.36	15,000	Holiday Inn	15,000	0
		9000 West Front		2,500	Jack in the Box	2,500	0
		9002 West Front		4,880	Commercial retail	0	4,880
		9006 West Front		5,000	Restaurant	0	5,000
		9020 West Front		12,700	Business park	0	12,700
3	Fairfield Inn &	9700 El Camino Real	1.97	51,740	Hotel: 100 Rooms	0	51,740
	Meridian Office Complex			15,000	Office	15,000	0
4	Moresco Plaza	7305 Morro	1.76	33,758	Office	22,197	11,561
5	The Annex	1905 El Camino Real	13	120,900	Retail/Restaurant	0	120,900
6	Walmart	2055 El Camino Real	26.1	139,560	Walmart & Retail pad	0	139,560
7	Home Depot/Marriott Hotel Center	805-957 El Camino Real	29.6	166,255	Phase 1: Retail/HD	152,409	13,846
				89,818	Phase 2: 130 Room Hotel (Phase 2)	0	89,818
		905 El Camino Real		18,000	Phase 2: Retail/Restaurant	0	18,000
8	Curbaril Center (Gearhart)	7955 Curbaril	1.46	17,000	Office	0	17,000
9	Montecito (Gearhart)	8950 Montecito	0.56	2,660	Tastee Freeze	2,660	0
		8970 Montecito	0.31	3,000	Retail	0	3,000
		9530 El Camino Real	0.24	2,744	K-Man	2,744	0
10	Restaurant (Kmart Center)	4300 El Camino Real	0.83	5,000	Restaurant	0	5,000
11	Dove Creek Commercial	11600 El Camino Real	5.19	60,000	Retail	0	60,000
12	8120 Morro Liquor store	8120 Morro	0.43	5,400	Retail	0	5,400
13	WestPac Mixed Use	9105 Principal	5.52	16,550	Retail/Office	0	16,550
14	The Acacias	4705 El Camino	1.71	6,500	Commercial	0	6,500

*Table 3-5: Future City Approved Commercial Developments							
Project Name		Location	Lot Size (Acres)	Total Project Area (Sq Ft)	Project Type	Total Project Built as of June 2013 (Sq Ft)	Total Remaining as of June 2013 (Sq Ft)
	Mixed Use	Real		2,166	Office/Indoor rec	0	2,166
15	Traffic Way (Downtown)	5802 Traffic	0.394	13,770	Retail	0	13,770
16	Hoff /Wysong (Downtown)	6490 El Camino Real	1.5	26,500	Retail/Restaurant/ Office	0	26,500
		Total	**126**	**990,017**		**291,946**	**677,671**
*Approved commercial development projects list provided by City of Atascadero Planning Department							

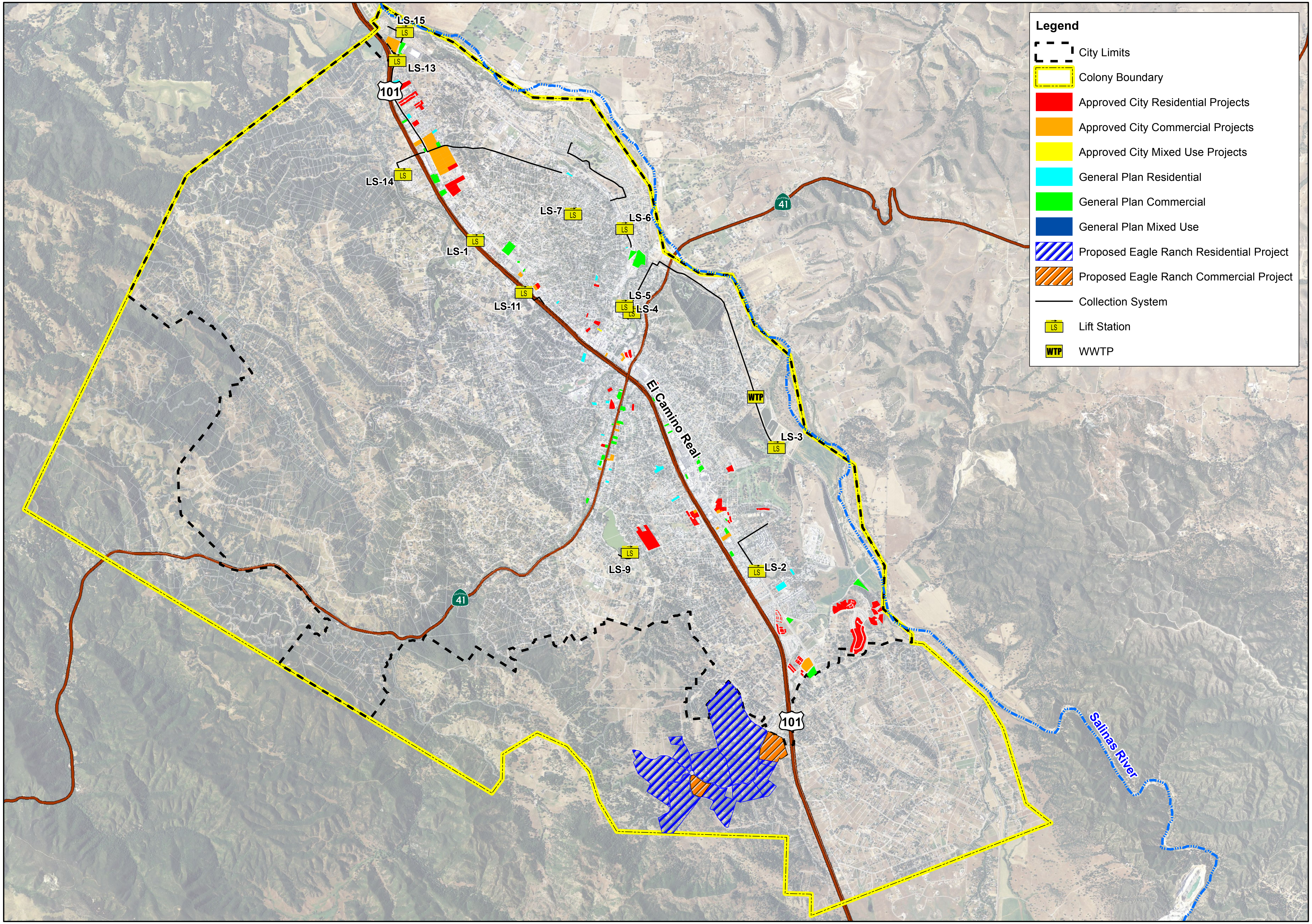
In addition to the City approved commercial projects identified above, the proposed Eagle Ranch project may be considered for annexation by the City. City staff has directed MKN to include the proposed development for analysis. Commercial development estimates provided by the project developer have been included in **Table 3-6**.

Table 3-6: Proposed Eagle Ranch Project (Commercial)				
Project Name	**Location**	**Lot Size (Acres)**	**Total Project Area (Sq Ft)**	**Project Type**
Eagle Ranch: HWY Commercial	Southwest of City limits	15.2		Hotel: 200 rooms
			5,400	Restaurant
Eagle Ranch: Village Center	Southwest of City limits	2.8	15,000	Small Retail/Office
	Total	**18.0**	**20,400**	

MKN also reviewed vacant commercial parcels, which would receive wastewater services in the future according to the General Plan and included those parcels in the future wastewater projections. These land uses, as identified by the City's Community Development Department, include: General Commercial, Service Commercial, Downtown, Commercial Park and Industrial. **Table 3-7** below identifies the potential future commercial acreage from development of the City's vacant commercial properties.

Table 3-7: Future Commercial Acreage based on City General Plan		
Land Use	**Designation**	**Future Acres Based on City's General Plan**
Commercial Park	CPK	14.9
Downtown	D	0.1
General Commercial	GC	27.0
Industrial	IND	9.1
Service Commercial	SC	1.6
	Total	**52.6**

Figure 3-3 identifies the location of the approved, potential, and General Plan residential and commercial development projects that would receive wastewater service in the future.



City of Atascadero Water Reclamation Facility Master Plan Update

Figure 3-3: Future Residential and Commercial Development

Scale: NTS

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SECTION 4 WASTEWATER FLOWS

4.1 Historical Water Reclamation Facility Flow Records

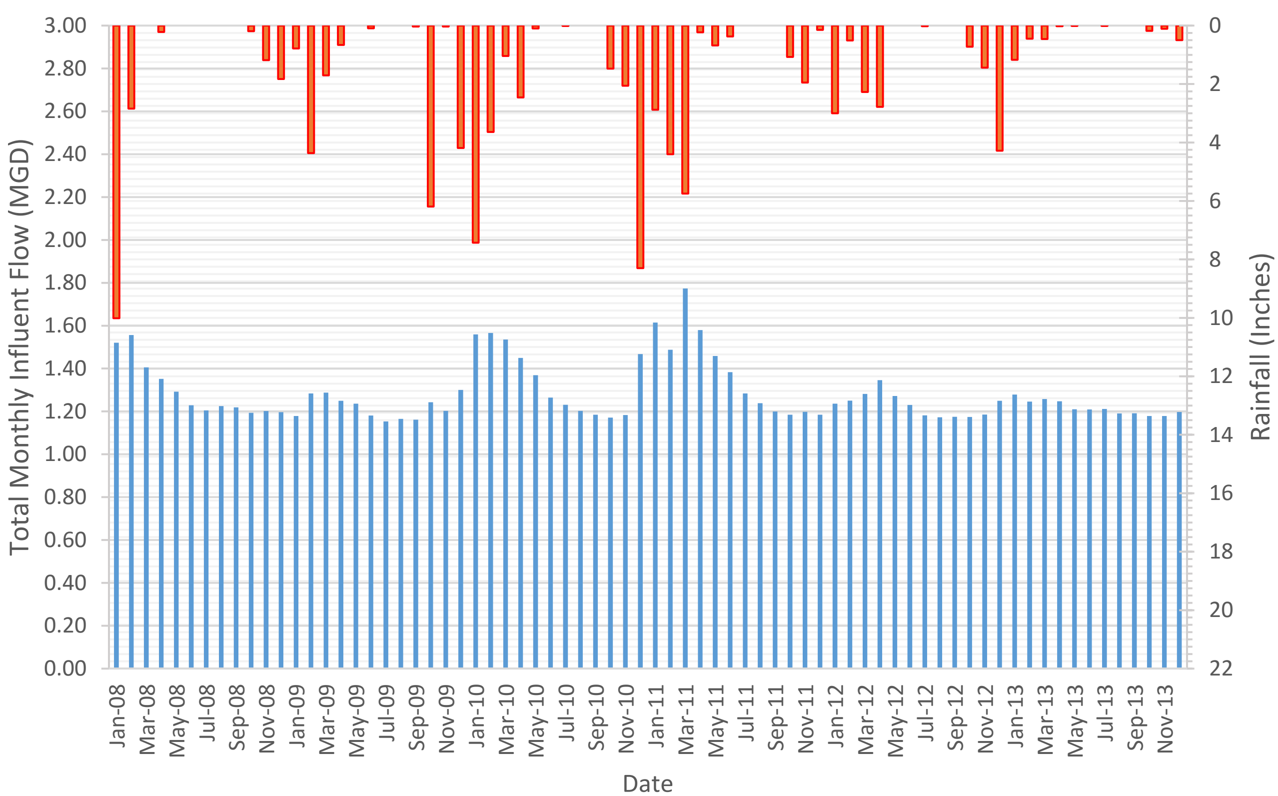
MKN reviewed the water reclamation facility's daily and monthly influent flow records from the City's annual reports and annual rainfall data collected by the City from January 2008 to December 2013. **Table 4-1** provides a summary of the historical wastewater flow records. The average annual flow varies by more than ten percent from year to year, with the highest flows seen in 2011. Flows from 2011 were used for planning purposes in this report.

Table 4-1: Historical WRF Influent Flows

Year	2008	2009	2010	2011	2012	2013
Flows (MGD)						
Average Daily Flow (ADF)	1.30	1.22	1.35	1.38	1.23	1.22
Maximum Month Flow (MMF)	1.56	1.30	1.57	1.77	1.35	1.28
Average Dry Weather Flow (ADWF)	1.27	1.19	1.25	1.30	1.21	1.20
Average Wet Weather Flow (AWWF)	1.37	1.26	1.42	1.44	1.25	1.24
Peak Day Dry Weather Flow (PDDWF)	1.57	1.34	1.71	1.55	1.35	1.93
Peak Day Wet Weather Flow (PDWWF)	2.34	1.93	2.76	3.01	1.65	1.37
Peak Daily Flow (PDF)	2.34	1.93	2.76	3.01	1.65	1.93

As shown in **Figure 4-1**, months of high rainfall appear to generally correlate with higher plant inflows.

Figure 4-1: Average Monthly WRF Influent Flow and Rainfall – 2008 to 2013



Additionally, MKN and subconsultant, Fluid Resource Management, Inc., (FRM) performed dry weather and wet weather flow monitoring during the periods of July 2, 2013 to August 7, 2013 and February 6, 2014 to April 9, 2014 to estimate peak hour dry weather and wet weather flow conditions. A detailed discussion of the flow metering effort is provided later in this Section.

4.2 Wastewater Flow Conditions

The flow conditions used to analyze the wastewater collection system and referenced throughout the report are defined below:

Average Daily Flow (ADF)

ADF is the average daily wastewater flow over the course of a year and is generally obtained by averaging the mean monthly flows conveyed to a treatment plant through the course of a year. The ADF was determined using annual average flow for 2011. This year was chosen since it appeared to represent peak conditions for the period reviewed (2008 – 2012) and is considered conservative. The existing ADF is estimated at 1.38 million gallons per day (MGD).

Maximum Month Flow (MMF)

MMF is the average daily flow during the month with the maximum cumulative flow. MMF is often the regulated flow parameter for a wastewater treatment plant discharge permit. The current waste discharge requirements for the City's WRF, as specified in Regional Water Quality Control Board (RWQCB) Reclamation Order No.01-014, limit plant effluent to a maximum month flow of 2.39 MGD. The existing MMF is estimated at 1.77 MGD based on plant flow records.

Average Dry Weather (ADWF) and Wet Weather (AWWF) Flows

ADWF and AWWF are the average of daily flow rates experienced during wet and dry weather months respectively. Consideration of average dry and wet weather flows allows analysis of treatment systems at appropriate flow rates and temperatures for the dry and wet seasons. Precipitation of 0.25 inches or more per month was assumed to identify wet weather months. Seasonal wastewater patterns indicated higher flows occurred during the wet weather or winter months, although rainfall at the plant itself could have a significant impact. The existing ADWF and AWWF are estimated at 1.3 and 1.44 MGD respectively based on WRF influent flow records.

Peak Day Dry Weather Flow (PDDWF) and Wet Weather Flow (PDWWF)

PDDWF and PDWWF are the maximum daily flow rates experienced at the WRF during dry and wet weather months respectively. The existing PDDWF and PDWWF are estimated at 1.55 and 3.01 MGD respectively.

Peak Day Flow (PDF)

PDF is the maximum daily flow rate experienced at the WRF and is used to design or evaluate hydraulic retention times for certain treatment processes. The existing PDF is estimated at 3.01 MGD.

Peak Hour Flow (PHF), Peak Hour Dry Weather Flow (PHDWF) & Peak Hour Wet Weather Flow (PHWWF)

PHF is the maximum one-hour flow experienced by the system, and is typically used for sizing collection system piping, lift stations, flow meters, interceptors, and headworks systems. Peak hour flow is typically derived from WRF influent records, flow monitoring, or empirical equations used to estimate PHF based on service area population. For this report, PHDWF and PHWWF were estimated from the flow study that was included in the Wastewater Collection System Master Plan Update (MKN/MNS, 2014). The existing PHDWF is estimated to be 5.24 MGD and the PHWWF is estimated at 4.97 MGD. The existing PHF is the higher of the two, or 5.24 MGD.

4.3 Existing Wastewater Flows

Based on our review and analysis of WRF influent flow records and flow monitoring (Wastewater Collection System Master Plan Update, MKN/MNS, 2014), the following peaking factors identified in **Table 4-4** were developed for use in the capacity analysis of the collection and treatment systems. The peaking factors for peak hour dry weather flow and peak hour wet weather flow were estimated by taking an average of the respective peaking factors calculated in the flow monitoring study for each sewershed.

Table 4-4: Existing Wastewater Flows			
Flow Condition	**Flow (MGD)**	**Peaking Factor**	**Source**
Average Daily Flow (ADF)	1.38	--	City of Atascadero WRF 2011 Daily Flow Records
Maximum Month Flow (MMF)	1.77	1.3	City of Atascadero WRF 2011 Daily Flow Records
Peak Day Dry Weather Flow (PDDWF)	1.55	1.1	City of Atascadero WRF 2011 Daily Flow Records
Peak Day Wet Weather Flow (PDWWF)	3.01	2.2	City of Atascadero WRF 2011 Daily Flow Records
Peak Hour Dry Weather Flow (PHDWF)	5.24	3.8	Dry Weather Flow Monitoring from July 2, 2013 to August 7, 2013
Peak Hour Wet Weather Flow (PHWWF)	4.97	3.6	Wet Weather Flow Monitoring from March 11, 2014 to April 8, 2014
Peak Hour Flow (PHF)	5.24	3.8	Flow Monitoring Study

4.4 Future Wastewater Flows

Table 4-5 provides a summary of the flow factors used to estimate the City's future residential and commercial wastewater flows. For potential commercial development projects and vacant commercial properties with undefined development square footage, flow factors from the 2002 Sewer Master Plan were used to estimate future flow.

Table 4-5: Flow Factors		
Flow Type	**Unit**	**Flow Factor (GPDU)**
Residential	Persons	70
Hotel	Rooms	100
Approved and/or Proposed Commercial	Sq ft	0.1
Proposed and/or General Plan Commercial	Parcel	70 to 1,000

Table 4-6 identifies the additional wastewater flow that will be generated by the approved residential and commercial developments, proposed residential and commercial developments, and vacant residential and commercial properties based on the review presented in **Section 3**.

Table 4-6: Additional Future Flow					
Flow Type	**Development Type**	**Summary**	**Unit**	**Flow Factor (GPDU)**	**Flow (GPD)**
Residential	City Approved Project	3,048	Persons	70	213,360
	General Plan Vacant Properties	520	Persons	70	36,400
				Total	**249,760**
Hotel	City Approved Project	430	Rooms	100	43,000
				Total	**43,000**
Commercial	City Approved Project	698,071	Sqft	0.1	69,807
	General Plan Vacant Properties – Commercial Park	7	Parcels	100	700
	General Plan Vacant Properties – General Commercial	38	Parcels	90	3,420
	General Plan Vacant Properties – Industrial	2	Parcels	1000	2,000
	General Plan Vacant Properties – Service Commercial	5	Parcels	400	2,000
				Total	**77,927**
				Total Future Flow	**370,687**

The future additional ADF was added to the existing ADF to determine the total future ADF**.** Future peak flows were projected using peaking factors developed from the historical flow analysis as summarized in **Table 4-4**.

The future wastewater flow conditions are summarized in **Table 4-7** below, and were used to analyze the capacity of the existing collection system during future wastewater flow conditions.

Table 4-7: Projected Future Wastewater Flows		
Flow Condition	**Flow (MGD)**	**Peaking Factor**
Average Daily Flow (ADF)	1.75	--
Maximum Month Flow (MMF)	2.28	1.3
Peak Day Dry Weather Flow (PDDWF)	1.92	1.1
Peak Day Wet Weather Flow (PDWWF)	3.85	2.2
Peak Hour Flow (PHF)	6.65	3.8

SECTION 5 WASTEWATER LOADINGS

5.1 Historical Influent Loading

Influent organic loading is measured at the plant using five-day biological oxygen demand (BOD_5) and total suspended solids (TSS). The monitoring results for 2008 through 2012 are summarized below. These records indicate that the plant experienced the greatest BOD loading in 2011. For 2008 through 2010, average TSS concentrations were between 35 and 80% greater than BOD loading. With the exception of November 2011, TSS measurements were lower than BOD in 2011 and 2012. However, the results for 2012 are suspect as they are unusually low for influent wastewater.

Table 5-1: Historical Influent BOD and TSS Concentrations

	2008		2009		2010		2011		2012	
Month	BOD_5 (mg/L)	TSS (mg/L)	BOD_5 (mg/L)	TSS (mg/L)	BOD_5 (mg/L)	TSS (mg/L)	BOD_5 (mg/L)	TSS (mg/L)	BOD_5 (mg/L)	TSS (mg/L)
January	--	224	--	--	--	--	--	--	--	--
February	67	192	130	--	100	160	151	7.9	66.2	1.8
March	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--
May	173	192	110	--	122	125	52	5.2		0.8
June	--	--	--	--	--	--	--	--	--	--
July	--	285	--	--	--	--	--	--	--	--
August	90	95	130	--	97.2	90	--	--	88.1	--
September	--	--	--	--	--	--	290	--	--	--
October	--	--	--	--	--	--	--	--	--	--
November	130	--	90	158	233	490	120	207	47.3	50
December	--	--	--	--	--	--	--	--	--	--
Annual Average	115	198	115	158	138	216	153	73	67	18
Maximum Month	173	285	130	158	233	490	290	207	88.1	50

For the purposes of this report, 2011 BOD concentrations were used to estimate the BOD loading. The TSS loading was assumed to be 50% greater than the BOD loading. Estimated average and maximum month loadings are summarized in the table on the next page.

Table 5-2: Existing Influent BOD and TSS Loadings					
Month	ADF (mgd)	BOD_5 (mg/L)	BOD_5 (ppd)	TSS (mg/L)	TSS (ppd)
January	1.61	-	-	-	-
February	1.49	151	1,874	226.5	2,811
March	1.77	-	-	-	-
April	1.58	-	-	-	-
May	1.46	52	632	78	949
June	1.38	-	-	-	-
July	1.28	-	-	-	-
August	1.24	-	-	-	-
September	1.20	290	2,900	435	4,351
October	1.18	-	-	-	-
November	1.20	120	1,199	180	1,798
December	1.18	-	-	-	-
Annual Average	1.38	153	1,651	230	2,477
Maximum Month	1.77	290	2,900	435	4,351

Notes: 2011 flows and BOD_5 loadings used. TSS concentrations assumed to be 50% greater than BOD loadings for each month.

The average influent flows and loadings are near the original design values for the water reclamation facility, as summarized in the Table below.

Table 5-3: Comparison of Current Values to Original Design			
	Current Value	Original Design	% of Original Design
Average Daily Flow (MGD)	1.38	1.40	99%
Average Influent BOD_5 (mg/L)	153	185	83%
Average BOD_5 Loading (ppd)	1,651	2,161	76%
Average Influent TSS (mg/L)	230	250	92%
Average TSS Loading (ppd)	2,477	2,921	85%

5.2 Estimate of Future Influent Loadings

Future influent loadings were estimated to evaluate the existing system and potential alternative systems under future conditions. The projected BOD_5 and TSS loadings were determined by dividing the existing average daily and maximum monthly BOD_5 and TSS loadings (**Table 5-2**) by the ADF and MMF, respectively. This provides the loadings in terms of pounds per million gallons. These terms were multiplied by the projected flow rates to find the projected BOD_5 and TSS loadings shown in **Table 5-4**. The future estimated average flows and TSS loading will be above the original plant design, and the future estimated average BOD loading will be approximately at (98% of) the original design.

Table 5-4: Estimated Existing and Future Influent BOD and TSS Loadings

	Existing	Future
ADF (MGD)	1.38	1.77
Average BOD_5 Loading (ppd)	1,650	2,120
Average TSS Loading (ppd)	2,480	3,180
MMF (MGD)	1.77	2.28
Maximum Month BOD_5 Loading (ppd)	2,900	3,740
Maximum Month TSS Loading (ppd)	4,350	5,610

Due to the inconsistency of the historical influent concentrations and the potential for water conservation measures to increase influent loadings, future maximum month concentrations for BOD_5 and TSS were assumed to be 290 mg/L and 435 mg/L respectively for conservative sizing of potential future treatment processes. This is consistent for a primarily residential community with a water conservation program.

A detailed assessment of influent loading is recommended as part of any preliminary design for future improvements at the treatment plant.

SECTION 6 EXISTING WASTEWATER TREATMENT AND DISPOSAL FACILITIES

6.1 Waste Discharge Requirements

The Atascadero WRF is permitted through the California Regional Water Quality Control Board with Waste Discharge Requirements Order No. 01-014 (**Appendix A**). The permit authorizes discharge of up to 2.39 MGD of treated wastewater through percolation basins on a maximum month basis. It provides discharge specifications, including requirements for treated effluent quality, and a monitoring and reporting program. The effluent limitations are summarized in the following table.

Table 6-1: Summary of WDR Effluent Limits

Constituent	Unit	Concentration
Settleable Solids	mL/L	0.3
BOD_5 soluble	mg/L	100
Total Dissolved Solids	mg/L	1000
Sodium	mg/L	200
Chloride	mg/L	250
Nitrate (as Nitrogen)	mg/L	8
Boron	mg/L	1.0
pH	pH units	Between 6.5 and 8.3
Dissolved oxygen	mg/L	> 2.0

Additionally, the following groundwater limitations are specified in the permit:

- The discharge shall not cause nitrate concentrations in the groundwater downgradient of the disposal area to exceed 8 mg/L (as Nitrogen).
- The discharge shall not cause a significant increase of mineral constituent concentrations in underlying groundwaters, as determined by comparison of samples collected from wells located upgradient and downgradient of the disposal area.
- The discharge shall not cause concentrations of chemicals and radionuclides in groundwater to exceed limits set forth in Title 22, Chapter 15, Article 4 and 5 of the California Code of Regulations.

6.2 Historical Effluent Quality

MKN reviewed the historical treated effluent quality based on annual reports from 2008 to 2012 provided by the City. For this time period, settleable solids are consistently at or below 0.1 mL/L, and pH and dissolved oxygen are within permit limits. The table below provides a summary of soluble BOD_5 and total suspended solids concentrations.

Table 6-2: Treated Effluent Soluble BOD-5 and Total Suspended Solids Concentrations (2008 – 2012)										
	2008		2009		2010		2011		2012	
Month	$sBOD_5$ (mg/L)	TSS (mg/L)	$sBOD_5$ (mg/L)	TSS (mg/L)	$sBOD_5$ (mg/L)	TSS (mg/L)	$sBOD_5$ (mg/L)	TSS (mg/L)	$sBOD_5$ (mg/L)	TSS (mg/L)
January	2.8	40	27.3	43.2	26.4	33.7	1.3	29	3	22.2
February	6.1	56.2	29.2	58.4	14.2	50.8	2.3	52	4	32
March	7.4	63.4	28.2	46.8	13.2	60.4	2.3	57	3.5	59.8
April	5.3	49.2	24	54	10.5	45	2.5	34.2	4.6	32.3
May	5.8	57	20	49.8	9.7	53.8	2.5	33.2	3.3	37.8
June	52.8	42.8	16	68.2	10.2	56.7	3.7	47.2	2.6	44.8
July	8.4	53.7	12.8	63.2	10.3	61.2	3.5	22.2	3.2	42.3
August	9.3	47.2	18.2	57	3.8	44.5	3.4	32.5	2.7	78.3
September	11.8	44.7	20.2	60.5	2.7	31.2	16.6	31.4	2.6	43.6
October	12.5	26	16	53.8	16	29	16	17.6	16	31
November	27	37.6	11.5	53.2	3.6	28.7	6.6	22.7	1.5	36.2
December	17	37.2	7.7	45.8	2.9	31	2	23.4	2.4	39
Annual Avg.	14	46	19	54	10	44	5	34	4	42
Max. Month	53	63	29	68	26	61	17	57	16	78

Note: WDR effluent limit for $sBOD_5$ concentration is 100 mg/L.

Soluble BOD (sBOD) is the readily biodegradable portion of BOD and is expected to be oxidized rapidly in the aeration zone of a treatment plant. The soluble BOD_5 test is similar to the total BOD_5 test, but the sample is first filtered through a total suspended solids (0.45 micrometer) membrane filter, which removes suspended bacterial solids, cell debris, algae, silts, and other suspended solids. The annual reports (2008 – 2012) indicate the treated effluent has consistently been below the permitted $sBOD_5$ concentration limit of 100 mg/L.

The City also performs semi-annual sampling of the treated effluent for chemical oxygen demand (COD), total dissolved solids (TDS), sodium, nitrate and other salts. MKN reviewed the City's annual reports and laboratory results for 2008 through 2012 are summarized in the table below[1]. The WDR limits are also shown. The data indicates that the treated effluent periodically contains TDS, sodium, and chloride concentrations greater than the WDR limit, although no exceedances were observed in 2012. Typical ways to reduce salts in the treated effluent include obtaining a drinking water supply with lower salts, reducing user contributions (pretreatment requirements for high-salts industrial users, reducing or replacing self-regenerating water softeners in the community with canister water softeners), or implementing salts removal at the water reclamationfacility. Salts removal at the treatment facility is often the most costly option, and in this case would require a process upgrade to an extended aeration facility, followed by filtration and reverse osmosis systems.

[1] The annual report for 2012 showed the nitrate concentration as higher than the total nitrogen concentration. The corresponded laboratory report was reviewed and it was confirmed that the values were switched on the annual report.

Table 6-3: Treated Effluent Semi-Annual Monitoring Results (2008 – 2012)									
	Total Dissolved Solids (TDS) (mg/L)	Sodium (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Chemical Oxygen Demand (COD) (mg/L)	Boron (mg/L)	Total Nitrogen (mg/L)	Nitrate (mg/L)	Zinc (mg/L)
WDR Limit	**1000**	**200**	**250**	**--**	**--**	**1**	**--**	**8**	**--**
Feb-08	780	131	181	152	110	0.3	33	0.2	0.03
Aug-08	<u>1100</u>	<u>220</u>	<u>300</u>	170	130	0.4	30	0.3	ND
Feb-09	947	140	210	140	230	0.3	42	0.2	ND
Aug-09	<u>1200</u>	<u>220</u>	<u>310</u>	170	180	0.41	42	1.8	0.02
Feb-10	868	130	210	170	150	0.3	28	0	0
Aug-10	<u>1020</u>	<u>213</u>	<u>283</u>	153	100	0.3	20	0.1	0
Feb-11	910	160	215	143	100	0.2	14	ND	0.1
Aug-11	990	182	<u>253</u>	149	150	0.3	20	0.3	0.03
Feb-12	860	150	216	141	100	0.3	23	0.3	0.07
Aug-12	960	186	241	136	100	0.4	26	0.1	0.04

Note: Results greater than WDR limit are underlined.

6.3 Description of Existing Facilities

The Atascadero WRF facilities include an RV waste receiving facility, comminuter & flow meter station, headworks screens, aerated lagoon, facultative lagoon, polishing pond, a chlorine contact chamber that has been repurposed for post-aeration, recirculation pump station, percolation basins, and sludge drying beds (**Figure 1-1**). An irrigation well is used to pump a mixed of treated, percolated effluent and groundwater to the nearby Chalk Mountain Golf Course. The facilities also include a controls/office building and a building with conference room and restroom. Additional buildings on the property are utilized for other Public Works facilities.

MKN visited the WRF on February 19, 2014 and April 8, 2014 to review the existing facilities. Details regarding the design capacity and existing condition are following.

RV Waste Receiving Facility

The RV waste receiving facility consists of a receiving box and a pumping station. The receiving box has a manually cleaned bar screen to protect the pumps from large solids. Details for the existing station are summarized in the table below.

Table 6-4: RV Waste Receiving Facility Design Summary	
Capacity of holding tanks, gallons	10,000
Number of pumps	2
Type of pumps	Progressing Cavity
Pump Capacity, each, gpm	50

The City has plans to install a new RV waste receiving station near the new headworks facility. The new facility will consist of a sloped concrete pad with a drain, an isolation valve and a cleanout, and piping to the headworks screens. The RV Waste Receiving Facility also collects sewage from the onsite Public Works and WRF buildings. These laterals would need to be re-routed to the headworks in order to abandon and remove the old receiving facility. Based on a review of a topographic survey of the WRF site and assuming an average 0.2% slope it appears the laterals from the office building and the shop could be rerouted to the headworks facility without requiring a lift station.

RV Waste Receiving Station

Comminuter & Flow Meter Station

Flow enters the WRF site from Lift Station 3 and Lift Station 5, and currently runs through a manifold with comminuters and flow meters. Since the headworks screens were installed, the comminuters are no longer in service. The City has plans to relocate the flow meters, simplify the alignment to the headworks and remove the comminuters station (Phase 2 Headworks Project). Daily total flows are recorded. From here, influent sewage flows to the headworks.

Comminuter and Flow Meter Station

Operations staff noted that the flow meters were installed in the mid 1980's and they require frequent calibration. New influent flow meters coordinated with the Phase 2 Headworks Project are recommended.

Headworks

The headworks project was completed in early 2014 and consists of two parallel in-channel, mechanically-cleaned screens, a bypass channel with a manually-cleaned bar rack, and a screenings wash-press with bagger. The screened influent sewage flows to the aeration lagoon. The screens and washer compactor appear to be in good condition and operating properly. City staff noted no issues.

Table 6-5: Existing Headworks Design Summary	
BAR SCREENS	
Type of Screens	Chain and Rake
Number of Screens	2
Bar spacing, inch	0.25
Capacity, each screen, MGD	6.0
SCREENINGS WASH PRESS	
Type of wash press	Screw
Washing capacity, CF/hr	54.5

Headworks Screens

Treatment Ponds

The treatment ponds include an aeration lagoon with splasher-type mechanical surface aerators, a large facultative lagoon, and a polishing pond. The aerated lagoon has an asphaltic liner and the other two ponds are lined with bentonite clay throughout and rip rap along the banks. Screened influent enters the northern end of the aeration lagoon and flows south to the transfer pipe and into the facultative lagoon. Flow moves from north to south across the facultative lagoon. Due to prevailing winds and pond geometry, settled solids generally collect along the eastern bank and in the southwestern corner of the facultative lagoon. The effluent weir is on the southern bank, near the southwest corner of the lagoon. From here, flows moves to the polishing pond. Shallow and shaped like a letter “c”, flow moves from the northwest end, around an arch to the southwest end where it enters the former chlorine contact chamber, which now serves as a post-aeration area.

Table 6-6: Existing Treatment Ponds Design Summary	
AERATION LAGOON	
Number	1
Surface Area, acres	1.4
Operating depth, feet	8
Side Slope (horizontal/vertical)	2.5
Operating volume, MG (approx.)	2.98
Aerators	
Type	Mechanical Surface
Number	7
Total Horsepower, hp	155
FACULTATIVE LAGOON	
Number	1
Surface Area, acres	8.1
Operating depth, feet	6
Side Slope (horizontal/vertical)	3
Operating volume, MG (approx.)	14.9
Aerators	None
POLISHING POND	
Number	1
Surface Area, acres	5
Operating depth, feet	4.4
Side Slope (horizontal/vertical)	3
Operating volume, MG (approx.)	6.55
Aerators	None
Total Operating volume, all ponds, MG (approx.)	24.44

During the site visit, operations staff noted one of the two valves on the transfer line between the aeration and facultative lagoons is broken. Regular valve maintenance and repair of the broken valve is recommended to maintain the ability to isolate individual ponds.

Aeration Lagoon

The water level in the aeration lagoon was drawn down as part of the headworks project. This allowed staff to assess the asphaltic liner below the water level, which was reportedly in good condition. They were also able to remove patches of solids that had accumulated around inlet pipes. It is generally recommended that asphaltic liners are inspected regularly and repaired or replaced every ten to fifteen years depending on condition.

Maintenance for the treatment ponds primarily consists of managing sludge build-up and maintaining the surface aerators in the aeration lagoon. Sludge management is discussed in a subsequent section below. There are a total of seven aerators: five 25-horsepower and two fifteen-horsepower aerators. Historically, the surface aerators would fail because of rags binding the drive shaft. The newly-installed headworks screens should reduce the amount of large solids flowing into the ponds and lessen the frequency of ragging. Aerators are currently refurbished and/or replaced as needed.

Facultative Lagoon and Recirculation System

Chlorine Contact Chamber/ Post-Aeration Chamber

The chlorine contact chamber is located at the southwestern end of the polishing pond. The chamber is not currently used for disinfection. In 2007, the City installed a compressor and twenty-four 12-inch disk diffusers to aerate the treated effluent and increase dissolved oxygen concentrations. The post-aeration system has not required significant maintenance since installation. Minor cracking of the concrete channels were observed around posts and cross beams.

The chlorine contact chamber design parameters are summarized in the table below. The effluent sampling station and flow meter are located downstream of the post-aeration system. The effluent flow meter utilizes a submersible transducer and transmitter. Operations staff noted that it requires frequent calibration and adjustments.

Table 6-7: Existing Chlorine Contact Chamber Design Summary	
Sections	2
Length to Width Ratio	24:1
Detention Time at 1,000 gpm (pumped), minutes	60
Chlorine Mixer Horsepower (not currently used)	3
Chlorine Dosage, mg/L (not currently used)	15
Chlorine Regulators (each 500 ppd capacity)	2

Post-Aeration Chamber

Recirculation Pump Station

Originally constructed to pump treated effluent to the percolation ponds, the pump station was reconfigured in 2007 to recirculate oxygen rich effluent from post aeration chamber (former chlorine contact chamber) to the front of the facultative lagoon after the treated effluent line was upsized and the percolation ponds were excavated to allow gravity flow. The City currently recirculates approximately 1 MGD. A calcium nitrate feed system is located adjacent to the pump station. City staff will apply approximately 120 gallons per day of calcium nitrate to the recirculated treated effluent during times of low dissolved oxygen in the ponds, typically during summer and fall. The pump seals appear to be leaking and should be replaced.

Table 6-8: Existing Recirculation Pump Station Design Summary	
Number of pumps	2
Type of pumps	Constant Speed
Pump capacity, each pump, gpm	1,000
Motor horsepower, each	15

Recirculation Pumps and Force Main

Percolation Basins

The WRF has six percolation basins onsite. The City utilizes five, and the adjacent Atascadero State Hospital (ASH) uses one for infiltration of their separately treated wastewater. The treated effluent pipeline is 24-inch PVC, with 16-inch discharge pipes to each basin. Treated effluent is allowed to drain to one percolation basin at a time, except for periods of wet weather, when flows are greater and staff opens valves to two percolation basins. Regular maintenance includes maintaining the isolation valves, annual mowing and ripping of the pond bottoms, and applying squirrel bait and weed killer once to twice per year. The percolation ponds have overflow pipes to allow high waters to pass between them to reduce risk of overflows.

Table 6-9: Existing Percolation Basins Design Summary	
Number of basins, total	5
Evaporation Rate, inches/year	50
Precipitation Rate, inches/year	15
Net Surface Area, acres	18

Percolation Basin and Isolation Valve

Irrigation Well

An irrigation well was installed downstream of the percolation basins in the late 1990's to draw mixed treated effluent and groundwater and pump it to a holding pond at the Chalk Mountain Golf Course for reuse as irrigation water. A new pump and controls were recently installed to run the well pump on a timer. The well pump generally runs at night, with exception of the summer months when water demands are high and the pump sometimes runs all day. The City currently has plans to install a second irrigation well to provide some system redundancy.

Sludge Management

The majority of the solids coming in to the WRF settle out in the facultative lagoon. Approximately three times per year during the dry season (between April and October), City staff dredge the facultative lagoon to remove sludge from the bottom of the pond, while still maintaining operation. Floating pipe is connected to the pump and used to route watery sludge from the dredge to a set of sludge drying beds.

Currently, there are two sets of eight concrete lined sludge drying beds located on the east side of the facultative lagoon. According to City staff, additional area is needed to manage the amount of sludge and provide adequate drying under current conditions.

Table 6-10: Existing Sludge Drying Bed Design Summary	
Number of drying beds	16
Dimensions, feet, each bed (approx.)	25 x 84
Total drying bed area (SF)	33,600

Sludge Drying Beds

SECTION 7 WATER AND BIOSOLIDS QUALITY GOALS

Water and biosolids quality goals are typically driven by regulatory requirements and the intended end use. There is no “life” on Waste Discharge Requirements, although the permits are typically revisited upon significant changes to treatment or disposal methods. The existing treatment plant is a water reclamation facility that percolates to groundwater and provides water for indirect use in blended supply for irrigation. There does not appear to be a significant driver for more advanced treatment at this time. It is more likely that the need for increased treatment will be driven by desire to reduce power cost, improve management and efficiency of sludge dewatering, reduce odor potential as the area around the facility continues to develop, and to address hydraulic and organic design capacity.

7.1 Potential Future Water Quality Goals

Potential future discharge requirements could include salts or nutrient removal, or an increased level of treatment would be required if expansion of the recycled water program is pursued. The potential for a recycled water program is explored in **Section 11**.

The State of California’s State Water Resources Control Board issued General Orders for Recycled Water for Landscape Irrigation Uses of Municipal Recycled Water in 2009 to promote the use of recycled water. The purpose of the General Orders is to streamline the regulatory process for dischargers under the following conditions:

- Recycled water is limited to “disinfected tertiary recycled water produced by a public entity at a municipal wastewater treatment plant (WWTP) as defined in Water Code section 13625(b)(1) and section 13625(b)(2). This designation requires 100% redundancy in coagulation and filtration equipment.
- Specified uses of recycled water including parks, greenbelts, playgrounds, school yards, athletic fields, golf courses, cemeteries, residential common area landscaping, commercial landscaping excluding eating areas, and freeway/highway/street landscaping.
- Producers, distributors, and users of recycled water must comply with Title 22 requirements and all applicable requirements of the State Recycled Water Policy. Producers and distributors are required to ensure compliance of recycled water users.
- Salt sources shall be managed through pretreatment and source control in the water supply, treatment of salts at the treatment plan, or through development of a salt/nutrient management plan for a groundwater basin or subbasin.

The General Orders provide requirements for operation, monitoring, and signage indicated recycled water is in use.

Process improvements would be required if tertiary recycled water is pursued. The current level of treatment is not adequate for downstream filtration. Tertiary filtration systems are typically designed for upstream concentrations of 20-30 mg/L BOD_5 and TSS. Pond systems typically produce significant algae concentrations during parts of the year and will not consistently meet filter influent requirements. Equipment manufacturers will typically not provide process warranties for filtration systems downstream of pond systems. Although hypochlorite disinfection has been performed in the past, larger chlorine contact basins would be required to provide 90 minutes of contact time per the Title 22 requirements.

7.2 Potential Future Biosolids Quality Goals

Biosolids from the Atascadero WRF are extracted from the bottom of the ponds using a dredge, dewatered onsite in concrete drying beds, and hauled for disposal at Chicago Grade Landfill. Based on the City’s agreement with Chicago Grade, a requirement for a higher level of treatment for the biosolids is not anticipated. A review of biosolids treatment requirements is included below, should additional treatment be required or desired in the future.

Sludge can be treated to Class A or Class B levels and over 50% solids content for landfill disposal, or land-application.

The Code of Federal Regulations, Title 40, Part 503 (40 CFR 503) defines time and temperature requirements for Class A and Class B biosolids as defined below:

1. Class A: Aerated static pile or in-vessel: 55 degrees Celsius (deg C) for at least 3 days. Windrow: 55 deg C for at least 15 days with 5 turns

2. Class B: 40 deg C or higher for 5 days during which temperatures exceed 55 deg C for at least 4 hours

In addition, the designation of “exceptional quality” or EQ can be applied to biosolids that meet both the Class A requirements and the maximum pollutant levels of part 503 including various metals. According to federal and state regulations, these biosolids can be sold in bags or bulk and used without additional regulatory restrictions. Class B composted biosolids can be used on agricultural land (within the limits established by the San Luis Obispo County Biosolids Ordinance) where there is no public contact provided additional site restrictions are met.

San Luis Obispo County has a Biosolids Ordinance that limits land application of treated biosolids to 1,500 cubic yards per year until March 2017. The extension was intended to allow time for additional studies to determine impact on food crops, issues related to emerging contaminants, and address other concerns with more widespread use of biosolids. Composted biosolids have been exempt from the County’s application limits. An example of a successful composting program is the City of Morro Bay which produces EQ biosolids mixed with green waste for use in landscaping.

SECTION 8 ABILITY OF EXISTING SYSTEM TO MEET EXISTING AND FUTURE FLOWS AND LOADINGS

The discussion in this section assumes the existing WDRs will remain in effect. As discussed in the previous section, there are potential future policies and regulations that could affect effluent goals and permit requirements but details cannot be speculated at this time.

8.1 Preliminary Treatment

The recently installed headworks facility was designed for an ultimate PHF of 6.0 MGD. The headworks screens are redundant – each screen can handle up to 6.0 MGD and the facility includes a bypass channel to allow flow to pass if water backs up in the screenings channels. The existing PHF is estimated to be 5.24 MGD. The estimated future PHF is 6.65 MGD based on anticipated growth and flow monitoring. However, currently the influent rate is limited by the existing capacities of Lift Stations 3 and 5 as all the flow to the WRF travels through one of these two lift stations. The estimated combined capacity of these two lift stations with all pumps running is 5.76 MGD. With the design of 6.0 MGD per screen plus the overflow channel, the existing screening facility appears adequate for existing and anticipated future peak hour flows.

8.2 Secondary Treatment

As described in Section 2, the theoretical treatment capacity and aeration requirements for the existing pond system were recently reviewed in the Wastewater Treatment Plant Audit (AECOM, July 2011). The assessment indicated that treatment capacity at the plant is limited by hydraulic retention time, and additional capacity cannot be obtained from the existing treatment process by increasing or enhancing aeration. Additional volume would be required to significantly increase hydraulic retention time. Based on available influent data, the assessment assumed an influent BOD_5 concentration of 179 mg/L. The Plant Audit concluded that "the current maximum discharge limit of 2.39 MGD was … (a) reasonable limit in terms of treatment capacity and, without expansion or upgrade, significantly greater treatment capacity would be difficult to achieve from the pond system while continuing to consistently operate within compliance goals". The Plant Audit also noted that "… hydraulic retention time in the aerated pond is lower than typically recommended for design, and organic loading relative to pond areas is very high. Prolonged operation of pond systems at low retention times could result in significant operational problems…"

Indeed, City staff noted operational difficulties with hydraulic capacity during wet weather events, sludge management and seasonal odors. Additionally, the original plant was designed for an average flow rate of 1.4 MGD, with historical long-term plans to upgrade the process for flows beyond 1.4 MGD (Long Range Plan, Kennedy/Jenks/Chilton and John L Wallace & Associates, July 1989; Amendment to the Long Range Plan, Kennedy/Jenks, June 1991; Preliminary Design Report, Brown & Caldwell, May 1997). The influent flows and loadings are at or very near the design capacity of the plant. Average daily influent flow rate is at 99% of the original design, and average BOD and TSS concentrations are at 83% and 92%, respectively (**Table 5-3**).

MKN reviewed the theoretical treatment capacity of the existing system using a first-order rate kinetics model. The model utilized to assess the treatment plant capacity is relatively conservative and utilizes typical first-order BOD removal rate constants for aerobic and facultative lagoons. The following table summarizes the assumptions utilized for the model.

Table 8-1: Assumptions for Existing Pond System Treatment Model

	Value	Basis
Flow rate	1.77 MGD	Existing MMF
Temperature	54.5 °F	Average December ground temp
Influent BOD_5 concentrations	290 mg/L	2011 Maximum
Effluent BOD_5 concentration goal	< 100 mg/L	Effluent limit is 100 mg/L soluble BOD_5
First Order Rate constants, k_{20}		
Aeration Lagoon	0.276 day^{-1}	Typical for partial-mix aerobic
Facultative Lagoon	0.11 day^{-1}	Typical for facultative
Polishing Pond	0.11 day^{-1}	Typical for facultative

Table 8-1: Assumptions for Existing Pond System Treatment Model		
	Value	Basis
Available volume, facultative lagoon	70%	Assume 30% unavailable due to sludge accumulation

The estimated BOD_5 concentrations across the pond system are summarized in **Table 8-2**.

Table 8-2: Estimated BOD_5 Concentrations based on Existing Maximum Month Flows and Loadings			
	Influent BOD_5 (mg/L)	Effluent BOD_5 (mg/L)	HRT (days)
Aeration Basin	290	214	1.7
Facultative Lagoon	214	143	5.9
Polishing Pond	143	109	3.7

The model indicates the estimated effluent total BOD_5 concentration under existing maximum month flows and loadings is 109 mg/L. A review of the historical effluent quality shows the average soluble BOD_5 in the treated effluent was less than 10 mg/L in 2011 and 2012 (**Table 6-2**). The ratio of total BOD_5 to soluble BOD_5 can vary dramatically due to algae growth, however soluble BOD_5 will be at or below total BOD_5 concentrations. The model was also run assuming the system experiences significant wind mixing so that the facultative and polishing ponds behave more like partial mixed ponds with regard to BOD removal kinetics. In this case, the estimated effluent total BOD_5 concentration was 53 mg/L.

MKN reviewed the theoretical aeration requirements. Assuming all the aeration for BOD removal occurs in the aeration basin, the model estimates approximately 230 hp of surface aerators is required under current maximum month flows and loadings (1.77 MGD and 290 mg/L BOD_5), 75 hp more than the current supply.

The modeling results suggest the existing system may be experiencing significant aeration from wind mixing in the facultative lagoon and polishing pond. Wind mixing is not typically considered when designing systems because it is considered unreliable for treatment. Pond systems are often unpredictable due to several variables including temperature, wind, algae, loading, flow patterns, aerator placement and power, solids accumulation, etc. Based on the design capacity, the existing operational challenges, theoretical modeling and comparison to typical design parameters, adequate additional capacity in the existing pond system cannot be assumed at this time. It is recommended that the City plan for facility improvements to increase capacity and reliability of the secondary treatment system. Improvement alternatives are reviewed in **Section 9**.

The influent BOD appears to be significantly lower than would be expected for a residential community with a water conservation program. For this reason, the maximum influent BOD concentration measured in the last five years (290 mg/L) was assumed for the analyses in this report. City staff has recently refined their sampling methods to improve accuracy in their BOD sampling program. The new data should be closely reviewed when it becomes available. As additional data is collected, if the BOD loads are higher than the historical data suggests, this could indicate the plant is operating closer to or possibly higher than the design values.

To allow some time for planning and to accrue funding, the City may wish to perform a site-specific re-rating study to estimate the potential for interim capacity of the existing system. Considering the historical effluent quality and the BOD limit based on soluble BOD, it is possible that capacity beyond the design rating may be available with the existing secondary treatment system. However, a site-specific re-rating study would be required to assess the potential for the system to accept higher flows and loadings than its original design. The re-rating study would include thorough sampling across the pond system and more detailed modeling than could be performed for this Master Plan Update.

8.3 Disinfection

The City is currently using the chlorine contact chamber for post-aeration. MKN reviewed the capacity of the existing chlorine contact chamber for potential usage for disinfection in the future. The chlorine contact chamber has an approximate working volume of 60,000 gallons (derived from design parameters listed in **Table 6-7**). The following table summarizes the estimate of available contact time for existing and future peak day flows. Title 22 disinfected tertiary recycled water (standard for irrigation of parks, schools, etc.) requires a contact time of 90 minutes at peak day flows. If disinfection was desired, a minimum contact period of 15 minutes at peak hourly flow (or maximum pumping rate) is recommended.

Table 8-3: Estimated Contact Time Available with Existing Chlorine Contact Chamber

	Estimated Peak Day Flow		Estimated Peak Hour Flow		Contact Time (minutes)	
	MGD	gpm	MGD	gpm	At Peak Day Flow	At Peak Hour Flow
Existing	3.04	2111	5.24	3639	28	16
Future	3.85	2674	6.65	4618	22	13

8.4 Percolation Basins

There are six percolation basins on the property. Five are utilized by the City, and one is dedicated to the adjacent Atascadero State Hospital (ASH). The Long Range Plan, Wastewater Treatment Facilities (Kennedy/Jenks/Chilton and John L. Wallace & Associates, July 1989) cites a 1989 John L. Wallace & Associates study that estimated the percolation capacity for four ponds under a 100-year precipitation event. The study found that with four available infiltration ponds, the maximum effluent infiltration capacity would be 1.86 MGD assuming no golf course irrigation and 2.46 MGD with golf course irrigation. At that time, treated effluent for the golf course irrigation was being disinfected and pumped directly to the golf course, not through the percolation basins. The basins were also shallower. All basins were excavated in the late 1990's. Also, the City was using only four ponds for percolation, whereas five are now used. It is assumed that these estimates would be higher with five percolation ponds in use.

Regular maintenance (weed abatement and annual ripping) is recommended to assist percolation capacity. The City may consider performing a field test of percolation capacity.

8.5 Sludge Management

Currently, solids primarily settle in the facultative lagoon and are removed using a floating dredge which pumps accumulated sludge to concrete-lined sludge drying beds. The dredging operation is described further in **Section 10**.

The existing sixteen (16) sludge drying beds have a total available area of approximately 33,600 SF. Currently, wastewater staff uses one of the beds for drying sewer trash collected from the sides of the ponds and from the collection system. It was assumed that this practice will continue, leaving a total available area for sludge drying of 31,500 SF. Assuming an average fill depth of 12 inches, the available drying bed volume is approximately 31,500 CF.

MKN estimated the amount of solids collected in the facultative lagoon under existing and future conditions. The following table summarizes the assumptions and calculations.

Table 8-4: Estimated Sludge Production and Required Drying Bed Area at Existing and Future Conditions

	Existing Value	**Future Value**	**Notes**
AAF (MGD)	1.38	1.77	2011 Average
Average Influent TSS concentration (mg/L)	300	300	Assumed average
Average Effluent TSS concentration (mg/L)	40	40	3-year average (2010 – 2012)
% Volatile Solids	70	70	

Table 8-4: Estimated Sludge Production and Required Drying Bed Area at Existing and Future Conditions			
	Existing Value	**Future Value**	**Notes**
% Annual VSS reduction	60	60	
% Total Solids of sludge dredged from lagoon	5	5	
Density of sludge dredged from lagoon (lb/gal)	8.5	8.5	Assumes specific gravity of 1.02
Total Mass of Solids (lb/yr)	786,400	1,008,640	Calculated
Total Volume of Sludge (CF/yr)	247,340	317,240	Calculated
Total drying bed volume available (CF/yr)	94,500	94,500	Assumes 12-in fill depth, and fill/empty three times
Estimated drying bed volume deficit (CF/yr)	152,840	222,740	
Estimated additional drying bed area needed (SF)	50,947	74,247	Assumes 12-in fill depth, and fill/empty three times

The WRF produces an estimated 786,400 pounds of dry solids per year under existing flows and loadings. If the current pond system is expanded to accommodate future flows and loadings, sludge production is estimated to be over one million pounds of dry solids per year at estimated future conditions.

Assuming the sludge drying beds are filled (to a depth of 12 inches) and sludge is removed three times per year, the total available volume (with one out of service) is 94,500 CF/year. If the drying beds are filled to a depth of 12 inches and are filled and emptied three times per year, an estimated 50,947 SF of drying bed area is needed to meet existing conditions, and 74,247 SF is needed to meet future conditions.

WRF staff have indicated that the existing sludge drying bed area is insufficient for existing operations. Additionally, sludge could be accumulating in the ponds, leaving the pond system through the effluent, or digestion is higher than estimated herein. Given the shallow depth in the facultative and polishing ponds, it is unlikely that significant anaerobic sludge digestion is taking place. Planning to increase drying bed area or improve solids thickening/dewatering is recommended and is discussed later in this Master Plan.

8.6 Power

The WRF does not currently have a permanent standby generator to provide power to the plant in the case of emergency power outages. Without an automatic standby generator, the City is at risk of an overflow if the power fails. A permanent standby generator on an automatic transfer switch is recommended to provide an emergency standby power source for the plant.

SECTION 9 WASTEWATER TREATMENT IMPROVEMENT ALTERNATIVES

The capacity of the existing system was reviewed as summarized in **Section 8**. Several alternatives were explored for the future water reclamation facility. Potential drivers for changing the main process include meeting future flows and loadings; reducing energy requirements; improving the efficiency of sludge processing; and reducing potential for odor as land around the treatment facility continues to develop.

9.1 Preliminary Treatment

The headworks screening facility was recently installed, is performing well, and appears to be adequate for anticipated future flows. Therefore, no alternatives were evaluated for preliminary treatment.

9.2 Secondary Treatment System – Existing Treatment Process

Secondary treatment at the existing WRF is performed by the pond system. The following alternatives were reviewed for improving the existing secondary treatment process. Additional alternatives for upgrading the treatment process are discussed in **Section 9.3**.

- No action – Maintain existing treatment configuration and practice
- Expand pond system – If space is available, add a second aeration lagoon of similar volume, and deepen and split the facultative lagoon into two, maintain existing polishing pond
- Aeration improvements – The following alternatives were investigated for improving the existing aeration system for both existing and potential future pond systems. These improvements will not increase capacity in the existing system without additional ponds, but may improve efficiency and provide energy savings.
    - Conversion to brush aerators
    - Installation of dissolved oxygen controls for existing surface aerators
    - Conversion to diffused aeration system

No Action

As described in the previous section, the existing secondary treatment system consists of an aeration lagoon with seven splasher aerators for a total of 155 horsepower, a facultative lagoon, and a polishing pond. The system benefits from significant wind mixing at the site and historical monitoring results indicate that the City consistently meets effluent requirements for soluble BOD and TSS. However, the plant is currently at its original design capacity, and increased flows and loadings may exacerbate operational challenges and impact effluent quality. Current operational challenges include seasonal odors, limited hydraulic capacity during wet weather events, and the significant effort required for sludge collection, management, and disposal. Additionally, the existing secondary treatment process does not allow for increased effluent quality limits or goals.

Expand Pond System

MKN evaluated the existing pond system utilizing a treatment model described in **Section 8**. As described above, the pond model is conservative and cannot predict site-specific conditions since it is based on general, observed performance across San Luis Obispo and Monterey Counties. The treatment capacity of pond systems are site specific and a comparison to other pond systems cannot be considered reliable. Based on a review of historical effluent quality, it is estimated that the City's WRF has capacity to treat existing flows and loadings while meeting the permit requirements. However, modeling results and a comparison to the original design indicate the plant is at capacity. The conceptual design for an expanded system presented here is based on providing a future hydraulic retention time (HRT) (flow divided by treatment volume) and organic areal loading rate (BOD loading divided by treatment pond surface area) to match the existing.

The proposed expanded pond system consists of adding a second aeration lagoon with geometry similar to the existing, and splitting the facultative lagoon into two cells by adding a small earthen berm down the middle. The facultative lagoon would also be excavated to a lower elevation to provide additional volume and hydraulic detention time. The estimated organic loading in pounds per day per acre will be slightly higher than the existing loading, but the aeration system will be designed assuming the majority of the BOD reduction will occur in the aeration ponds. Some aerators may be required in the facultative lagoons to maintain an aerated cap and reduce odors. The additional volume will provide a hydraulic retention time for future flows that is slightly higher than the existing. Splitting the facultative lagoon will limit areas of solids accumulation, with the majority settling out in the first lagoon. It will also allow the City to temporarily take a pond out of service to replace a liner or to remove sludge. Flow to the aerated lagoons would be split equally for parallel operation, the facultative lagoons would be operated in series, and the polishing pond would remain unchanged. A process flow diagram for the expanded pond system is provided in **Figure 9-1**.

The existing plant site is constrained by the regulatory floodway to the north (discussed in **Appendix B**); railroad to the west; and Atascadero State Hospital property to the south. In addition, the only open area large enough for new ponds on the plant site has been identified as cultural resource site. The only potentially viable location identified is to the northeast of the existing aeration pond, within the existing floodplain. However, this is close to existing residential neighborhoods, crossing existing hiking trails and native tree planting areas. The area would require significant grading to accommodate a new aeration pond and would require an analysis of the floodplain impacts. (See **Appendix B** for FEMA Flood Insurance Rate Maps).

Assuming these constraints can be addressed and an additional pond could be constructed, the proposed system design is described in the table below.

Table 9-1: Future Treatment Ponds Design Summary	
AERATION LAGOON	
Number	2
Surface Area, acres	1.4
Operating depth, feet	8
Side Slope (horizontal/vertical)	2
Operating volume, MG (approx.)	2.98
FACULTATIVE LAGOON	
Number	2
Surface Area, acres, each	3.98
Operating depth, feet	10
Side Slope (horizontal/vertical)	3
Operating volume, MG, each (approx.)	10.94
POLISHING POND	
Number	1
Surface Area, acres	5
Operating depth, feet	4.4
Side Slope (horizontal/vertical)	3
Operating volume, MG (approx.)	6.55
Total Operating volume, all ponds, MG (approx.)	34.4

In addition to the operational challenges and unpredictability, one of the main disadvantages to maintaining the existing secondary treatment process is the inability to reliably meet a higher level of treatment than is currently required in the WDRs. It is unlikely that the limits from the existing WDRs would be maintained in new WDRs, based on regulatory trends. Another concern is the hydraulic capacity of the existing system downstream of the ponds. Currently, during wet weather events, the pond system collects a significant amount of infiltration in precipitation into the ponds. The Plant Audit estimated an additional 1 MGD enters the pond system with 2.65 inches of rain, which is equivalent to 2.4 MGD when experienced over a 10 hour period (AECOM, July 2011). An additional aeration basin would add approximately 1.4 acres, which would collect an estimated 100,000 gpd, equivalent to 240,000 gpd over a 10 hour period.

A preliminary estimate of construction cost for the future pond system is provided in **Table 9-2**, considering construction of the new aeration pond and modification of the facultative lagoon to increase depth and create two separate lagoons. This cost opinion does not include odor control.

Table 9-2: Preliminary Opinion of Construction Cost – Future Pond System

Description	Quantity	Unit	Unit Price	Amount
AERATION LAGOON				
Excavate new aeration lagoon	19,500	CY	$ 8	$ 156,000
Asphalt liner and base	1	LS	$ 200,000	$ 200,000
Grading	1	LS	$ 40,000	$ 40,000
Piping and Valves	1	LS	$ 50,000	$ 50,000
Export excavated material	19,500	CY	$ 5	$ 97,500
FACULTATIVE LAGOON				
Bypass and drain lagoon	1	LS	$ 60,000	$ 60,000
Excavate pond to 12 FT	44,200	CY	$ 15	$ 663,000
Export excavated material	44,200	CY	$ 5	$ 221,000
Install earthen berm (12-FT wide)	8,200	CY	$ 20	$ 164,000
Install rip rap	1	LS	$ 50,000	$ 50,000
Piping and Valves	1	LS	$ 35,000	$ 35,000
Subtotal Construction Cost Opinion				**$ 1,740,000**
Engineering and Administration	30%			$ 522,000
Contingency	30%			$ 522,000
Total Construction Cost Opinion				**$ 2,790,000**

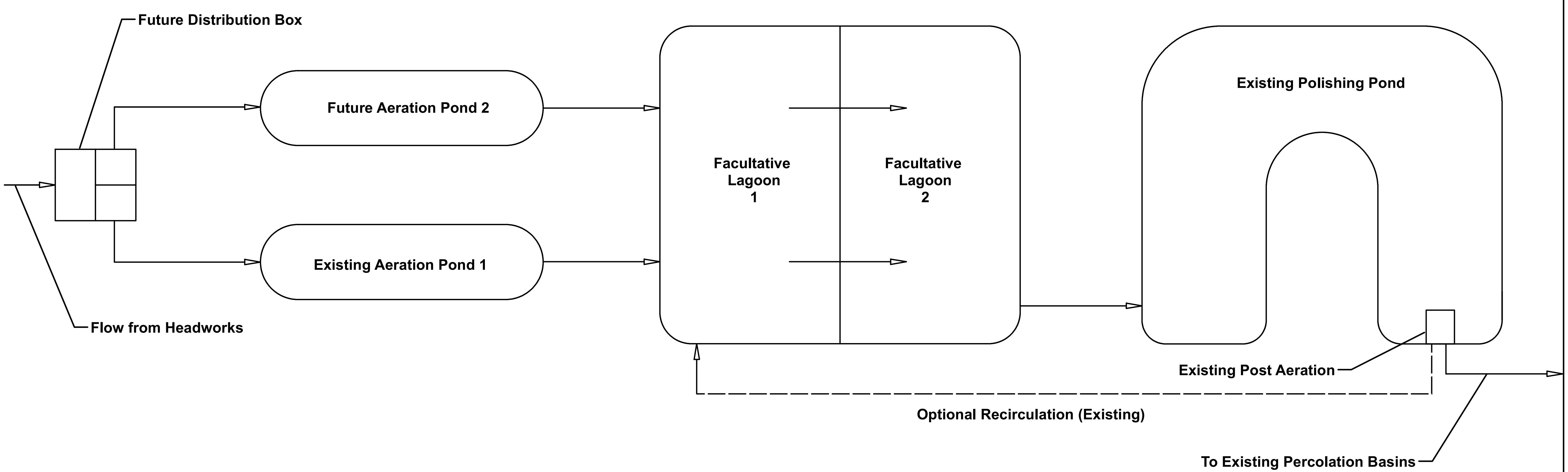
Notes: 1. Assumes space for a second aeration lagoon can be identified near existing aeration lagoon. 2. Does not include aeration costs. See Table 9-4 for estimated cost with surface aeration and following subsection for aeration alternatives.

MKN reviewed the theoretical aeration requirements assuming continued use of surface, splasher-type aerators with the future pond system. An estimated 300 horsepower will be required to meet future flows and loadings. **Table 9-3** summarizes the preliminary opinion of construction cost for a future pond system utilizing surface aeration.

Table 9-3: Preliminary Opinion of Construction Cost – Future Pond System with Surface Aerators

Description	Quantity	Unit	Installed Unit Price	Amount
Surface splasher aerators, 25 hp	6	EA	$ 39,000	$ 234,000
Appurtenances	1	LS	$ 20,000	$ 20,000
Electrical	1	LS	$ 94,000	$ 94,000
Subtotal Surface Aerators				**$ 348,000**
Subtotal Future Pond System (Table 9-3)				$ 1,740,000
Subtotal Future Pond System with Surface Aerators				**$ 2,088,000**
Engineering and Administration	30%			$ 626,400
Contingency	30%			$ 626,400
Total Construction Cost Opinion				**$ 3,350,000**

Notes: 1. Assumes space for a second aeration lagoon can be identified near existing aeration lagoon. 2. Assumes existing aerators can be reused (155 HP total).



City of Atascadero Water Reclamation Facility Master Plan Update

Figure 9-1: Expanded Pond System Process Flow Diagram

Aeration Improvements

The existing pond system is limited by hydraulic retention time (or volume). While these aeration improvement options will not improve capacity for the existing system, they are worth exploring for electrical efficiency on an interim basis and if the pond system will be sustained in the future. Options were assessed for both the existing pond system and the future expanded pond system described above. However, if area for an additional aeration pond is not identified, a future pond system may not be feasible.

<u>Brush aerators</u>

Brush aerators are floating mechanical surface aerators that use a horizontal cylinder with steel or plastic blades and an in-line horizontal drive. The blades become submerged in the water as the cylinder is rapidly rotated by an electrical motor drive, spraying the water across the pond to provide circulation and entrain air in the wastewater. The rapidly rotating blades "sheer" the water, creating fine bubbles for oxygen transfer.

House Brush Aerator with
Levee Stake Anchoring System

MKN reviewed brush aerators (ex. House Aerators) for potential installation at the Atascadero WRF. When compared to splasher-type surface aerators (the current aeration equipment), brush aerators report a greater average standard aeration efficiency (SAE) and mixing efficiency, and can be designed to provide a mixed, oxygenated surface layer while allowing the deeper portions to remain settled and oxygen limited. The larger SAE, measured in pounds of oxygen per hour per horsepower, translates to lower power requirements.

Brush aerators can be anchored using cables or levee arms, and can be equipped with splash shields and rotor covers to reduce aerosol sprays. The drive train is completely sealed in an enclosure for corrosion resistance.

The recommended installation for the existing and potential future pond system is summarized in the table below.

Table 9-4: Proposed Brush Aerator Installation

	Existing Pond System	Future Pond System
MMF	1.77 MGD	2.28 MGD
Brush aerators for aeration basin(s)	(4) 25 hp	(4) 25 hp in each pond
Brush aerators for facultative lagoon(s)	(2) 7.5 hp	(1) 7.5 hp in each pond
Total aerator horsepower	115 hp	215 hp

Compared to the existing surface aerators, converting to brush aerators could provide a reduction of 40 HP, or an estimated 261,000 kilowatt-hours (kw-hr) per year (at 24 hours per day) for the existing pond system and current flows and loadings. At $0.12 per kw-hr, this is an estimated $31,320 annual electrical savings for full replacement. With an estimated installed cost of $48,000 each for 25-HP brush aerator, the City may wish to consider this option if existing surface splasher aerators need to be replaced. The investment in energy efficiency would result in a payback period of 6 to 7 years, assuming no significant electrical improvements would be required and the existing electrical system meets code requirements.

The recommended installation for the future pond system, however, will be limited by mixing requirements, so the advantage of greater aeration efficiency with brush aerators is reduced. The recommended horsepower for brush aerators is approximately 85 horsepower less than the recommended aeration power for surface splasher aerators for the future pond system. The amounts to an estimated annual electrical savings of $67,000 (at $0.12 per kw-hr). Estimated electrical costs and capital costs are summarized for the various alternatives later in this section.

Brush aerators in the facultative lagoon may not be required with the existing recirculation system which pumps oxygenated effluent from the polishing pond back to the front of the facultative lagoon. However, assuming a DO concentration in the effluent of 7 mg/L (2012 average) and recirculation of 1.0 MGD, the amount of oxygen provided by the recirculation system is approximately 58 pounds per day. One 10-hp brush aerator is expected to provide approximately 450 pounds per day. If conversion to brush aerators is pursued for the existing and/or future WRF systems, a comparison of installation in the facultative lagoon and maintaining the recirculation system should be evaluated further, including consideration of energy and maintenance requirements. For the purposes of this report, it is assumed that the installation in the facultative lagoons will be included and the recirculation system would be abandoned.

Table 9-5 summarizes the preliminary opinion of construction cost for a future pond system utilizing brush aeration.

Table 9-5: Preliminary Opinion of Construction Cost – Future Pond System with Brush Aerators

Description	Quantity	Unit	Installed Unit Price	Amount
Brush aerators, 25 HP	8	EA	$ 51,000	$ 408,000
Brush aerators, 7.5 HP	2	EA	$ 30,000	$ 60,000
Appurtenances	1	LS	$ 20,000	$ 20,000
Electrical	1	LS	$ 94,000	$ 94,000
Subtotal Surface Aerators				**$ 582,000**
Subtotal Future Pond System (Table 9-3)				$ 1,740,000
Subtotal Future Pond System with Surface Aerators				**$ 2,309,000**
Engineering and Administration	30%			$ 696,600
Contingency	30%			$ 696,600
Total Construction Cost Opinion				**$ 3,720,000**

Notes: 1. Assumes space for a second aeration lagoon can be identified near existing aeration lagoon.

<u>Dissolved Oxygen Control</u>

Currently, the aerators run constantly (24 hours a day, 7 days a week) when they are activated by the operators, unless they are out of service due to ragging or maintenance activities. Oxygen requirements depend on influent loading, which varies throughout the day, and day to day. The existing surface aerators make up 155 HP, equivalent to over 1 million kw-hr per year when run 24 hours per day. At $0.12 per kw-hr (the 2012 average electrical cost at the WRF), an estimated $121,500 is spent on aeration.

MKN calculated the aeration requirements for the existing and future flows and loadings if ponds with surface aerators were used. Assuming maximum month flows and loadings, an estimated 230 HP is required. A reduction of the number and size of aerators is not recommended.

However, there may be potential to reduce the total aerator run time and still maintain adequate treatment. As mentioned, influent loadings can vary. A dissolved oxygen (DO) probe can be added to the aeration basin and connected to controls for the existing aerators to maintain the DO within a desired range, for example between 2 and 6 mg/L. Although an estimate of potential power savings is difficult to predict at this time, loadings at night time are typically significantly less during peak periods. An estimate to install a controls system for the existing aeration basin is approximately $60,000 based on a review of similar installations. This would include furnishing and installing a programmable, automatic-washing DO probe on a mounting arm and a pre-assembled and vented enclosure containing a controller, an air-blast compressor, a power disconnect breaker, relays, and power connections. The estimate also includes new conduit and conductors, a mooring post for the mounting arm, a concrete pad for the control panel and new aerator disconnects with contactors for the controls. This estimate could be doubled to $120,000 to budget for the potential future aeration basin.

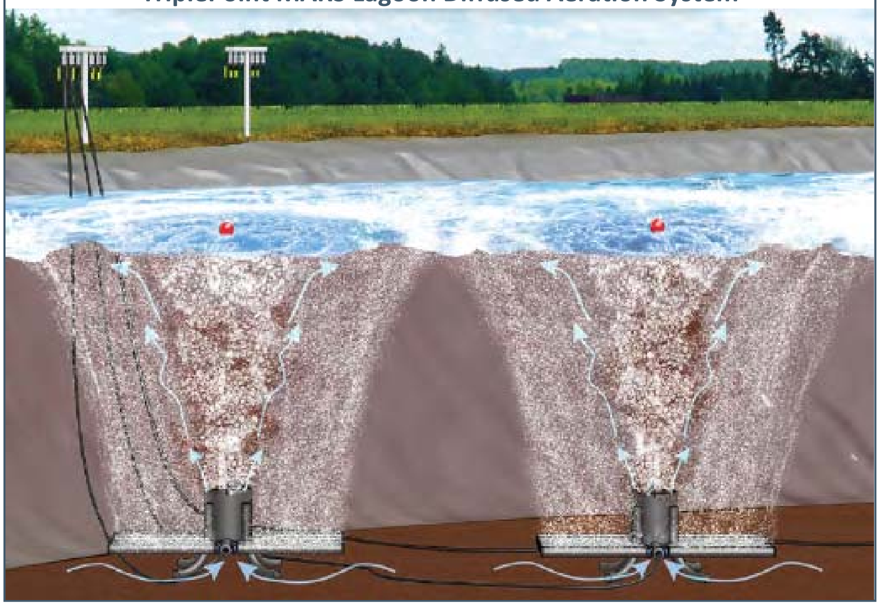
Required maintenance for the dissolved oxygen probes includes daily cleaning and weekly calibration.

Diffused Aeration

One option for the biological treatment system is to maintain the pond system, but replace the surface aerators in the aeration lagoon with a diffused (or subsurface) aeration system. The primary advantage to a submerged diffused aeration technology over surface aerators in this case is the potential to lower energy costs with more efficient aeration. Disadvantages compared to surface aerators are capital cost to install blowers and air piping, less visibility of aeration equipment since the diffuser assemblies are submerged, and the requirement to enter the pond in a boat to retrieve diffuser assemblies when diffuser maintenance is required. Though the aeration is more efficient, it is anticipated that the effluent quality will be comparable to the existing system. MKN reviewed two diffused aeration systems: The Parkson Biolac® system and the MARS diffused aeration system by Triplepoint. The two systems are described further below.

Triplepoint is an American company with over 100 US installations. The MARS lagoon aeration diffuser utilizes a patented technology (Double Bouble™) which combines fine bubble membranes with a coarse bubble static tube aerator.

TriplePoint MARS Lagoon Diffused Aeration System



The fine bubble membrane diffusers provide for oxygenation of the water column, while the coarse bubble aerator (center) provides mixing. The Triplepoint MARS system is portable, not attached to piping or frames in the pond. Each MARS diffuser has its own weighted legs and is fed air by flexible weighted tubing. The flexible tubing is connected to air headers on the shore, and air piping to one or more blowers. A tethered float, connected to each submerged diffuser, allows the diffuser assemblies to be located from the surface. The diffusers can be installed without dewatering existing treatment ponds, and lifted for maintenance from a boat on the surface.

TriplePoint estimates that less than 60 horsepower is required for a MARS system at the existing Atascadero WRF and 80 horsepower will be required for the future system. Based on first-order rate kinetics and the proposed aeration system, the aeration basin effluent BOD_5 concentration is expected to be approximately 142 mg/L in the winter and 110 mg/L in the summer. The design assumes no nitrification will occur in the aeration basins, and that final treatment would occur in the facultative lagoon and the polishing pond.

For planning purposes, we have assumed two 100 horsepower blowers (one duty and one standby) to serve the potential future pond system. Diffuser assemblies would be installed in each of the two aeration basins, connected to flexible air tubing that runs to the bank of the pond and connects to a steel manifold (approximately four assemblies per manifold). An air header would connect the manifolds and supply air from the blowers. A blower and control room is recommended to protect the equipment from the environment. The proposed system is estimated to provide an aeration basin effluent BOD_5 concentration of 142 mg/L during winter conditions (when degradation rates are lower) and maximum month loadings. It is assumed that additional treatment occurring in the facultative lagoon and polishing pond will provide a final effluent BOD_5 concentration less than 100 mg/L. Details for the proposed TriplePoint installation are provided in the table below.

Table 9-6 Proposed TriplePoint Diffused Aeration System		
	Existing Pond System	**Future Pond System**
MMF	1.77 MGD	2.28 MGD
Number of diffuser assemblies	40	66 (33 in each pond)
Number of aeration manifolds	10	20
Blower Horsepower, estimated minimum	60	80

The preliminary opinion of construction cost is summarized in the table below.

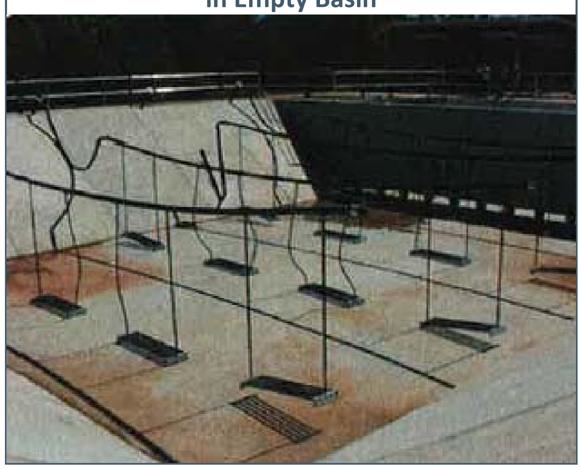
Table 9-7: Preliminary Opinion of Construction Cost – Future Pond System with TriplePoint Diffused Aeration System

Description	Quantity	Unit	Installed Unit Price	Amount
TriplePoint diffused aeration system	1	LS	$ 583,000	$ 583,000
Blowers (100 hp)	2	EA	$ 150,000	$ 360,000
Air piping and appurtenances (20% of equipment)	1	LS	$ 152,600	$ 152,600
Electrical and Instrumentation (20% of equipment)	1	LS	$ 152,600	$ 152,600
Controls and Blower Building Allowance	1	LS	$ 400,000	$ 400,000
Subtotal TriplePoint System				**$ 1,648,200**
Subtotal Future Pond System (Table 9-3)				$ 1,740,000
Subtotal Future Pond System with TriplePoint				**$ 3,388,200**
Engineering and Administration	30%			$ 1,016,460
Contingency	30%			$ 1,016,460
Total Construction Cost Opinion				**$ 5,430,000**

Notes: 1. Assumes space for a second aeration lagoon can be identified near existing aeration lagoon.

The Parkson Biolac®-L (lagoon) system is a diffused aeration system offered for wastewater treatment. Parkson also produces a system known as Biolac® (wave oxidation), which is an extended aeration process technology described later in this report. There are approximately 800 Biolac® installations in North American and over 1000 globally. The Biolac® aeration system uses fine bubble membrane diffusers that are attached to floating aeration chains. The floating aeration chains are moved across the basin when air supplied by blowers propels through the submerged diffusers, which are connected to the aeration chains and suspended off the basin floor. Airflow to each chain is independently controlled by air piping and butterfly valves at air headers on the shore.

Parkson Biolac® Diffused Aeration System in Empty Basin



The aeration chains and diffuser assemblies would be installed in the existing and proposed future aeration basin. An air header would deliver air from the blowers. A building is recommended to protect the blowers and controls.

For the existing pond system, the proposed installation involves splitting the aeration basin into two cells with a floating curtain and adding diffused aeration to create one complete mix cell and one partial mix cell. The complete-mix zone will include 12 aeration chains and 108 diffuser assemblies. The partial mix zone would contain 8 chains and 32 diffuser assemblies. Based on first-order rate kinetics and the proposed aeration system, the aeration basin effluent BOD_5 concentration is expected to be approximately 70 mg/L during winter conditions and maximum month loadings.

Parkson Biolac® Diffuser Assembly

Details for the proposed system are described in **Table 9-8**. It should be noted that Parkson assumes some nitrification will occur in the aeration pond. Monitoring and some manual control may be required to avoid excess nitrification and to stay within the nitrate limit set by the WDR. Dissolved oxygen controls and variable frequency drives for the blowers can be added for an additional cost to monitor and adjust aeration automatically.

Table 9-8: Proposed Biolac®-Lagoon Diffused Aeration System

	Existing Pond System	Future Pond System
MMF	1.77 MGD	2.28 MGD
Number of lagoons	1	2
Number of cells per lagoon	2	2
Cell 1 – complete mix zone		
Volume	1.04 MG	1.04 MG
Number of diffuser assemblies	108	108
Number of aeration chains	12	12
Cell 2 – partial mix zone		
Volume	1.96 MG	1.96 MG
Number of diffuser assemblies	32	32
Number of aeration chains	8	8
Blower Horsepower, minimum	90	180

A preliminary opinion of construction cost is included in the table below.

Table 9-9: Preliminary Opinion of Construction Cost – Future Pond System with Parkson Biolac-L Diffused Aeration System				
Description	**Quantity**	**Unit**	**Installed Unit Price**	**Amount**
Parkson Biolac-L diffused aeration system with (3) 100-hp PD Blowers	1	LS	$ 1,130,000	$ 1,130,000
Floating curtain to separate basins into two zones	2	EA	$ 30,000	$ 60,000
Air piping and appurtenances (20% of equipment)	1	LS	$ 226,000	$ 226,000
Electrical and Instrumentation (20% of equipment)	1	LS	$ 226,000	$ 226,000
Controls and Blower Building Allowance	1	LS		$ 400,000
Subtotal Biolac-L System				**$ 2,042,200**
Subtotal Future Pond System (Table 9-3)				$ 1,740,000
Subtotal Future Pond System with Biolac-L				**$ 3,782,000**
Engineering and Administration	30%			$ 1,134,600
Contingency	30%			$ 1,134,600
Total Construction Cost Opinion				**$ 6,100,000**

Notes: 1. Assumes space for a second aeration lagoon can be identified near existing aeration lagoon.

The preliminary cost opinion for the Parkson Biolac®-L system is greater than the proposed TriplePoint diffused aeration system described above. However, the anticipated BOD_5 concentration in the effluent leaving the aeration pond from the proposed Parkson system is approximately half that from the proposed TriplePoint system, and below the permitted effluent limit. The proposed TriplePoint system relies on additional BOD reduction through the facultative lagoon and polishing pond. If a pond system with diffused aeration is pursued, a conservative approach is recommended, to design for the majority of the BOD removal to occur in the aeration basin.

Summary of Pond System Alternatives

Several aeration systems were reviewed for the existing and potential future pond systems. Due to limited space, a pond system to treat future flows and loadings may not be feasible if an appropriate location for a second aeration basin is not identified. The City would need to acquire property to construct a new pond outside of the floodplain and away from residences. If a site is located for a second aeration basin, the alternative aeration systems may be considered. Each aeration system associated with the existing process (aerated/facultative pond system) is anticipated to provide similar effluent quality, appropriate for the existing permit requirements.

Some of the basic advantages and disadvantages between the pond system aeration technologies reviewed (assuming a second aeration basin can be sited) are summarized in the following table.

Table 9-10 summarizes the capital and estimated aeration electrical costs (annual and 20-year total).

Table 9-10: Summary of Future Pond System Alternative Capital and Electrical Costs

	Preliminary Capital Cost Estimate	Estimated Annual Aeration Electrical Cost	Estimated 20-year Aeration Electrical Cost
Expanded Pond System with Surface Splasher Aerators	$3,350,000	$255,000	$5,100,000
Expanded Pond System with Brush Aerators	$3,720,000	$183,000	$3,660,000
Expanded Pond System with TriplePoint Diffused Aeration	$5,430,000	$68,000	$1,360,000
Expanded Pond System with Parkson Biolac-L Diffused Aeration	$6,100,000	$153,000	$3,060,000

Notes: 1. Assumes space for a second aeration lagoon can be acquired near existing aeration lagoon. 2. Assumes $0.12 per kw-hr (WRF 2012 average electrical cost). 3. Annual aeration electrical cost estimated for future estimated flows and loadings. 3. It is possible that the electrical requirements for the surface splasher aerators could be reduced with installation of dissolved oxygen controls.

Table 9-11: Relative Comparison of Pond System Aeration Technologies

	Relative Advantages	Relative Disadvantages
Expanded Pond System with Surface Splasher Aerators	Current aeration system – simple, familiar technology. Aerators are visible, and relatively accessible. Lowest estimated capital cost.	Inefficient aeration. Highest estimated electrical cost. (Addition of DO controls has potential to increase efficiency and reduce electrical costs)
Expanded Pond System with Brush Aerators	Similar technology to existing. Aerators are visible, and relatively accessible. Relatively low capital cost. More efficient aeration than existing. Estimated electrical cost is approximately 30% less than existing (for future flows/loadings).	Slightly higher capital cost than continuation with existing technology. Lower aeration efficiency than diffused aeration.
Expanded Pond System with TriplePoint Diffused Aeration	More efficient aeration than existing.	Diffuser assemblies are not visible and relatively difficult to access, requiring entering the pond in a boat. Proposed system relies on BOD removal in facultative lagoon and polishing pond.
Expanded Pond System with Parkson Biolac®-L Diffused Aeration	More efficient aeration than existing.	Diffuser assemblies are not visible and relatively difficult to access, requiring entering the pond in a boat. Highest estimated capital cost

9.3 Secondary Treatment Process – Upgrade Process to Extended Aeration System

The existing secondary treatment system is limited by hydraulic retention time (volume) and an additional pond is recommended if the City wishes to continue with the existing process. The WRF site has limited space and a location is not available at the plant site for the additional pond which will be required to meet future flows and loadings. Additionally, the existing process does not allow for increased treatment. Odor control has been a concern in the past, as has been efficient sludge removal and processing.

Two extended aeration system alternatives were reviewed to expand capacity, improve treated effluent quality, reliability and operability, reduce the plant footprint, and reduce odor potential.

- Parkson Biolac® Wave Oxidation system
- Oxidation Ditch

When compared to pond systems, extended aeration systems improve effluent quality and reliability, and have the advantage of allowing for future tertiary treatment. Extended aeration systems pass wet weather flows without requiring equalization basins. Also, extended aeration systems typically have lower energy requirements and smaller footprints than conventional pond systems. The disadvantage is a greater capital investment, increased maintenance and control requirements, inherent with the higher level of technology, and a greater generation of sludge. Extended aeration systems achieve a higher level of treatment than pond systems by employing a longer solids retention time (SRT). The extended SRT increases the stability of the system, allowing for fluctuating loads under similar operating conditions. The process utilizes aeration and secondary clarification. Solids ("mixed liquor suspended solids" or "activated sludge") are returned from the secondary clarifier back to the aeration zone for the longer SRT. Excess solids are wasted, typically to a thickener and/or dewatering system for volume reduction.

The 1997 Preliminary Design Report (Brown & Caldwell, May 1997) conceptualized a conversion to an extended aeration system by adding a drum screen and a sedimentation system downstream of the aeration pond and recycling activated sludge from the sedimentation tank back to the front of the pond. The Parkson Biolac® Wave Oxidation system is very similar to this concept, but a process warranty is provided by the manufacturer and the process has a successful track record.

Parkson Biolac® Wave Oxidation

The Parkson Biolac® Wave Oxidation System is an extended aeration process that utilizes a longer SRT and moving aeration chains to reduce BOD and TSS concentrations to below 10 mg/L and total nitrogen to less than 8 mg/L. Airflow to the moving aeration chains can be controlled to create a wave of aerobic and anoxic zones, resulting in nitrification and denitrification. Multiple fine-bubble diffusers are mounted on the flexible air tubing suspended across the pond. The flexible Biolac® aeration system maintains the required mixing and suspension of solids at 4 cubic feet per minute per 1000 cubic feet of aeration basin volume, half that required for a typical stationary diffused aeration system. A process flow diagram for the Biolac® extended aeration system is included as **Figure 9-2** and a preliminary site plan is provided as **Figure 9-3**.

Pictures of the Biolac® system are included in **Section 9.2**. The diffuser assemblies and pond installation is the same as the Biolac®-L installation, but the aeration design and controls, and return activated sludge and solids retention time are designed for performance as an extended aeration process.

To handle projected future conditions, two 1.5 MG aeration basins are recommended. Approximate dimensions are 160 feet by 145 feet at grade, with a 1.5-to-1 side slope (horizontal to vertical) and a 12 foot side water depth. A minimum two-foot freeboard is recommended.

An estimated minimum aeration of 146 horsepower will be required for the system (at future MMF). However, it is recommended that three 125 horsepower blowers with VFDs are installed, to provide for adequate aeration during maximum month conditions and allow for variable operations, and to provide one standby blower for redundancy. The proposed Biolac® aeration system is summarized in the table below.

Table 9-12 Proposed Parkson Biolac® Extended Aeration System	
Number of aeration basins	2
Dimensions, each basin (at grade)	160 FT x 145 FT
Water Depth	12 FT
Basin Volume, each	1.51 MG
Number of diffuser assemblies, each basin	126
Number of aeration chains, each basin	9
Blower Horsepower, minimum	146

An influent lift station will be required to pump flows from the headworks to a distribution box upstream of the aeration basins and allow gravity flow from the aeration basins, through the clarifiers, and to the post-aeration chamber (which may be utilized as a chlorine contact chamber if disinfection is required in the future). Alternatively, the post-aeration chamber could be abandoned or bypassed and a new effluent manhole/sampling station and flow meter installed.

A preliminary opinion of construction cost is included in the table below. Earthwork estimates assume the aeration ponds and clarifiers are installed in the footprint of the polishing pond and the remaining polishing pond is filled. The secondary clarifier design is based on two units at 100 percent redundancy, so one can be taken offline for maintenance.

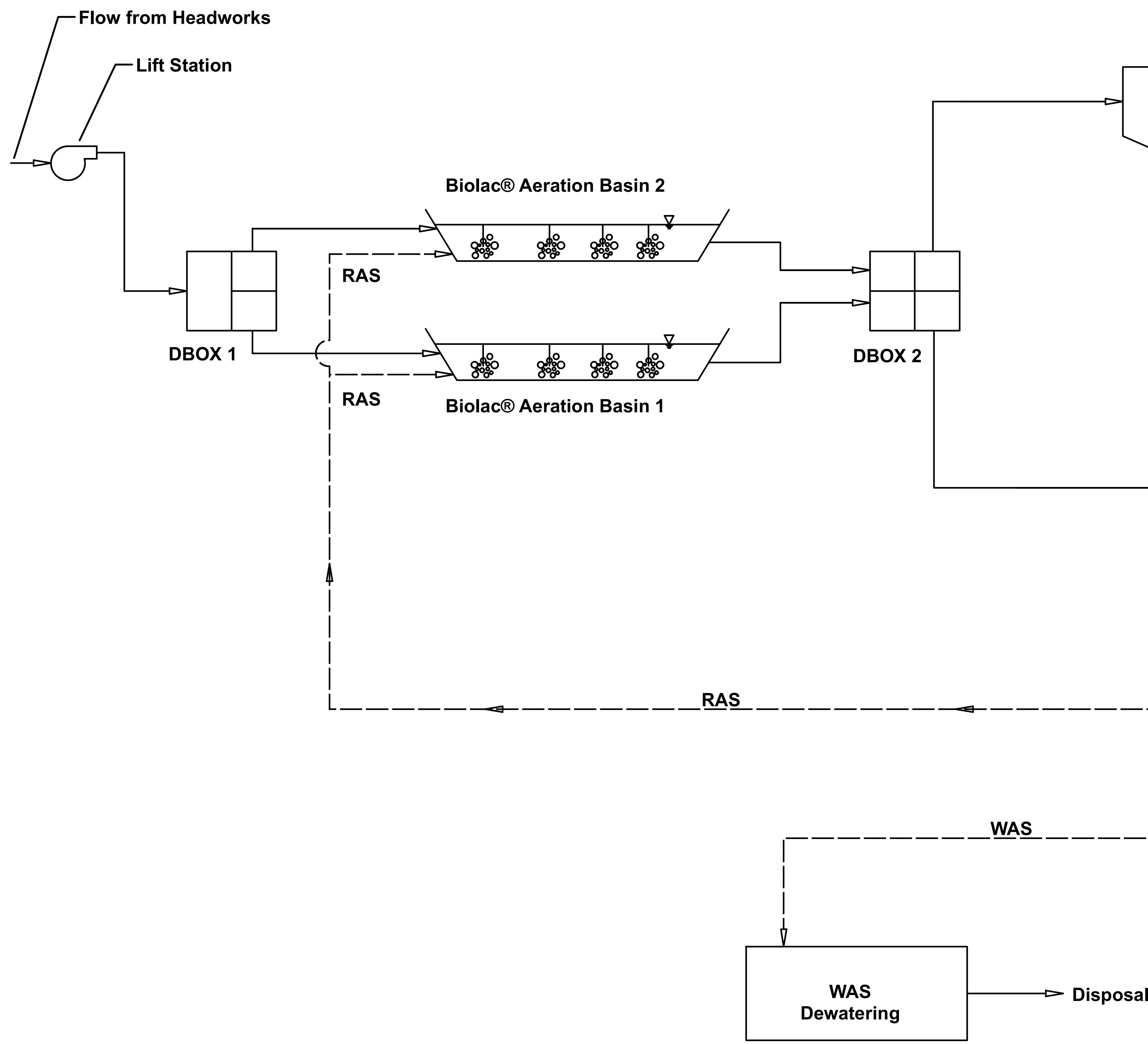
Table 9-13: Preliminary Opinion of Construction Cost – Parkson Biolac® Extended Aeration System

Description	Quantity	Unit	Installed Unit Price	Amount
Influent lift station and force main	1	LS	$ 1,000,000	$ 1,000,000
Parkson Biolac® Wave Oxidation System (including diffuser equipment, blowers and VFDs)	1	LS	$ 1,855,000	$ 1,855,000
HDPE Liner (60 mil, textured)	52,700	SF	$ 1.25	$ 66,000
Controls and Blower Building	2,250	SF	$ 250	$ 563,000
Secondary Clarifiers (90-ft Diameter)	2	EA	$ 1,160,000	$ 2,320,000
RAS/WAS Pump Station	2	EA	$ 240,000	$ 480,000
Distribution Boxes	3	EA	$ 50,000	$ 150,000
Earthwork	1	LS	$ 920,000	$ 920,000
Sitework	1	LS	$ 40,000	$ 40,000
Piping and Valves (25% of equipment)	1	LS	$ 1,170,000	$ 1,170,000
Electrical and Instrumentation (20% of equipment)	1	LS	$ 940,000	$ 940,000
Construction Cost Opinion Subtotal				**$ 9,510,000**
Engineering and Administration	30%			$ 2,853,000
Contingency	30%			$ 2,853,000
Total Construction Cost Opinion				**$ 15,220,000**

Notes: 1. Does not include sludge handling facilities; See Section 10.

Parkson offers an integral rectangular clarifier design that can be integrated into the Biolac® aeration basin. At this time, external circular clarifiers are recommended due to greater efficiencies and long history of performance. Utilizing integral clarifiers may reduce overall project cost and if this alternative is pursued, the City may wish to explore this option further during preliminary design.

Reaeration is not likely to be required. The existing post-aeration channel could be maintained to serve as an effluent monitoring channel.



Legend:

DBOX Distribution Box
RAS Return Activated Sludge
WAS Waste Activated Sludge

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Figure 9-2: Parkson Biolac® Process Flow Diagram with Mechanical Sludge Dewatering

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Figure 9-3: Parkson Biolac® Extend Aeration with Mechanical Sludge Dewatering Conceptual Site Plan

Legend

Property Boundary

FEMA Floodway (Zone AE)

(P) Proposed Facility
(E) Existing Facility

Note:
Footprints are Approximate

1 inch = 300 feet

0 150 300

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Oxidation Ditch

An oxidation ditch is a ring-shaped channel equipped with aeration and mixing devices. Influent wastewater is mixed with return activated sludge in an anoxic chamber to accomplish biological nutrient removal (nitrogen). The design mimics the kinetics of a completely mixed reactor in the aerated sections, with plug flow along the channels. The aeration zone, located at a turn in the channel, provides oxidation of BOD and ammonia and establishes constant flow, driving the mixed liquor along the channels. As wastewater leaves the aeration zone, oxygen concentrations decrease and denitrification occurs. The process flow diagram for this option is included as **Figure 9-4** and the conceptual site plan as **Figure 9-5**.

The Ovivo Carrousel® System is an example of a closed loop oxidation ditch reactor. The configuration is custom designed based on influent characteristics, and aeration and effluent requirements. Aerators are placed in such a way as to ensure solids suspension in the entire channel. The Ovivo Excell™Aerator incorporates a surface aerator on a common shaft with a lower turbine. The system is designed to be able to draw only 10-20 % of the nameplate power and maintain sufficient mixing throughout the channel. This allows for the build-out design to save energy during low influent loadings.

There are several type of oxidation ditch designs, some proprietary. In general, oxidation ditches provide a higher quality effluent than aerated ponds and can handle fluctuating loads. They are relatively simple to operate, and typically require less aeration energy than other extended aeration processes. Typically, the main disadvantage when compared to pond systems is the high capital cost due to the great amount of concrete required and relatively expensive equipment.

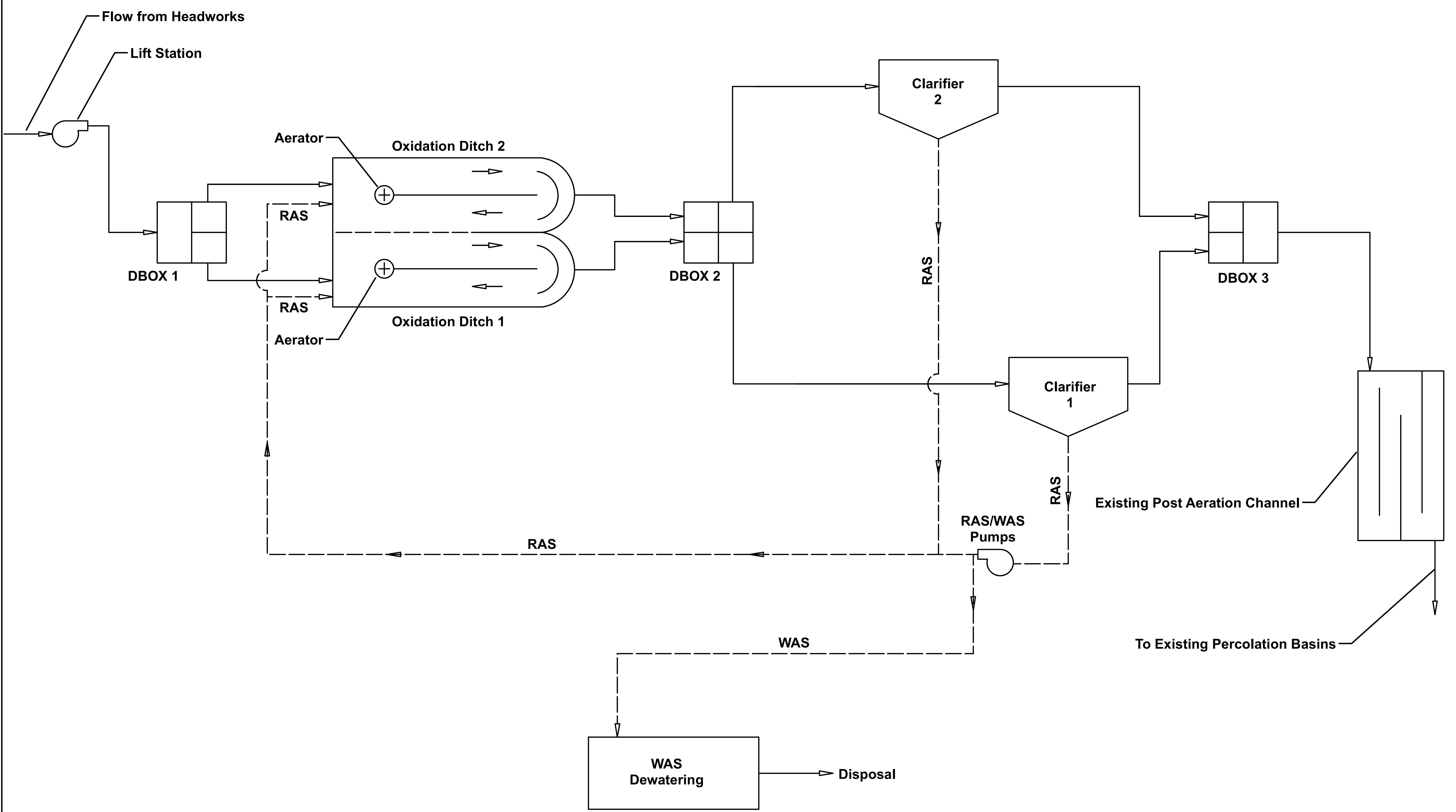
The proposed system assumes effluent goals of BOD and TSS less than 10 mg/L and total nitrogen less than 8 mg/L. The system includes two oxidation ditches with pre-anoxic chambers and common wall construction. Each ditch has one Excell™Aerator on a VFD, one 3 hp anoxic mixer, dissolved oxygen probes for control, and a hand-operated gate for internal recycle control. An estimated 100 hp will be required to provide aeration for the system during maximum month loading conditions. Two 120 hp aerators with a VFDs (one in each basin) is recommended, for 100% installed aerator redundancy. The aerator horsepower can be reduced by up to approximately 80% without significant compromise to required mixing. The proposed design is summarized in the table below.

Table 9-14: Proposed Oxidation Ditch System	
Number of oxidation ditches	2
Anoxic Basin Volume, each	0.08 MG
Carrousel® Basin Volume, each	0.57 MG
Operating Side Water Depth	12 FT
Approximate footprint, total	130 FT x 120 FT
Number of Aerators, each ditch	1
Aerator Horsepower, min	100 (120 recommended)

A preliminary opinion of construction cost is included in the table below. Earthwork estimates assume the oxidation ditches and clarifiers are installed in the footprint of the polishing pond and the remaining polishing pond is filled. The secondary clarifier design is based on two at 100 percent redundancy, so one can be taken offline for maintenance.

Table 9-15: Preliminary Opinion of Construction Cost – Oxidation Ditch Extended Aeration System				
Description	**Quantity**	**Unit**	**Installed Unit Price**	**Amount**
Influent lift station and force main	1	LS	$ 1,000,000	$ 1,000,000
Oxidation Ditch System (2 basins, common wall)	1	LS	$ 2,470,000	$ 2,470,000
Controls Building	1,200	SF	$ 250	$ 300,000
Secondary Clarifiers (90-ft Diameter)	2	EA	$ 1,160,000	$ 2,320,000
RAS/WAS Pump Station	2	EA	$ 240,000	$ 480,000
Distribution Boxes	3	EA	$ 50,000	$ 150,000
Earthwork	1	LS	$ 990,000	$ 990,000
Sitework	1	LS	$ 40,000	$ 40,000
Piping and Valves (20% of equipment)	1	LS	$ 1,054,000	$ 1,054,000
Electrical and Instrumentation (20% of equipment)	1	LS	$ 1,054,000	$ 1,054,000
Construction Cost Opinion Subtotal				**$ 9,860,000**
Engineering and Administration	30%			$ 2,958,000
Contingency	30%			$ 2,958,000
Total Construction Cost Opinion				**$15,780,000**

Notes: 1. Does not include sludge handling facilities; See Section 10.



Legend:

DBOX	Distribution Box
RAS	Return Activated Sludge
WAS	Waste Activated Sludge

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Figure 9-4: Oxidation Ditch Process Flow Diagram with Mechanical Sludge Dewatering

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Figure 9-5: Oxidation Ditch with Mechanical Sludge Dewatering Conceptual Site Plan

Legend

Property Boundary

FEMA Floodway (Zone AE)

(P) Proposed Facility
(E) Existing Facility

Note:
Footprints are Approximate

1 inch = 300 feet

0 150 300

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Summary of Extended Aeration Alternatives

Two extended aeration systems were reviewed for the WRF to meet future requirements. Due to limited space, the existing treatment system (ponds) may not be expandable to treat future flows and loadings. Preliminary evaluation criteria for both extended aeration systems included meeting higher treatment goals than the existing WDR effluent requirements (effluent BOD_5 and TSS concentrations less than 10 mg/L and a total nitrogen concentration less than 8 mg/L). Both systems will require an increased level of operation and maintenance, inherent in the higher technology, when compared to the existing process, but they are both considered reliable and relatively simple to operate. Both systems also offer more efficient aeration than the existing process technology and handle shock-loading well without impact to treatment.

Both extended aeration alternatives could be installed within a portion of the polishing pond footprint as shown in the site plans. The rest of the pond would be filled and the existing facultative lagoon and aeration pond would no longer be required and could be abandoned. Alternatively, the aeration pond could be maintained and repurposed as an equalization basin to dampen peak flows into the system. **Table 9-16** summarizes the capital and estimated aeration electrical costs (annual and 20-year total). Other electrical requirements for the two systems are anticipated to be similar and are not included in the estimated costs below (pumping for the influent lift station and sludge systems, sludge thickening systems, etc.).

Table 9-16: Summary of Future Extended Aeration System Alternative Capital and Electrical Costs

	Preliminary Capital Cost Estimate	Estimated Annual Aeration Electrical Cost	Estimated 20-year Aeration Electrical Cost
Parkson Biolac® Wave Oxidation System	$15,220,000	$95,000	$1,900,000
Oxidation Ditch System	$15,780,000	$85,000	$1,700,000

Notes: 1. Assumes $0.12 per kw-hr (WRF 2012 average electrical cost). 2. Annual aeration electrical cost estimated for projected future average flows and maximum month loadings.

Some of the basic advantages and disadvantages between the two extended aeration systems reviewed are as follows:

Table 9-17: Relative Comparison of Extended Aeration Systems

	Relative Advantages	Relative Disadvantages
Parkson Biolac® Wave Oxidation System	Lower capital cost. Large number of diffuser assemblies offer greater aeration redundancy when compared to two surface aerators. Diffuser assemblies are relatively simple and easy to work on, once removed from the basin.	Slightly higher aeration requirements result in higher estimated aeration electrical costs. Diffuser assemblies are not visible and relatively difficult to access, requiring entering the pond in a boat. Proprietary process, little proven competition.
Oxidation Ditch System	Slightly lower aeration requirements results in lower estimated aeration electrical cost. Surface aerators are visible and easily accessible from a concrete deck.	Higher capital cost Surface aerator equipment offers less aeration redundancy, when considering large number of diffusers. (However, 100% redundancy in installed HP is provided in proposed system).

9.4 Treated Effluent Disposal

The treatment facility currently reclaims wastewater for irrigation at a nearby golf course. Treated effluent is percolated onsite and later pumped with groundwater from an irrigation well downstream of the percolation site, then sent to a holding pond at the golf course for use as irrigation water. A discussion of reuse opportunities is included in **Section 11**.

Treated effluent from the facility flows by gravity through a 24-inch pipeline to one of five onsite percolation basins. Individual discharge pipes to each pond are 16 inches in diameter. The discharge lines cause hydraulic constrictions during periods of high flow, particularly during wet weather events. In response, the City began opening valves to allow treated effluent into two percolation basins at once during wet weather. The Plant Audit (AECOM, July 2011) recommended replacing these 16-inch discharge lines with (minimum) 21-inch pipelines or add a parallel discharge line (16 inch or greater). This improvement is still recommended to reduce the risk of overflow during unexpected high flows or rain events. A budget of $150,000 to $200,000 is recommended for the treated effluent pipeline improvements.

SECTION 10 BIOSOLIDS MANAGEMENT IMPROVEMENT ALTERNATIVES

10.1 Existing Biosolids Management Practices

The City currently owns and operates a dredge to collect settled sludge from the facultative lagoon and pump it to onsite, concrete-lined sludge drying beds for drying before hauling to Chicago Grade Landfill for disposal. According to City staff, the dredge was purchased in the late 1990s. In 2006, a new particulate trap was installed to meet the County Air Pollution Control District requirements, and the City performed rehabilitation on the dredge in 2009, costing approximately $25,000.

On average wastewater staff dredge the facultative lagoon three times per year during the dry season (approximately between April and October). Each time, the dredging operations takes approximately 20 days; five days for set-up, ten days for dredging, and five days tear-down and cleanup operations takes.

Estimated annual costs for the existing dredging operations is summarized below.

Table 10-1: Estimated Existing Annual Dredging Costs

Task/Material	Amount	Unit	Unit Cost	Estimated Annual Cost
Replace sludge piping (once every 3 years)	1	Lump sum	$ 15,000	$ 5,000
Set up dredge operation (3 operators, 5 days, once per year)	120	Man-Hours	$ 110	$ 13,200
Dredge facultative lagoon (2 operators, 10 days, 3 times per year)	480	Man-Hours	$ 110	$ 52,800
Tear-down and cleanup (3 operators, 5 days, once per year)	120	Man-Hours	$ 110	$ 13,200
General dredge maintenance and fuel	1	Lump sum	$ 10,000	$ 10,000
Rent three (3) yard loader for sludge handling	1	Lump sum	$ 5,000	$ 5,000
Estimated Annual Total				**$ 99,200**

Notes: Estimated unit cost for man-hour is based on estimated fully-allocated hourly rate provided by the City. Estimate does not include costs for spreading and working sludge in drying beds, required sampling and analyses prior to disposal, or hauling costs.

As described in **Section 8.5**, it appears that the existing drying bed area is insufficient at current conditions. An estimated additional drying bed area of approximately 51,000 SF is needed to meet current conditions, and 74,250 SF for future conditions assuming continued operation and expansion of the current wastewater process (**Table 8-4**). These area estimates are for active drying bed area should not be considered total footprints, which need to account for walls, ramps, and roadways around the beds.

Concrete-lined sludge drying beds are estimated to cost between $16 and $20 per square foot, based on recent bid results in the area. The recommended budget for additional drying bed area to meet existing conditions is $830,000 to $1,020,000; or $1,200,000 to $1,500,000 to meet future conditions with the current WRF process.

10.2 Biosolids Management Alternatives for Existing Treatment Process

MKN reviewed potential alternatives to improve current biosolids management with the existing treatment process. Existing operations, as described above, involve operation of a dredge to extract settled solids from the facultative lagoon (an area of over 8 acres) and pump it to adjacent sludge drying beds.

One potential improvement may be to reduce the area in which the sludge settles by installing a floating baffle or curtain to create smaller cells within the lagoon. If designed correctly, the majority of the solids should settle out in the first cell and the baffle would prevent the wind from moving the majority of the solids into the second portion of the pond. Baffles can also help minimize effects of stratification, which can occur during temperature changes and induce short-circuiting. However, if the flow paths and lagoon hydraulics are not fully understood and a baffle is designed or placed incorrectly, it could increase the potential for short-circuiting which reduces hydraulic retention time and potentially impacts effluent quality.

Another alternative is to contract with a specialty contractor for extraction and dewatering onsite. Specialty contractors can remove, screen, dewater, and even transport and dispose of the sludge if desired. For example, WBI, Inc. (Katy, TX) provides dredging and dewatering services for industrial and municipal facilities across the United States, including Camrosa Water District in Camarillo. A budget estimate was developed assuming an average of 1 foot of sludge accumulation in the lagoon, a dredge used for extraction, the sludge is screened and dewatered with three to four belt filter press, and dewatered solids are pumped to the existing drying beds. It was assumed that the City would coordinate hauling and disposal. A flat staging area of approximately 120 feet by 150 feet would be needed for the belt filter press. It is estimated the project would take approximately 3 months, the sludge would be dewatered to 20% total solids, and the budget would be approximately $285,000 to $315,000 (phone call with Tom Whitener, WBI, Inc, 9/18/2014). The cost may be reduced with operation of the City's existing dredge.

If the City plans to pursue contract dewatering, some additional investigation is recommended to tighten the budget, including estimated sludge volumes, consideration of timing for the project (8 hours per day, 24 hours per day, etc.), and testing of the sludge for a better estimate of polymer usage.

10.3 Biosolids Management Alternatives for Extended Aeration Treatment Process

The additional biological activity of either extended aeration processes discussed above (Parkson Biolac® or oxidation ditch) provides a higher level of treatment and produces a greater volume of sludge than the existing pond system. The sludge is settled in the secondary clarifiers. MKN reviewed two sludge management alternatives to reduce the water content and volume of sludge.

- Mechanical thickening with drying beds
- Mechanical dewatering process

Mechanical Thickening Systems

MKN reviewed two commonly used mechanical thickening systems: gravity belt thickener and rotary drum thickener.

<u>Gravity Belt Thickener (GBT)</u>

This technology utilizes a system of pulleys and a permeable belt that filter and compress solids to separate water from sludge. The GBT is a modification of the upper gravity drainage zone of the belt filter press, improved with the emphasis on thickening. A slow-moving fabric belt moves over rollers driven by a variable-speed drive to separate the solids from the water using gravity drainage and capillary suction forces. Polymer is added to the sludge feed for conditioning prior to distribution to the belt. The sludge is distributed evenly across the belt width and water drains through the belt as the increasingly concentrated sludge is carried towards the discharge end. A series of plow blades along the length of the belt ridge and furrow the sludge and increases drainage through the fabric. After discharge, the belt runs through a high-pressure wash cycle. An example of a GBT is shown in the picture to the right.

Gravity Belt Thickener (Huber Corporation, 2013)

GBT is a commonly-used technology but it can be difficult to contain odors and keep the area around the system clean since they are typically open systems without containment.

One 1.0 to 1.5 meter GBT is anticipated to meet future conditions. GBTs can be designed as a skid-mounted system, including sludge pumps, polymer feed system and controls, for ease of installation. A preliminary opinion of construction cost was prepared assuming a skid-mounted GBT system on a concrete slab with a shade structure. Siting away from neighbors will be important to reduce potential for odor impacts. An enclosure with odor control could be designed, but will add to the cost. Considering the area that will become available if an extended aeration process is constructed, it is anticipated that an open GBT could be sited with minimal potential for odor impacts.

Table 10-2: Preliminary Opinion of Construction Cost – Gravity Belt Thickening System

Component	Quantity	Unit	Installed Unit Price	Amount
Gravity Belt Thickening system (GBT, feed pump, polymer system & controls)	1	EA	$ 390,000	$ 390,000
Thickened sludge pump	1	EA	$ 45,500	$ 45,500
Piping & appurtenances	1	LS	$ 40,000	$ 40,000
Site work, equipment slab and shade structure	1	EA	$ 30,000	$ 30,000
Electrical and Instrumentation	1	LS	$ 67,000	$ 67,000
				$ 572,500
Engineering and Administration	30%			$ 171,750
Contingency	30%			$ 171,750
Total Construction Cost Opinion				**$ 916,000**

Rotary Drum Thickener (RDT)

Rotary drum thickeners or RDTs (also called rotary screen thickeners) consist of a flocculation tank, polymer feed system, internal screw, a drum screen, and a motorized drive. The units are fed internally and they allow free water to drain through a moving, porous media while retaining flocculated solids. An external water source is typically required to spray wash the screens and prevent clogging at regular intervals, often several minutes per hour. This technology has fewer associated odor issues (compared to the GBT) since the unit is typically contained. An example of an RDT is provided in the picture to the right.

Rotary Drum Thickener (Parkson Corporation, 2013)

A preliminary opinion of construction cost was prepared for the RDT system, assuming mounting outdoors on a concrete slab. A shade structure will not be required, as the RDTs are fully enclosed with stainless steel exterior.

Table 10-3: Preliminary Opinion of Construction Cost – Rotary Drum Thickening System				
Component	**Quantity**	**Unit**	**Installed Unit Price**	**Amount**
Rotary Drum Thickening System (RDT, feed pump, polymer system and controls)	1	EA	$ 415,000	$ 415,000
Thickened sludge pump	1	EA	$ 45,500	$ 45,500
Piping & appurtenances	1	LS	$ 40,000	$ 40,000
Site work and equipment slab	1	EA	$ 25,000	$ 25,000
Electrical and Instrumentation	1	LS	$ 72,000	$ 72,000
Subtotal Construction Cost Opinion				**$ 597,500**
Engineering and Administration	30%			$ 179,250
Contingency	30%			$ 179,250
Total Construction Cost Opinion				**$ 956,000**

Comparison of Thickening Equipment Alternatives

Both the GBT and RDT can provide effective thickening with a small footprint, low power requirements, and relatively low day-to-day operator interface. The performance of each is highly dependent on the solids characteristics and correct polymer mixing and dosing. The alternative thickening technologies are compared in the table on the next page.

Table 10-4: Comparison of Sludge Thickening Systems		
	GBT	**RDT**
Typical % Discharge Solids	4 - 8 %	4 - 8 %
Footprint	Low	Low
Energy requirement	Low	Low
Typical polymer requirement	Low	Low
Odor potential	Moderate	Low
Operator attention requirement	Low	Low
Maintenance Requirement	Low	Low
Performance & Operation History	> 30 years	20 - 25 years
Preliminary Construction Cost Opinion	$ 916,000	$ 956,000

Additional sludge drying beds will be required if thickening is performed. An estimate of the amount of drying bed area required is included in the following section.

Sludge Drying Beds

Additional sludge drying beds will be needed to further reduce the weight and volume of thickened sludge prior to hauling. The thickening systems described above are estimated to thicken the waste activated sludge from the clarifiers from 0.5% to approximately 6% total solids. MKN reviewed the existing available sludge drying bed area and estimated the additional area required with an extended aeration process at existing and future conditions. The following table summarizes the assumptions and calculations.

Table 10-5: Estimated Sludge Production and Required Drying Bed Area at Existing and Future Conditions			
	Existing Value	**Future Value**	**Notes**
AAF (MGD)	1.38	1.77	2011 Average
Average Influent BOD concentration (mg/L)	250	250	Assumed average (85% of estimated max month 290 mg/L)
Average Effluent BOD concentration (mg/L)	10	10	
Estimated Sludge Yield (lb sludge/lb BOD removed)	0.75	0.75	Typical extended aeration sludge yields 0.7 - 0.75
Estimated Dry Solids Produced (tons/yr)	373	478	Calculated
% Total Solids of WAS from clarifier	0.5	0.5	Typical for extended aeration WAS
% Total Solids of thickened WAS	6	6	Typical for WAS thickeners
Pan Evaporation rate (in/yr)	50	50	CIMIS Report for station #163
Average Annual Precipitation (in/yr)	15	15	
Annual Evaporation Rate ($kg/m^2/yr$)	762	762	Calculated
Estimated drying bed area required (SF)	116,040	148,900	Calculated
Total drying bed volume available (SF)	33,600	33,600	
Estimated drying bed area deficit (SF)	82,440	115,300	

Assuming implementation of an extended aeration process, an estimated additional drying bed area of approximately 82,440 SF (1.9 acres) is needed to meet current conditions, and 115,300 SF (2.6 acres) for future conditions. These area estimates are for active drying bed area should not be considered total footprints, which need to account for walls, ramps, and roadways around the beds. If the extended aeration process is constructed, approximately 8 acres of area will be available, just within the facultative lagoon area.

Concrete-lined sludge drying beds are estimated to cost between $16 and $20 per square foot, based on recent bid results in the area. The recommended budget for additional drying bed area to meet future conditions is $1.85M to $2.31M.

Coupled with a GBT, the recommended budget for this sludge management approach is $2.7M to $3.2M. A sludge dewatering system is expected to be less expensive. Alternative sludge dewatering systems are described in the following section.

Sludge Dewatering Systems

An alternative to thickening and new sludge drying beds is a mechanical dewatering system. MKN reviewed two dewatering technologies: Belt Filter Press and Screw Press.

<u>Belt Filter Press</u>

A belt filter press (BFP) is a continuous feed dewatering device utilizing a permeable belt and mechanically applied pressure to achieve dewatering. BFPs are typically available in metric belt sizes ranging from 0.5 to 3.5 meters in width. Conditioned sludge is introduced onto the BPF in a gravity drainage section where it is thickened by gravity. Pressure is then applied to the thickened sludge by pressing the sludge between two porous belts. Water is squeezed out of the sludge and the final dewatered sludge cake is removed from the belts by scraper blades. Filtrate is returned to the liquid treatment process.

3DP® Belt Filter Press (BDP, 2013)

When polymer is used with the BFP, a dewatered sludge containing 18 to 23 percent solids content can typically be achieved. Solids capture rates can exceed 95 percent. Odors can be an issue with the belt filter press, so odor control facilities may be required. Enclosing the belt filter presses is a common practice to reduce odors. The building would also contains the polymer storage and feed equipment and thickened sludge pumps. Alternatively, if sufficient space is available to reduce potential for odors impacts, a shelter can be used to protect the equipment, which would reduce costs.

It is assumed that one belt filter press (1.0m – 1.5m) will meet future requirements, and sufficient space will be available with the installation of an extended aeration process to allow for outdoor installation with simple equipment slab, containment curbs and a shelter. A preliminary opinion of construction cost is summarized in the table below.

Table 10-6: Preliminary Opinion of Construction Cost – Belt Filter Press Dewatering System

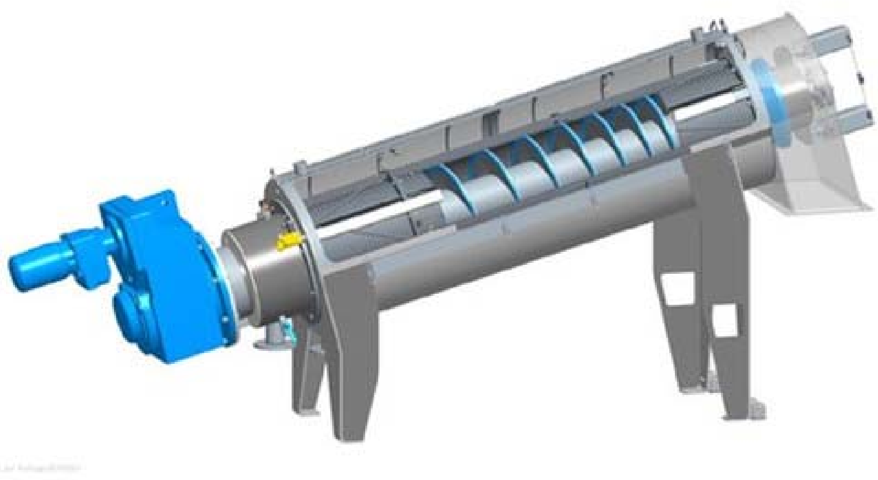
Component	Quantity	Unit	Installed Unit Price	Amount
Belt Filter Press dewatering system (BFP, feed pump, polymer system, and controls)	1	LS	$ 559,000	$ 559,000
Site work, equipment slab and shade structure	1	LS	$ 45,000	$ 45,000
Site piping (15% of equipment)	1	LS	$ 84,000	$ 84,000
Electrical and Instrumentation (15% of equipment)	1	LS	$ 84,000	$ 84,000
Subtotal Construction Cost Opinion				**$ 772,000**
Engineering and Administration	30%			$ 231,600
Contingency	30%			$ 231,600
Total Construction Cost Opinion				**$ 1,236,000**

<u>Screw Press</u>

The screw press is a continuous feed operation utilizing a gravity drainage at the inlet end of a helical feed screw that reduces the volume of the material being dewatered as it is conveyed from the inlet to the discharge end of the screw press. There are two primary configuration of screw presses: horizontal and inclined as shown in the figures below. Some screw presses also utilize the addition of lime and heat to both dewater solids, and to reduce pathogens to produce biosolids that meet Class A standards set forth in 40 CFR 503.

Horizontal Screw Press (FKC Corporation, 2013)

Inclined Screw Press (Hydroflux Industrial, 2013)



A flocculation vessel (or "floc tank") is typically located upstream of the press. Polymer is combined with solids in the floc tank to enhance dewaterability of the sludge. A portion of the water is removed from the solids by gravity drainage at the inlet to the press. The screw then squeezes free water (filtrate) out of the solids by the screw which progressively reduces the volume available for the solids to occupy. The water is released through screens or perforations that surround the body of the screw. Solids exit at the screw's discharge outlet as dewatered cake.

The screw press is compact and completely enclosed. Energy consumption and noise are low due to the low speed and low horsepower of the variable-speed, screw drive motor, and the polymer consumption for dewatering is relatively low. Operating costs are also typically low. Typical solids capture rate is 95 percent or more. A preliminary opinion of construction cost is summarized in the table below.

Table 10-7: Preliminary Opinion of Construction Cost – Screw Press Dewatering System

Component	Quantity	Unit	Installed Unit Price	Amount
Screw press dewatering system (screw press, washwater pump, air compressor, polymer system, sludge feed pump, controls)	1	LS	$ 594,000	$ 594,000
Site work, equipment slab and shade structure	1	LS	$ 40,000	$ 40,000
Site piping (15% of equipment)	1	LS	$ 89,000	$ 89,000
Electrical and Instrumentation (15% of equipment)	1	LS	$ 89,000	$ 89,000
Subtotal Construction Cost Opinion				**$ 812,000**
Engineering and Administration	30%			$ 243,600
Contingency	30%			$ 243,600
Total Construction Cost Opinion				**$ 1,300,000**

Comparison of Dewatering Equipment Alternatives

Both the BFP and screw press can provide effective dewatering. The performance of each is highly dependent on the solids characteristics and correct polymer mixing and dosing. The alternative dewatering technologies are compared in the table below.

Table 10-8: Comparison of Dewatering Systems

	Belt Filter Press	Screw Press
Typical % Discharge Solids	18 - 22	15 - 30
Solids Capture Efficiency, %	> 98	90 - 95+
Footprint	High	Moderate
Energy requirement	Moderate	Low
Polymer requirement	Low	Moderate
Odor potential	High	Low
Operator attention requirement	High	Low
Maintenance requirement	Moderate	Low
Performance & Operation History	High	Moderate
Preliminary Construction Cost Opinion	$1,236,000	$1,300,000

SECTION 11 REUSE OPPORTUNITIES

11.1 Overview of Recommendations for Recycled Water Program Development

The following sections identify the possible locations, flows, and water quality goals for a City recycled water program. At this time, the City is meeting effluent permits at the existing WRF and is producing recycled water for use at Chalk Mountain Golf Course. This has been a successful water reuse program for decades.

In the future, the City may elect to expand the existing water reuse program for the following reasons:

- Regulatory requirements become more strict, requiring a significant upgrade of the existing WRF in order to continue discharging to the existing percolation ponds; and
- Atascadero Mutual Water Company (AMWC), the City's water purveyor, cannot meet customer demand and needs an additional source of supply.

At that time, it may be cost-effective for the City to develop and expanded the existing water recycling program when compared with other options for meeting effluent requirements or water supply goals.

11.2 Existing Recycled Water Program

The existing WRF percolates treated effluent into the groundwater basin beneath the WRF. A blend of this effluent and groundwater is extracted from one irrigation well and conveyed to Chalk Mountain Golf Course for irrigation use. The City plans to install a second well and pump system in order to provide a redundant irrigation supply and also to increase this supply in the future.

11.3 Coordination with Other Agencies

The Atascadero Mutual Water Company (AMWC) is the water purveyor for the City of Atascadero and outlying areas within the Colony. Since AMWC provides water for all uses (including domestic, irrigation, commercial, and industrial) within the City, City staff would partner with AMWC to develop an expanded water recycling program to deliver water to more customers than just the Golf Course.

11.4 Potential Customers and Flows

Identifying water reclamation opportunities requires a consideration of flow, location, and water quality requirements. The most significant reuse opportunities within the City (in terms of water demand) are irrigation users. MKN performed a preliminary assessment of irrigable areas within City limits. The map and table in **Appendix C** provide the ownership and size of each parcel. A summary is provided in the table below.

Table 11-1: Summary of Open Space, Recreational, Agricultural, and Public Facility Acreage Within City Limits

Land Use	Approximate Size (Acres)	Notes
Agriculture	44	
Public Facilities	812	
Recreation	430	Includes 243 Acres of Chalk Mountain Golf Course, current irrigation user for City's reclaimed water
TOTAL	**1286**	

The City is already producing 1542 AFY that is percolated and can be extracted for irrigation, and approximately 1979 AFY would be available at future flows. Assuming approximately 2.5 feet of water demand per acre for an average year, over 3,200 AFY of water demand (including demand for Chalk Mountain Golf Course, which is partially met by the City WRF now) is represented by the acreage identified in **Table 11-1**.

The following sections discuss recycled water quality regulations and goals, focusing on irrigation uses.

11.5 Recycled Water Quality Regulations and Goals

The California Code of Regulations (CCR) Title 22, Division 4, Chapter 3, Sections 60301 through 60355 regulate recycled wastewater and requirements are administered jointly by California Department of Health Services (CDHS) and RWQCB.

Four treatment levels are defined in the regulations for various recycled water uses in California: disinfected tertiary recycled water, disinfected secondary-2.2 recycled water, disinfected secondary-23 recycled water and undisinfected secondary recycled water. These are summarized in **Table 11-2**.

Table 11-2: Title 22 Recycled Water Types and Allowable Uses (California Code of Regulations)

Recycled Water Type	Required Treatment	Median Total Coliform (MPN/100 mL)[1]	Maximum Total Coliform (MPN/100 mL)[2]	Allowable Uses
Disinfected Tertiary	Oxidized, Coagulated[3], Filtered, Disinfected	2.2	23[4]	Surface irrigation for food crops including edible portion, parks and playgrounds, schoolyards, unrestricted access golf courses, roadway landscaping, and residential & commercial landscaping
Disinfected Secondary-2.2	Oxidized, Disinfected	2.2	23	Irrigation of food crops where edible portion is above ground and not contacted by recycled water (ex. drip irrigation is used)
Disinfected Secondary-23	Oxidized, Disinfected	23	240	Irrigation of cemeteries, freeway landscaping, restricted access golf courses, pasture for milk animals
Undisinfected Secondary	Oxidized	NA	NA	Irrigation for orchards & vineyards where edible portion does not contact recycled water (ex. drip irrigation is used), non-food bearing trees, fodder crops and fiber crops, seed crops not eaten by humans, ornamental nursery stock

Notes:
1. Based on bacteriological results of the last 7 days for which analyses were completed.
2. Does not exceed in more than one sample in any 30 day period
3. Coagulation is not typically required if membrane filtration is used and/or turbidity requirements are met.
4. No sample shall exceed 240 MPN/100 mL.
5. Reference: California Code of Regulations, Title 22, Division 4, June 2001 Edition

Water quality objectives vary for different uses. Water quality for unrestricted urban use (ex. irrigation of parks are schools) is primarily driven by public safety and suitability for application. Safety assurances are written into Title 22 requirements through standards for effluent coliform concentrations and usage restrictions, such as pipeline distance from potable water pipelines, proximity to groundwater, prevention of cross-connection between potable and non-potable systems, and restrictions near eating facilities and drinking fountains. Potential customers may need to reconfigure either irrigation or potable water systems in order to comply with these requirements.

There have been multiple studies to determine constituents of concern in reclaimed water used for irrigation. Suitability of water for irrigation is directly related to the concentration and kind of chemical constituents present. Some water constituents that most commonly affect recycled water suitability for irrigation include electrical conductivity of the irrigation water (ECw), sodium adsorption ratio (SAR), bicarbonates, chlorides, and boron. General irrigation water quality guidelines are shown in **Table 11-3**. A summary of the treated effluent quality from the existing WRF is presented in **Table 11-4**. Relative salt tolerance of various agricultural crops is presented in **Table 11-5** at the end of this section.

Table 11-3: Water Quality Guidelines for Irrigation

Problem and Related Constituent	References	No Problem	Increasing Problems	Severe Problems
Salinity[1]				
EC_w of irrigation water (mmhos/cm)	1,2	<0.75	0.75 - 3.0	>3.0
TDS (mg/l) or (ppm)	2	<450	450 - 2000	>2000
Permeability				
EC_w of irrigation water (mmhos/cm)	1	>0.5	<0.5	<0.2
adj.SAR[2]	1	<6.0	6.0 - 9.0	>9.0
Specific ion toxicity from root absorption[3]				
Sodium (evaluated by adj.SAR)	1,2	<3.0	3.0 - 9.0	>9.0[4]
Chloride (meq/l)	1	<4	4.0 - 10.0	>10
Chloride (mg/l)	1,2	<142	142 - 355	>355
Boron (mg/l)	1	<0.5	0.5 - 2.0	2.0 - 10.0
Specific ion toxicity from foliar absorption[5] (sprinkler irrigation)				
Sodium (meq/l)	1	<3.0	>3.0	--
Sodium (mg/l)	1,2	<69	>69	--
Chloride (meq/l)	1	<3.0	>3.0	--
Chloride (mg/l)	1	<106	>106	--
Miscellaneous[6]				
Total Nitrogen (NH_4-N + NO_3-N) (mg/l)	1,2	<5	5 - 30	>30
(The following apply only for irrigation by overhead sprinklers)				
Bicarbonate (HCO_3) (meq/l)	1	1.5	1.5 - 8.5	>8.5
Bicarbonate (HCO_3) (mg/l)	1,2	<90	90 - 520	>520
Residual Chlorine (mg/l)	2	<1.0	1.0 - 5.0	>5.0
PH	1,2	Normal range = 6.5-8.4		

[1]Assumes water for crop plus needed water for leaching requirement will be applied. Crops vary in tolerance to salinity.

[2]adj.SAR (adjusted sodium absorption ratio) is calculated form a modified equation developed by U.S. Salinity Laboratory to include added effects of precipitation or dissolution of calcium in soils and related to CO_3 + HCO_3 concentrations. Permeability problems related to low EC or high adj.SAR of water can be reduced if necessary by adding gypsum.

[3]Most tree crops and woody ornamentals are sensitive to sodium and chloride. Most annual crops are not sensitive.

[4]Shrinking-swelling type soils (montmorillonite type clay minerals); higher values apply for others.

[5]Leaf areas wet by sprinklers may show a leaf burn due to sodium or chloride absorption under low-humidity / high-evaporation conditions. (Evaporation increases ion concentration in water films on leaves between rotations of sprinkler heads.)

[6]Excess N may affect production of quality of certain crops (i.e., sugar beets, citrus, avocados, apricots, and grapes).

Table 11-3: Water Quality Guidelines for Irrigation
HCO_3 with overhead sprinkler irrigation may cause a white carbonate deposit to form on fruit and leaves. Reference 1: Ayers, Robert S., Quality of Water for Irrigation, Journal of the Irrigation and Drainage Division, ASCE, June 1977. (Table 1, page 136) Reference 2: Irrigation with Reclaimed Municipal Wastewater – A Guidance Manual, California State Water Resources Control Board, Report Number 84-1 WR, July 1984. (Table 3-4, page 3-11) Note: Interpretations are based on possible effects of constituents on crops, soils or both. Guidelines are flexible and should be modified when warranted by local experience or special conditions of crop, soil, and method of irrigation.

Table 11-4: Existing City of Atascadero WRF Effluent Quality

Constituent	Units	2011/2012 Effluent Quality	Comparison to Quality Guidelines presented in Table 11-3[1]
Bicarbonate	mg/L	NA	
Boron	mg/L	0.3	Low end of increasing problems for salinity
Chloride	mg/L	231	Increasing problems for root and foliar absorption
Total Nitrogen	mg/L	21	Increasing problems for quality production problems for certain crops, including citrus, avocados, apricots, and grapes.
pH	--	NA	Within normal range
TDS	mg/L	930	Increasing problems for salinity
EC	mmhos/cm	NA	
Sodium	mg/L	170	Increasing problems for foliar absorption

[1]Crops vary in tolerance to the constituents above in Table 11-3. Table 11-3 summarizes general irrigation water guidelines as published by the quoted references. Care should be taken in interpretation and application of this data.

Electric Conductivity/TDS

Salinity can be indirectly measured by electrical conductivity. The units of conductance are typically decisiemens per meter (dS/m), which is equivalent to millimhos per centimeter (mmhos/cm). Multiple devices and protocols exist for the monitoring/measuring of electrical conductivity, including in-office and in-field measurements.

ECw is the electrical conductivity of the irrigation water. It is a measure of the total salt content of the irrigation water and is used to quantify its salinity. Though an EC measurement of the effluent is not available, the existing WRF effluent TDS concentration is within the "Increasing Problems" range as shown in **Table 11-4**. Salts reduction measures or intensive irrigation management may be required in order to control soil salinity levels. Adequate rainfall can assist the salt leaching process and help to mitigate the accumulation of soluble salts in the soil profile.

Sodium Adsorption Ratio

The sodium adsorption ratio (SAR) is the most reliable index of sodium hazard to crops and soils. A moderately high SAR will not generally result in a toxic effect to most plants. However, some crops are sensitive to excess sodium. Foliar toxicity may exist due to elevated sodium concentrations but it is site- and crop-specific.

A reduction in soil permeability is a major problem that occurs with high-sodium irrigation water. Applying water with an SAR below 6 does not usually result in permeability problems. If the SAR is between 6 and 9, permeability problems can occur on fine-textured soils. An SAR above 9 will likely result in permeability problems on all mineral soils except coarse, sandy soils.

Bicarbonates and Adjusted Sodium Adsorption Ratio (SAR_{adj})

Bicarbonates in irrigation water applied to the soil will precipitate calcium from the cation exchange complex as relatively insoluble calcium carbonate. As exchangeable calcium is lost from the soil, the relative proportion of sodium is increased with a corresponding increase in the sodium hazard (SAR). Bicarbonates in the irrigation water contribute to the overall salinity, but, more importantly, they may result in a previously calcium-dominant soil becoming sodium dominant by precipitating the exchangeable calcium, which, in turn, will reduce soil permeability.

A measure of the bicarbonate hazard in irrigation water can be expressed as the adjusted SAR (**Table 11-3**). The adjusted SAR takes into account the concentration of bicarbonates in irrigation water in relation to their effect on potential increases in soil SAR. When the adjusted SAR is less than 6, soil permeability problems generally do not occur. If the adjusted SAR is between 6 and 9, permeability problems can occur on fine-textured soil. An adjusted SAR above 9 will likely result in permeability problems in mineral soils except course, sandy soils, where adverse impacts to soil permeability are not a major concern. Periodic soil treatment (i.e. deep ripping or disking) or water treatment may be required to maintain favorable water infiltration characteristics in project soils.

Bicarbonates in irrigation water may also cause potential problems in micro-irrigation systems as a result of lime precipitation, which can cause emitter plugging. These potential problems are accentuated in alkaline irrigation water.

Chlorides

Chlorides are necessary for plant growth in relatively small amounts. However, high concentrations of chlorides can inhibit growth and result in toxicity to foliage if applied by sprinkler irrigation. Chlorides in irrigation water are toxic to some plant species. The chloride concentration of the existing treatment plant effluent (see **Table 11-4**) is within the range of increasing problems for root and foliar absorption when compared to the guidelines in **Table 11-3**. If a sprinkler wets the leaf areas, foliage toxicity (leaf burn) problems may also be apparent as a result of the effluent having a slightly higher-than-desired chloride concentration level (**Table 11-3**).

Boron

Boron in irrigation water does not have an effect on soil physical conditions, but in high concentrations it can have a toxic effect on some plants. The boron concentration of the existing treatment plant effluent (see **Table 11-4**) is at the low end of increasing problems for salinity when compared to the guidelines in **Table 11-3**.

Table 11-5: Relative Salt Tolerance of Agricultural Crops				
Crop Type	**TOLERANT**	**MODERATELY TOLERANT**	**MODERATELY SENSITIVE**	**SENSITIVE**
Fibre, Seed and Sugar Crops	Barley, Cotton, Jojoba, Sugarbeet	Cowpea, Oats, Rye, Safflower, Sorghum, Soybean, Triticale, Wheat, Durum Wheat	Broad, Castorbean, Maize, Flax, Millet (foxtail), Groundnut/Peanut, Rice (paddy), Sugarcane, Sunflower	Bean, Guayule, Sesame
Grasses and Forage Crops	Alkali grass (Nuttall), Alkali sacaton, Bermuda grass, Kallar grass, Saltgrass (Desert), Wheatgrass (fairway crested) Wheatgrass (tall), Wildrye (altai), Wildrye (Russian)	Barley (forage), Brome (mountain), Canary grass (reed), Clover (hubam), Clover (Sweet), Fescue (meadow), Fescue (tall), Harding grass, Panic grass (blue), Rape, Rescue grass, Rhodes grass, Ryegrass (italian), Ryegrass (perennial), Sudan grass, Trefoil (narrowleaf), birdsfooot, Trefoil, broadleaf, Wheat (forage), Wheatgrass (various), Wildrye (beardless & Canadian)	Alfalfa, Bentgrass, Bluestem (Angleton), Brome (smooth), Buffelgrass, Burnet, Clover (various), Corn (forage), Cowpea (forage), Dallis grass, Foxtail (meadow), Grama (blue), Lovegrass, Milkvetch (Cicer), Oatgrass (tall), Oats (forage), Orchard grass, Rye (forage), Sesbania, Siratro, Sphaerophysa, Timothy, Trefoil (big), Vetch (common)	
Vegetable Crops	Asparagus	Artichoke, Beet (red), Zucchini squash	Broccoli, Brussels sprouts, Cabbage, Cauliflower, Celery, Corn (Sweet), Cucumber, Eggplant, Kale, Kohlrabi, Lettuce, Muskmelon, Pepper, Potato, Pumpkin, Radish, Spinach, Squash (scallop), Sweet potato, Tomato, Turnip, Watermelon	Bean, Carrot, Okra, Onion, Parsnip

Table 11-5: Relative Salt Tolerance of Agricultural Crops				
Crop Type	**TOLERANT**	**MODERATELY TOLERANT**	**MODERATELY SENSITIVE**	**SENSITIVE**
Fruit and Nut Crops	Date palm	Fig, Jujube, Olive, Papaya, Pineapple, Pomegranate	Grape	Almond, Apple, Apricot, Avocado, Blackberry, Boysenberry, Cherimoya, Cherry (sweet), Cherry (sand), Currant, Gooseberry, Grapefruit, Lemon, Lime, Loquat, Mango, Orange, Passion fruit, Peach, Pear, Persimmon, Plum (prune), Pummelo, Rose apple, Sapote (white), Strawberry, Tangerine

1 Reproduction of table presented in Water Quality for Agriculture FAO Irrigation and Drainage Paper 29 Rev 1 (Ayers and Westcot, Reprinted 1989 and 1994). Data taken from: Maas E.V. 1984 Salt tolerance of plants. In: The Handbook of Plant Science in Agriculture. B.R. Christie (ed). CRC Press, Boca Raton, Florida.
2 These data serve only as a guide to the relative tolerance among crops. Absolute tolerances vary with climate, soil conditions and cultural practices.

SECTION 12 SOLAR ENERGY PRODUCTION ALTERNATIVES

Public utilities have several options for providing solar power as an alternative to electrical service (or as a supplement to electrical service) at their facilities. The typical approaches are to purchase and install the solar panels (either through conventional design-build, design-bid-build, or design-build-operate-finance) or to develop a power purchase agreement with a provider who owns, operates, and sells power back to the utility.

The City has considered proposals from two different design-build entities:

1. REC Solar May 2013 proposal sized a 675 kW (DC, equivalent to 586 kW-AC) system at $2,025,000 and estimated an 8.5 year payback. System size was based on previous twelve month's electrical usage, assuming the solar facility would reduce electrical power requirements by 78% over the previous year (reduction from 1.4M kWh to approximately 300,000 kWh). Solar systems are often sized to satisfy an electrical load of 70 to 80% of the total annual power demand to allow constant power production, since power usage fluctuates throughout the year at treatment plants. No footprint was provided.

2. Chevron Energy Solutions has preliminarily sized a 425 kW system and estimated approximately 1.55 acres would be required. The budget is approximately $2,100,000, based on preliminary discussions with Chevron Energy Solutions Company (phone call with Ashu Jain, August 1, 2014, and emails dated 8/4/14 and 8/8/14). Sizing was based on 2013 energy usage and estimated energy savings from adding VFDs to aerators. Estimated energy savings was $150,000 per year. Chevron Energy Solutions estimated a 14-year payback.

Based on the proposals provided above, it is recommended that the City assume that a solar facility will cost approximately $2.1M with a footprint of 1.6 ac. At this time, there is not sufficient room available at the WRF for this system unless the archeological area could be utilized. Special footings could be designed to reduce subsurface loading and potential for impact to cultural resources. Upgrading the current treatment system to extended aeration would allow some area currently taken up by ponds to be used for other functions, such as a solar panel system.

Installing more efficient aeration could result in a decrease in power required at the WRF. Therefore, the area requirement and capital cost could be reduced.

If the City does not intend to pursue this as a capital project, another option for reducing the initial investment is to work with a service provider who owns, operates, and sells power back to the City. The lack of available area at the WRF would still need to be addressed under this option.

SECTION 13 REPAIR AND REPLACEMENT RESERVES

There are a number of approaches to develop a repair and replacement program for a facility. A typical methodology is to inventory the existing equipment, develop unit costs for replacement and estimate the annual accumulation amount required to fund the future replacement projects. A rate impact study or other funding method to accumulate the funds for future replacements can then be determined.

MKN reviewed the major pieces of equipment and appurtenances at the existing facility that would require regular replacement over a 20 year timeframe. An installed replacement cost and typical design life was estimated. We recommend adding a 25% reserve to cover potential expenses in the case that a piece of equipment needs to be replaced sooner than anticipated. **Table 13-1** presents the facility replacement assessment. The recommended annual replacement reserve fund for the existing facility's major equipment is $130,000.

Table 13-1: Existing Facility Major Equipment Inventory and Repair and Annual Replacement Fund Recommendation

Equipment/ Materials	Estimated Installed Cost	Typical Design Life (Yrs)	Recommended Repair Fund (125% Annualized Cost)
Aerator 1 (25 HP)	$ 20,000	5	$ 5,000
Aerator 2 (25 HP)	$ 20,000	5	$ 5,000
Aerator 3 (25 HP)	$ 20,000	5	$ 5,000
Aerator 4 (25 HP)	$ 20,000	5	$ 5,000
Aerator 5 (25 HP)	$ 20,000	5	$ 5,000
Aerator 6 (15 HP)	$ 15,000	5	$ 3,750
Aerator 7 (15 HP)	$ 15,000	5	$ 3,750
Aeration Pond asphalt liner	$ 200,000	15	$ 16,667
Headworks Channel Coating	$ 40,000	15	$ 3,333
Mechanical Screen 1	$ 70,000	20	$ 4,375
Mechanical Screen 2	$ 70,000	20	$ 4,375
Screenings Dewatering/ Compaction Unit	$ 70,000	20	$ 4,375
Effluent Pump	$ 40,000	10	$ 5,000
Plant Water Pumping System	$ 20,000	10	$ 2,500
Chlorine Contact Chamber Coating	$ 60,000	15	$ 5,000
Dredging System	$ 60,000	10	$ 7,500
Dredging Pipe	$ 15,000	3	$ 6,250
Influent Sampler	$ 8,000	10	$ 1,000
Effluent Sampler	$ 8,000	10	$ 1,000
Influent Flow Meter 1	$ 10,000	10	$ 1,250
Influent Flow Meter 2	$ 10,000	10	$ 1,250
Effluent Flow Meter	$ 10,000	10	$ 1,250
Valves and Gates	$ 200,000	15	$ 16,667
Plant Electrical Panels	$ 200,000	20	$ 12,500
Recommended Major Equipment Replacement Fund/Yr (Rounded to $10,000)			**$ 130,000**

SECTION 14 REVIEW OF GRANT AND LOAN PROGRAMS

MKN has evaluated several grant and loan programs to determine if funding would be available for future WRF upgrades at the City of Atascadero. The City is not considered an economically disadvantaged community, has low unemployment, is too large to be considered a "rural" entity, and is not in Metropolitan Water District's service area. Therefore, they are not eligible for many grant programs.

The following federal & state grant and loan programs appear to be the most viable for the City, particularly if recycling-related upgrades at the WRF are pursued (Kestrel Consulting, September 14, 2014). In general, expanding the water recycling program would have more grant and loan opportunities than the other capital improvements identified for the WRF.

14.1 Federal Grant Programs

US Bureau of Reclamation Title 16 Grant Program

If the City pursues an expansion of their recycled water program, the Title 16 Grant Program should be considered. There are three prerequisites for the Title 16 construction grant program: 1) the Project must be authorized by Congress for up to a specific dollar amount, 2) a feasibility study that meets specific requirements must be completed and approved by the Bureau, and 3) Congress must appropriate funds for the construction Project. This is a minimum three-year process.

Currently, many agencies are already in line for construction funding, and Congress has not authorized any new funding for construction projects since the Recovery Act of 2009. If the City were to be successful in steps 1, 2 and 3, in the future, then this grant program could potentially fund up to 25% of a recycled water project's cost, up to $20 million. The Title 16 federal grants require a minimum 75% match.

The Bureau must approve the feasibility study before a construction grant can be received. Having an approved feasibility study can also facilitate the appropriation by Congress.

Most years, the Bureau of Reclamation offers the WaterSMART: Title 16 Feasibility Study competitive grant program, which may contribute up to 50% of the cost of a feasibility study. These grants are capped at $150,000 and require a 50% local match. This grant is highly competitive. In the last round (2013) there were thirty applications and only 8 were funded (26%) in the 17 state western region.

Other WaterSMART Grants

The Bureau of Reclamation offers other types of WaterSMART grants most years. The majority of these grants are less than $300,000 and they support whatever objective the Bureau is focusing on that year in the 17 western states. For example, in 2013 the focus was energy efficiency and sustainability in wastewater treatment. The Bureau awards a handful of larger WaterSMART grants each year – up to $1,500,000 – however, Atascadero is not likely to be competitive for these based on the size of the population, demographics and location.

As project plans solidify, the City could potentially apply for a WaterSMART grant of up to $300,000 for features of a project that align with the Bureau's objectives and schedule for that particular year.

There are no other significant federal grants for construction available to Atascadero.

14.2 State Grant Programs

Most of California's major grant programs for water infrastructure (including recycled water) originate from the sale of statewide water bonds, which have been approved by voters. Examples of these include the parks and water bonds, Propositions 40, 50, & 84. Funding from Propositions 40 and 50 has been completely exhausted, and Proposition 84 is 96% spent. A new statewide water bond, Proposition 1, will be on the ballot this November. The measure, upon voter approval, would enact the *Water Quality, Supply, and Infrastructure*

Improvement Act of 2014. The $7.15 billion bond will include funding for several grant programs that could provide some funds toward Project construction:

- $810 million for expenditures on, and competitive grants and loans to integrated regional water management plan projects, and
- $725 million for water recycling and advanced water treatment technology projects.
- $2.7 billion for water storage projects - including underground storage, dams, reservoirs.

If the bond passes, then this funding would flow into two existing grant programs: the Department of Water Resources' (DWR) Integrated Regional Water Management Grant Program and the State Water Board's Water Recycling Facilities Grant Program. A new grant program would be established for the water storage funds. Grant guidelines would be revised or developed through a public process prescribed in the legislation. This would occur in early 2015, however, we might assume that the guidelines for the first two programs are likely to at least resemble their most recent iterations. In that case, it is realistic to expect that either one of these programs could potentially contribute $1-3 million toward construction of a water reclamation facility or storage component. If voters approve the bond in November, the earliest that competitive grant programs might open would be late 2015, with awards made in the first half of 2016. That is the earliest these new funds would be available.

The new water bond notwithstanding, the *only* state grant program that currently supports construction of water recycling facilities (if expanded water recycling is desired), and that *may* have construction funding available for the City of Atascadero is the (Prop 84) Integrated Regional Water Management Grant Program. The Central Coast Region may still have up to $6 million available in 2015 in this program, however, DWR is currently evaluating whether to award these funds to current applicants that requested drought emergency funding. It is also unclear that the Project will be at a sufficient state of readiness to be truly competitive.

Other state grants might support innovative stormwater features or public access or recreation features that might be included in a facility master plan. But these grants would likely be in the hundreds of thousands of dollars, and really depend on the design, timing and benefits of what is proposed.

California's electric utilities are required to increase the amount of renewable energy in their portfolios, including biogas from wastewater treatment. The City has been working with Chevron to identify energy recovery or energy efficiency improvements as part of this statewide initiative. Waste-to-energy components of the Project may be eligible for Pacific Gas and Electric's Self-Generation Incentive Program, which provides a rebate per watt produced. The amount varies on the amount of energy produced and the location of the facility. The rebate program is authorized and funded through the end of 2015.

14.3 Loans

The Clean Water State Revolving Fund (CWSRF) loan program originates from federal funds that come to the State Water Board from the USEPA. The state administers the loan program and also contributes funds. Wastewater treatment projects are financed through CWSRF at the regular rate, which is determined at the time of the loan. The rate is typically ½ of the General Obligation bond rate. Throughout 2013 and 2014, the interest rate has been approximately 2%. The program will loan up to $50 million per project. Communities that meet the "economically disadvantaged" criteria may be eligible for a portion of the loan principal to be "forgiven". The City of Atascadero does not meet these criteria.

Because of California's drought, recycled water projects are currently eligible for a reduced interest rate on CWSRF loans. The interest rate is approximately 1% annually, and is available for applications submitted through December 2015. It is possible to use the CWSRF loans for both planning and construction. The application process is extensive, and completed environmental documents are required for construction loans, but applications are accepted year- round. CWSRF may also be used for loan guarantees.

The California Infrastructure and Economic Development Bank (IBank) has broad authority to issue tax-exempt and taxable revenue bonds, provide financing to public agencies, provide credit enhancements, acquire or lease facilities, and leverage State and Federal funds. The IBank's current relevant programs include the Infrastructure State Revolving Fund (ISRF) Program, Exempt Facility Revenue Bond Program, and Governmental Bond Program. Infrastructure loans are available in amounts ranging from $50,000 to $25,000,000, with loan terms of up to 30 years. Interest rates are set on a monthly basis and currently range from 2-5%. Financing applications are continuously accepted.

14.4 Recommendations:

- If the City intends to expand the recycled water program, initiate the process for Title 16 funding by meeting with your local Representative. Meet with Bureau of Reclamation officials to discuss the project relative to their objectives. Complete a Title 16 Feasibility Study. Even if the Title 16 funds are not initially available, this program may be useful for future phases of the Project.

- Many City Councils have passed resolutions of support for Proposition 1, the Water Quality, Supply, and Infrastructure Improvement Act of 2014, to underscore the importance of this funding to local projects.

- Engage in the San Luis Obispo regional water management group that serves as the vehicle for Integrated Regional Water Management grants.

- Be aware of greenhouse gas emissions and energy impacts associated with different alternatives, as this is something that is evaluated and scored in almost all state funding.

- If the City would rather use a CWSRF loan than issue municipal bonds, initiate the loan application at least 9 months before funding is needed.

SECTION 15 CAPITAL IMPROVEMENTS PLAN

A capital improvements plan was developed summarizing the recommendations to meet existing and future deficiencies at the WRF. As described in this report, the existing WRF is at its design capacity for dry weather flow conditions and approaching the loading (TSS and BOD) capacity. The capital improvements projects (CIPs) were split into two categories based on whether they are recommended to meet existing or future needs. A priority was assigned to each project as summarized in **Table 15-1**.

Table 15-1: Capital Improvements Projects Priority Scale

Priority	Description
1	Required to meet existing deficiency and recommended for implementation within the next 0 – 5 years
2	Required to meet future deficiency and recommended for implementation within the next 5 – 10 years
3	Recommended to improve efficiency and or operations

The CIPs recommended to meet existing and future deficiencies are summarized in **Table 15-2** and **Table 15-3**, respectively. The cost opinions are based on the following assumptions:

- Cost opinions are in September 2014 dollars. When budgeting for future years, appropriate escalation factors should be applied.
- Engineering, project administration, and construction management costs are assumed at 30 percent of total construction cost opinion.
- Construction contingency of 30 percent has been included.

The opinion of probable construction cost is provided for budgeting purposes and represents a planning-level effort, based on current bid climate and installed costs for similar projects. Additional project details identified during planning, preliminary engineering, and design may increase or decrease the opinion of probable construction cost.

The future CIPs are in part driven by anticipated new development. Based on estimated existing and future flow rates, new development will be contributing approximately 21% of the future estimated wastewater flows.

Table 15-2: Capital Improvements for Existing Deficiencies							
Project ID	Project Name	Existing Facility	Deficiency	Capital Improvement Project (CIP)	Notes	Priority	Opinion of Cost (2014 $)
EWRFCIP-1	WRF Re-Rating Study	Not applicable	WRF is at design hydraulic capacity for dry weather flow and approaching loading capacity.	Perform re-rating study with detailed sampling, analysis, and modeling to estimate interim WRF capacity with existing system and confirm timeframe for improvements.		1	$ 50,000
EWRFCIP-2	Percolation Basin Capacity Evaluation	Not applicable	The percolation basins were last evaluated in 1989 when the system was operated differently and basins were shallower.	Perform field percolation test and estimate existing percolation basin capacity.		1	$ 30,000
EWRFCIP-3	Percolation Pond Discharge Piping Improvements	16" inlet pipelines to each of five (5) basins	As described in the Plant Audit (2011), hydraulic capacity of the percolation pond inlets is not adequate.	Install new parallel 16" inlets, valves, and concrete aprons.		1	$ 180,000
EWRFCIP-4	Aeration Improvements	Five (5) 25-hp and two (2) 15-hp surface aerators	Electrical efficiency would be improved by replacing the existing conventional aerators with brush aeration and dissolved oxygen control	Replace existing aerators with four (4) 25-hp brush aerators in the aeration lagoon, two (2) 7.5-hp brush aerators in the facultative lagoon, and a dissolved oxygen control system in the aeration lagoon.		3	$ 550,400
EWRFCIP-5	Sludge Drying Bed Improvements	33,600 sf of lined drying beds are available	Approximately 51,000 sf of lined drying beds are needed to meet existing needs.	Construct approximately 51,000 SF of concrete-lined drying beds including piping, valves, and appurtenances.		1	$ 1,020,000
EWRFCIP-6	Public Works Building Service Lateral Realignment	Onsite domestic sewage is directed to the existing RV station.	Existing RV receiving waste station will be relocated. Therefore the existing onsite sewage must be redirected to	Construct new lift station and force main from the existing RV receiving station to the Headworks.		1	$ 100,000
EWRFCIP-7	WRF Administrative Building and Laboratory	City has a control building and conference room with restrooms but no administrative building for staff offices or files. Existing laboratory has limited capabilities (ex. no hood)	City has no administrative building for the wastewater treatment facility although this was planned in the late 1990s	Construct new administrative building with laboratory		3	$ 450,000
EWRFCIP-8	Permanent Standby Generator	No permanent generator.	City has no permanent generator to maintain pumping, screening, and aeration at the WWTP during a power outage.	Install automatic transfer switch and permanent standby generator with weather enclosure and concrete pad.	Sizing requires design-level considerations. Cost opinion is based on generator costs for similar-sized facilities.	1	$ 150,000
						Total	**$ 2,530,400**

Table 15-3: Capital Improvements for Future Deficiencies							
Project ID	**Project Name**	**Existing Facility**	**Deficiency**	**Capital Improvement Project (CIP)**	**Notes**	**Priority**	**Opinion of Cost (2014 $)**
FWRFCIP-1	WRF Process Improvements	Facultative pond system	Existing pond system does not have the hydraulic or process capacity to meet future demands	Install new extended aeration system (ex. oxidation ditch or wave oxidation), including new clarifiers, RAS/WAS pumping system, piping, valves, electrical, instrumentation & controls, and appurtenances.	Begin planning process improvements now. Existing plant is at its design capacity for dry weather conditions based on flow and is approaching the TSS and BOD capacity.	2	$ 15,780,000
FWRFCIP-2	Solids Dewatering Improvements	Dredging system and sludge drying beds	Existing sludge drying beds do not meet existing demands.	Install new sludge dewatering system (ex. screw press or belt filter press) in conjunction with the extended aeration improvements (FWRFCIP-1).	Begin planning improvements now. Existing drying beds do not meet sludge demand.	2	$ 1,300,000
						Total	**$ 17,080,000**

SECTION 16 CONCLUSIONS AND RECOMMENDATIONS

16.1 Conclusions

This Master Plan Update provides an evaluation of the existing treatment, sludge handling and disposal facilities under existing and future conditions. The main conclusions are summarized below.

- The capacity of the existing WRF to treat existing and future flows and loadings was reviewed in **Section 8**. The analyses indicated that the existing treatment process is adequate for existing flows and loads, but these flows and loads are at or near the original plant design capacity threshold. Additional capacity cannot be assumed at this time.
- The current WRF treatment process configuration was intended to be an interim process to treat flows up to an ADWF of 1.4 MGD. The need for more efficient sludge management and wastewater treatment processing had been identified for the last 25 years (Brown & Caldwell, May 1997) (Kennedy/Jenks Consultants, June 1991) (Kennedy/Jenks/Chilton and John L. Wallace & Associates, July 1989).
- Due to the wet weather flows at the plant and contribution of rainfall to pond flows, hydraulic capacity is limited. This was identified in the 2011 Wastewater Treatment Plant Audit (AECOM, July 2011).
- The existing sludge management process is expensive and time consuming (**Section 10**) and the existing sludge drying bed capacity is inadequate for current sludge generation.
- The existing WRF site is constrained by residential properties to the north, the Union Pacific Railroad to the east, Atascadero State Hospital to the south, and the Salinas River floodway and floodplain to the west. Therefore, expanding the existing process (pond system) does not appear to be feasible.
- Conversion to an extended aeration system would provide additional capacity, fit within the existing plant site and provide space for additional land uses (such as solar generation), reduce odor generation potential, improve solids handling efficiency, and improve treated effluent quality. A greater amount of sludge will be produced with an extended aeration process, requiring more robust sludge management.
- The City currently recycles wastewater. Considering the cost to expand the recycled water program and since the City is not a water purveyor, there is not a supply-based need to expand the program at this time. However, should an expanded recycled water program become desirable in the future, there is sufficient irrigated area available within City limits (**Section 11**) to use the entire future plant production.
- Solar power to provide electricity for the WRF could be an option, but the only available space appears the archeological site which would require special structural supports to spread the loads and minimize potential impacts (**Section 12**).

16.2 Recommendations

The main recommendations are summarized below:

- Perform a rate study to plan and budget for the Capital Improvements Program and the existing and future operations and maintenance costs. The recommended Capital Improvements Program is summarized in **Table 16-1**.
- Develop and maintain an annual replacement reserve fund of $130,000 for the existing facility's major equipment (**Section 13**). Continue to reevaluate and update this reserve fund amount on an annual or biannual basis.
- Continue to improve influent monitoring and within the next year, perform a re-rating study (EWRFCIP-1) to estimate flow and loading capacity at the existing plant and confirm the timeframe for the WRF process improvements (FWRFCIP-1 and -2).
- Within the next five years, perform a percolation basin capacity evaluation (EWRFCIP-2) and EWRFCIP-3, -6, and -8.
- Within the next five years begin planning, permitting, and engineering for a plant upgrade to an extended aeration system (FWRFCIP-1) with sludge dewatering (FWRFCIP-2) and the new administration building/laboratory (EWRFCIP-7).

Table 16-1: Recommended Capital Improvements Program			
Project	**Project Name**	**Priority**	**Opinion of Cost (2014 $)**
EWRFCIP-1	WRF Re-Rating study	1	$ 50,000
EWRFCIP-2	Percolation Basin Capacity Evaluation	1	$ 30,000
EWRFCIP-3	Percolation Pond Discharge Piping Improvements	1	$ 180,000
EWRFCIP-6	Public Works Building Service Lateral Realignment	1	$ 100,000
EWRFCIP-7	WRF Administrative Building and Laboratory	3	$ 450,000
EWRFCIP-8	Permanent Standby Generator	1	$ 150,000
FWRFCIP-1	WRF Process Improvements	2	$ 15,780,000
FWRFCIP-2	Solids Dewatering Improvements	2	$ 1,300,000
		Total	**$ 17,960,000**

WORKS CITED

AECOM. (July 2011). *City of Atascadero Wastewater Treatment Plant Audit.*

Brown & Caldwell. (May 1997). *City of Atascadero Department of Public Works Preliminary Design Report Wastewater Treatment Facility Upgrade .*

Kennedy/Jenks Consultants. (June 1991). *Amendment to the Long Range Plan Wastewater Treatment Facilities City of Atascadero.*

Kennedy/Jenks/Chilton and John L. Wallace & Associates. (July 1989). *Long Range Plan Wastewater Treatment Facilities City of Atascadero.*

Kestrel Consulting. (September 14, 2014). *Letter to Rob Livick, Initial Findings on Grants and Strategy.*

APPENDIX A

Waste Discharge Requirements Order No. 01-014

kept

STATE OF CALIFORNIA
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION
81 Higuera Street, Suite 200
San Luis Obispo, California 93401-5427

TTWQ 2
Complex 6

WASTE DISCHARGE REQUIREMENTS ORDER NO. 01-014

Waste Discharger Identification No. 3 400100001

For

CITY OF ATASCADERO WASTEWATER TREATMENT FACILITY
CITY OF ATASCADERO, SAN LUIS OBISPO COUNTY

The California Regional Water Quality Control Board, Central Coast Region, (hereafter Board) finds that:

SITE OWNER AND LOCATION

1. The City of Atascadero, (hereafter "Discharger") owns and operates a Wastewater Treatment Facility located at 8005 Gabarda Avenue in the City of Atascadero, San Luis Obispo County (see Attachment 1).

PURPOSE OF ORDER

2. The Discharger filed a Report of Waste Discharge (ROWD) on December 21, 1999, in accordance with Section 13260 of the California Water Code. The report was filed for the continued authorization to discharge to groundwater, via percolation ponds. The ROWD, including all referenced materials and addendum's is hereby incorporated by reference as part of this Order.

3. The primary objectives of this updated Order are to: 1) permit the discharge of treated wastewater to groundwater, 2) update the Discharge Monitoring Program, and 3) bring the site into compliance with the Basin Plan and all applicable laws and regulations pertaining to this discharge.

SITE/FACILITY DESCRIPTION

4. **Discharge Type:** The plant discharges up to 2.39 million gallons per day (MGD) of treated municipal wastewater to evaporation percolation ponds located adjacent to the Salinas River. The percolation ponds total capacity is 11.6 MGD. The City is only responsible for the discharge to ponds 1-5. The Atascadero State Hospital is responsible for discharge to pond six. The location of the disposal ponds is shown on Attachment 1.

5. **Design and Current Capacity:** The Facility utilizes a mechanically aerated oxidation basin followed by a facultative pond as the primary wastewater treatment process. The treated wastewater then passes through a final polishing pond before being discharged to percolation ponds. The facility's average daily flow is 1.4 MGD. The facility's design flow is 2.39 MGD.

6. **Geology:** The site is typically level with elevations ranging from 856 feet to slightly over 859 feet. Surface soils are generally sandy silt that supports native vegetation.

   The site is underlain by alluvium and terraces of sand and gravels deposited in an ancient channel of the Salinas River. The depth and regularity of sand grading indicates that the profile was developed in an active stream channel. A clay irregularity follows the western site boundary. This is an indication of the western most migration of the Salinas River.
   The Paso Robles formation lies under this younger alluvium and is the major water bearing formation in Northern San Luis Obispo County. It consists of non-marine sand, gravel,

clay, and silty clay beds of Pliocene/Pleistocene age. A marine sedimentary formation lies under the Paso Robles formation consisting of marine sedimentary rocks of Tertiary age. These sediments typically consist of sandstone, conglomerate, mudstone, shale and chert. Water quality of the underlying unit is poor and is low yielding.

The basement complex consists of pre-Franciscan and Franciscan age rocks exposed in the mountains west of the site. The basement rocks consist of generally impermeable schist, marble, gneiss, chert, shale, and sandstone. The basement complex consists of more than 25,000 feet of highly folded and faulted materials.

Faulting in the bedrock is expected since the Rinconada Fault lies within 2000 feet and the San Andreas lies 41 miles to the East. A Maximum Probable Earthquake magnitude 6.4 has been predicted for the Rinconada fault and a Maximum Probable Earthquake magnitude 8 for the San Andreas Fault (S.L.O. County Safety Element, June 1999).

7. **Groundwater:** The facility is located on the southern end of the Salinas River Basin, near the western margin of the valley forming the basin. Folding and faulting control the general trend of the mountain ranges and also play an active role in groundwater flow directions and rates. The site is situated in the southern end of the Paso Robles groundwater basin, also referred to as the Atascadero Sub-basin. The Atascadero Sub-basin is bounded by the San Luis Mountain Range to the South and West, and the Rinconada Fault, a groundwater divide, to the east.

   The groundwater basin is recharged from several sources: infiltration of Salinas River water, precipitation, subsurface flow, irrigation water, urban watering, and treated wastewater. Groundwater discharge from the basin primarily includes pumpage from municipal, domestic and irrigation wells, and from subsurface flow. The primary recharge source is the Salinas River.

   Groundwater occurs under confined and unconfined conditions. Unconfined groundwater is found in the Recent Alluvium of the Salinas River and confined groundwater is found in the Paso Robles Formation. The Regional groundwater flow is in a northwesterly direction as shown on Attachment 2. The regional groundwater gradient (slope) is approximately 0.0001 feet per foot. The regional groundwater flow rate is approximately 0.1 feet per day or 36 feet per year (Carollo, 1992)

   Groundwater within the shallow water-bearing unit occurs under unconfined conditions and is encountered between 10 to 21.5 feet below ground surface. The groundwater encountered in the shallow aquifer is hydraulically connected to the Salinas River. Groundwater near the percolation ponds flow northeasterly, because of the influence of the percolation ponds. The hydraulic conductivity of the local unconfined aquifer ranges from 50 to 250 feet per day. (Carollo, 1992)

   Three monitoring wells have been installed around the periphery of the percolation ponds; Monitoring wells No. 1, 2 and 3 (MW-1, MW-2, MW-3). The location of the wells and other offsite private and public wells is shown on Attachment 2.

   The discharge occurs approximately one mile upgradient from the City of Atascadero's municipal water supply and about one half mile from several individual and domestic water supply wells. Groundwater located immediately downgradient of the percolation evaporation ponds is pumped by the city and sold to a nearby golf course.

8. **Surface water:** Surface water flows to an unnamed tributary of the Salinas River. This tributary flows easterly a couple hundred of feet to the Salinas River.

9. **Storm water:** Currently, all storm water is directed away from the treatment facility. Storm water that come into contact with the treatment process is collected and treated. The

site is protected from flooding or washout from a 100-year flood event.

MONITORING & REPORTING PROGRAM

10. The requirements for monitoring and reporting are contained in the Attached Monitoring and Reporting Program 01-014. Changes have been made to reflect current sampling and analysis methods.

BASIN PLAN

11. The Water Quality Control Plan, Central Coast Basin (Basin Plan) was adopted by the Board on November 19, 1989 and approved by the State Board on August 16, 1990. The Board approved amendments to the Basin Plan on February 11, 1994 and September 8, 1994. The Basin Plan incorporates statewide plans and policies by reference and contains a strategy for protecting beneficial uses of State waters.

12. Present and anticipated beneficial uses of groundwater in the vicinity of the discharge include:

    a. Municipal and Domestic Supply,
    b. Agricultural Supply, and
    c. Industrial Supply.

13. Present and anticipated beneficial uses of the Salinas River that could be affected by the discharge include:

    a. Municipal and Domestic Supply;
    b. Agricultural Supply;
    c. Industrial Supply;
    d. Groundwater Recharge;
    e. Water-contact Recreation;
    f. Non-contact Water Recreation;
    g. Wildlife Habitat;
    h. Warm Freshwater Habitat;
    i. Fish Migration; and,
    j. Fish Spawning.

14. Surface water quality objectives have not been included, since surface water discharge is prohibited by this Order.

15. Median Groundwater objectives for the Atascadero Sub-basin are:

Constituent	Concentration (mg/l)
Total Dissolved Solids	550
Sulfate	85
Boron	0.3
Sodium	65
Chloride	70
Total Nitrogen (as N)	2.3

16. Some effluent limits in the Order are higher than the Median Groundwater Objectives outlined in the Basin Plan. The higher limits are based, in part, on the assimilative capacity of the groundwater in the discharge zone. Further, groundwater protection is provided through the extraction and reuse of the shallow effluent mound beneath the percolation ponds.

ENVIRONMENTAL ASSESSMENT

17. This action is intended to enforce the laws and regulations administered by the Board. As such, these waste discharge requirements are for an existing facility and are exempt from provisions of the California Environmental Quality Act, Public Resources Code, Section 21100, et seq. in accordance with Section 15301, Chapter 3, Title 14, of the California Administrative Code.

EXISTING ORDERS AND GENERAL FINDINGS

18. This discharge has been subject to Waste Discharge Requirements contained in Order No. 88-84 adopted July 1988 and Cease and Desist Order 92-68.

19. Discharge of waste is a privilege, not a right, and authorization to discharge is conditional upon the discharge complying with provisions of Division 7 of the California Water Code and any more stringent effluent limitations necessary to implement water quality control plans, to protect beneficial uses, and to prevent nuisance. Compliance with this Order should assure this and mitigate any potential adverse changes in water quality due to the discharge.

20. On December 21, 2000, the Board notified the Discharger and interested agencies and persons of its intent to issue waste discharge requirements for the discharge and has provided them with a copy of the proposed Order and an opportunity to submit written views and comments.

21. After considering all comments pertaining to this discharge during a public hearing on March 23, 2001, this Order was found consistent with the above findings.

IT IS HEREBY ORDERED, pursuant to authority in Section 13263 of the California Water Code, The City of Atascadero, its agents, successors, and assigns, may discharge waste at the the City of Atascadero's Wastewater Treatment Facility, providing compliance is maintained with the following:

(Note: other prohibitions and conditions, definitions, and the method of determining compliance are contained in the attached "Standard Provisions and Reporting Requirements for Waste Discharge Requirements" dated January 1984. Applicable paragraphs are referenced in paragraph D.2. of this Order.)

A. PROHIBITIONS

1. Discharge of treated or untreated wastewater to the Salinas River or it's tributaries or surrounding fields controlled by the Discharger is prohibited.

2. Discharge of uncontaminated storm waters to the treatment facilities is prohibited unless adequate capacity is available.

3. Discharge of waste sludge or sludge drying bed leachate to the Salinas River or its tributaries is prohibited.

B. DISCHARGE SPECIFICATIONS

General Specifications

1. Neither the treatment nor the discharge of waste shall create a pollution, contamination or nuisance, as defined by Section 13050 of the California Water Code (CWC). (H & S.C. Section 5411, CWC Section 13263).

2. Waste shall not be disposed of in any position where they can be carried from the disposal site and discharged into waters of the State or United States.

3. Discharge shall be confined to the designated land discharge area as shown on Attachment 1 without overflow or bypass to adjacent properties or drainageways.

4. Daily flow, averaged over each month, shall not exceed 2.39 MGD.

Effluent Limitations

5. Effluent discharged shall not exceed the following limits:

Constituent	Unit	Concentration
Settleable Solids	ml/l	0.3
BOD_5 Soluble	mg/l	100
Total Dissolved Solids	mg/l	1000
Sodium	mg/l	200
Chloride	mg/l	250
Nitrate (as N)	mg/l	8
Boron	mg/l	1.0
pH	pH units	Between 6.5 and 8.3

Groundwater Limitations

1. The discharge shall not cause nitrate concentrations in the groundwater downgradient of the disposal area to exceed 8 mg/l (as N).

2. The discharge shall not cause a significant increase of mineral constituent concentrations in underlying groundwaters, as determined by comparison samples collected from wells located upgradient and downgradient of the disposal area.

3. The discharge shall not cause concentrations of chemicals and radionuclides in groundwater to exceed limits set forth in Title 22, Chapter 15, Article 4 and 5 of the California Code of Regulations.

Wastewater Quality

1. Effluent discharged to the percolation and evaporation ponds shall have an oxygen concentration greater than 2.0 mg/l.

System Operation

1. At least two feet of freeboard shall be maintained within the City controlled disposal ponds.

2. Discharge shall not cause the formation of vector habitat within treatment or disposal areas.

3. The public shall not have contact with inadequately treated wastewater as a result of treatment or disposal

4. The discharge shall not contain substances in concentrations, which are toxic to human, animal, aquatic or plant life operations.

Solids Control

1. All accumulated sludge, salts, or solid residues shall be disposed of in a manner approved by the Executive Officer.

2. Solids shall be tested as outlined in the attached Discharge Monitoring Program.

D. PROVISIONS

1. Order No. 88-84, "Waste Discharge Requirements for the City of Atascadero – Atascadero Wastewater Treatment Facility", adopted by the Board in July 1988, is hereby rescinded.

2. The Discharger shall comply with "Discharge Monitoring Program No. 01-014", as specified by the Executive Officer and incorporated as part of this Order. Reports shall be prepared semiannually and submitted by the 30th of January and July. Reports shall contain all data collected or calculated and all observations made during the previous Semi-annual sampling period. It shall also contain a narrative summary of any exceptions to the requirements of these Waste Discharge Requirements.

3. The Discharger shall comply with all items of the attached "Standard Provisions and Reporting Requirements for Waste Discharge Requirements" dated January 1984.

4. The Discharger shall submit a written report, acceptable to the Executive Officer, addressing:

   a. Whether there will be changes in the continuity, character, location, or volume of the discharge; and,

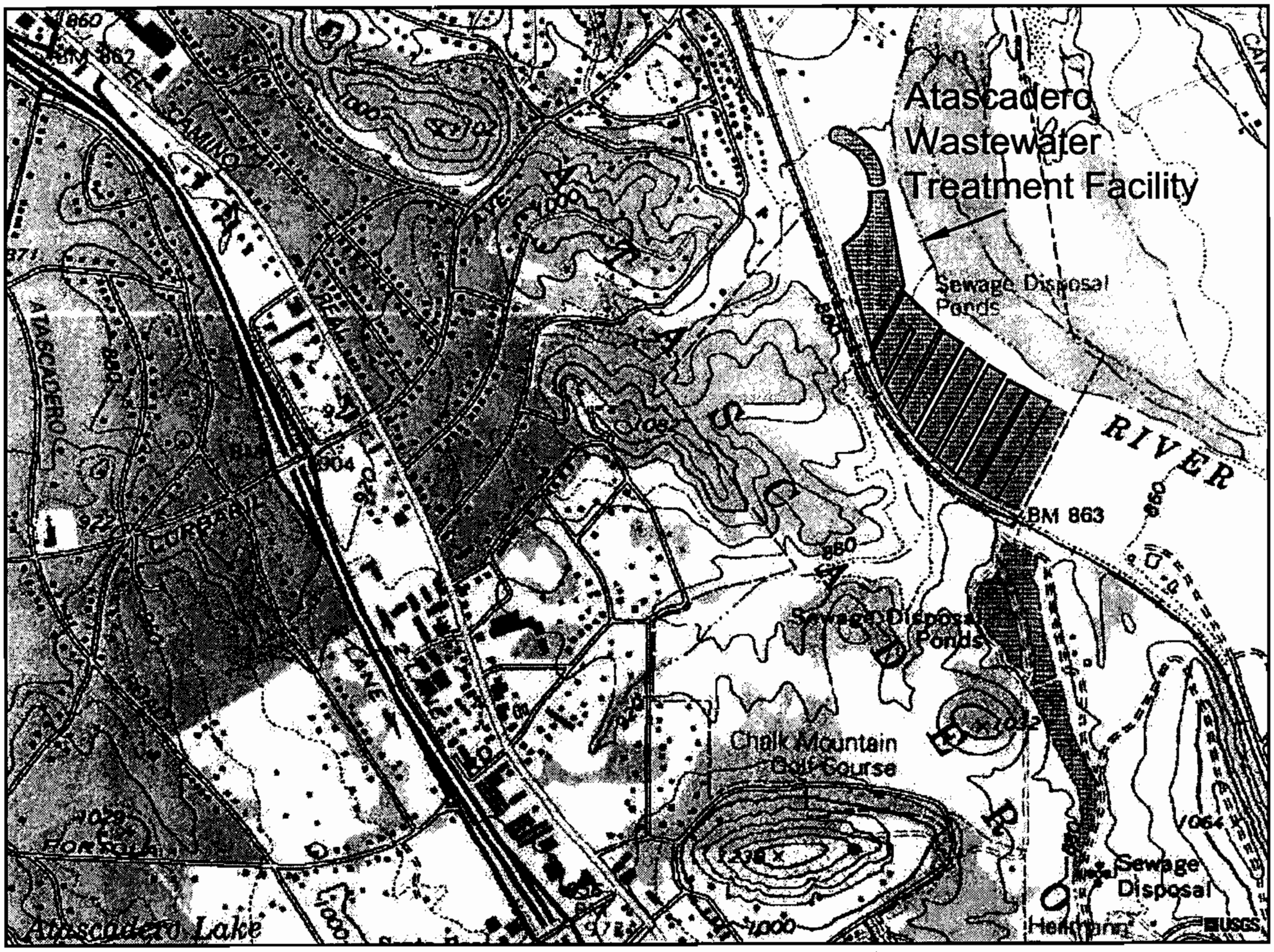
   b. Whether, in their opinion, there is any portion of the Order that is incorrect, obsolete, or otherwise in need of revision.

   c. A summary of all violations of Waste Discharge Requirements, Order No. 01-014, which occurred since adoption of the order along with a description of the cause(s) and corrective action taken.

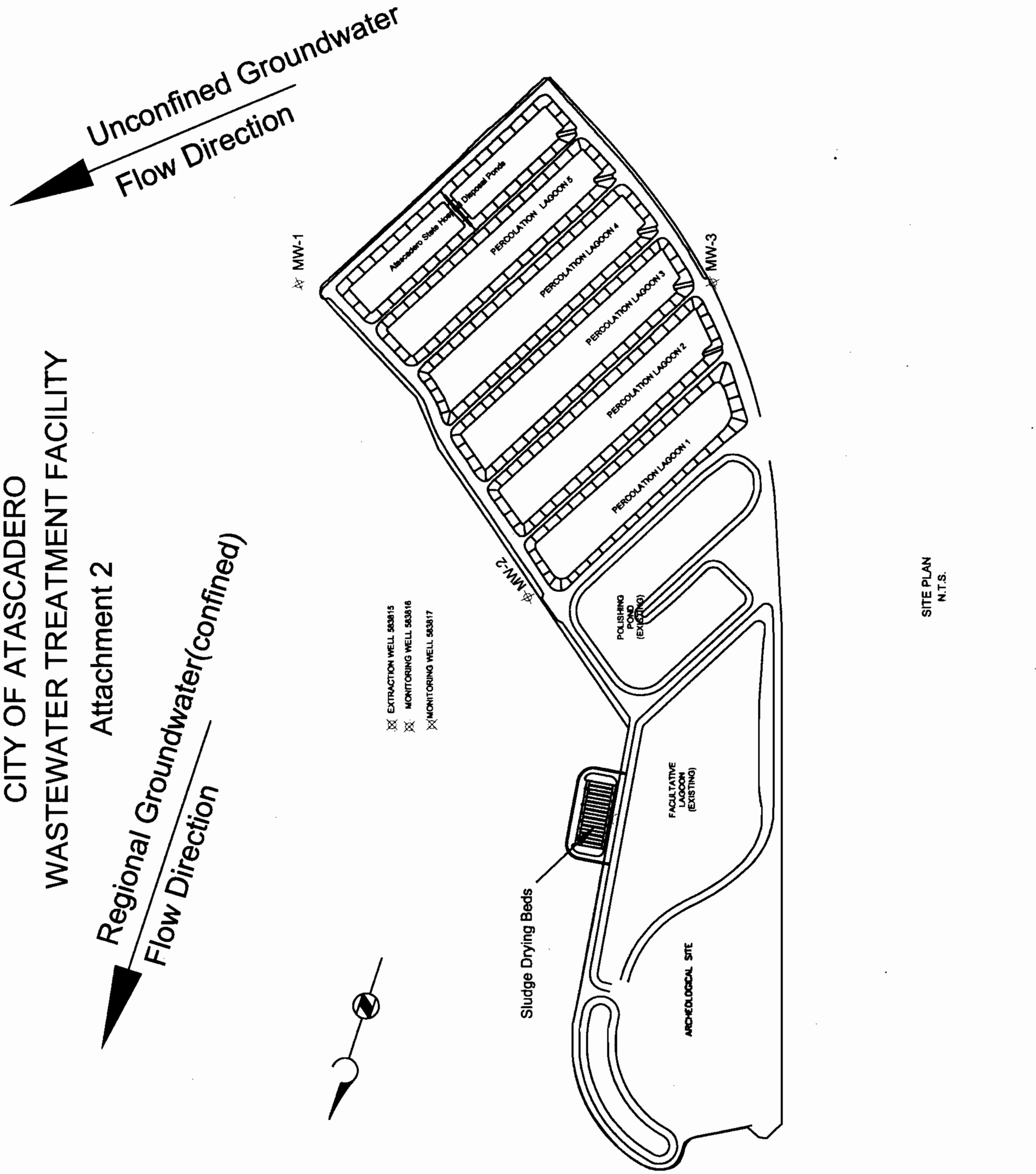
REPORT DUE DATE: **March 23, 2006**

I, Roger W. Briggs, Executive Officer, do hereby certify that the foregoing is a full, complete, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Coast Region, on March 23, 2001.

Roger W. Briggs,
Executive Officer



Central Coast Regional Water Quality Control Board 81 Higuera Street, Suite 200 San Luis Obispo, CA 93401	City of Atascadero, California Wastewater Treatment Facility **Location Map**	Attachment **1**



Central Coast Regional Water Quality Control Board 81 Higuera Street, Suite 200 San Luis Obispo, CA 93401	City of Atascadero, California Wastewater Treatment Facility **Location Map**	Attachment **2**

STATE OF CALIFORNIA
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION
81 Higuera Street, Suite 200
San Luis Obispo, California 93401-5427

MONITORING AND REPORTING PROGRAM ORDER NO. 01-014

Waste Discharger Identification No. 3 400100001

For

CITY OF ATASCADERO WASTEWATER TREATMENT FACILITY
CITY OF ATASCADERO, SAN LUIS OBISPO COUNTY

EFFLUENT MONITORING

Attachment A-1 shows sampling locations that correspond to the following requirements:

Representative samples of the treated wastewater discharged to the percolation ponds, shall be collected and analyzed as required by Order No. 01-014.

Constituent	Units	Sample Type	Minimum Sampling and Analyzing Frequency
Daily Flow	gpd	Metered	Daily Monthly
Maximum Daily Flow	gpd		Monthly
Mean Daily Flow	gpd		Monthly
Settleable Solids	ml/l	Grab, taken during peak loading period	Daily
Total Suspended Solids	mg/l	"	Once every 6 days
BOD_5 soluble	mg/l	"	"
pH	pH units	"	"
Dissolved Oxygen	mg/l	"	"
COD	mg/l	24-hr Composite	Semi-Annually(Feb. & Aug.)
Total Dissolved Solids	mg/l	"	Semi-Annually(Feb. & Aug.)
Sodium	mg/l	"	Semi-Annually(Feb. & Aug.)
Chloride	mg/l	"	Semi-Annually(Feb. & Aug.)
Sulfate	mg/l	"	Semi-Annually(Feb. & Aug.)
Total Nitrogen (as N)	mg/l	"	Semi-Annually(Feb. & Aug.)
Nitrate (as N)	mg/l	"	Semi-Annually(Feb. & Aug.)
Total Coliform Organisms	MPN/100ml	Grab	Weekly during pumping effluent mound*
Boron	mg/l	Grab	Semi-Annually(Feb. & Aug.)
Arsenic	mg/l	Grab	Yearly (November)
Barium	mg/l	Grab	Yearly (November)

*Samples shall be collected from reclamation well water; frequency will be re-evaluated once data reliability has been determined

Constituent	Units	Sample Type	Minimum Sampling and Analyzing Frequency
Cadmium	mg/l	Grab	Yearly (November)
Chromium	mg/l	Grab	Yearly (November)
Cyanide	mg/l	Grab	Yearly (November)
Lead	mg/l	Grab	Yearly (November)
Mercury	mg/l	Grab	Yearly (November)
Selenium	mg/l	Grab	Yearly (November)
Copper	mg/l	Grab	Yearly (November)
Zinc	mg/l	Grab	Semi-Annually(Feb. & Aug.)
VOC's	mg/l	Grab	Once/5 Years
PCB's	mg/l	Grab	Once/5 Years
Pesticides	mg/l	Grab	Once/5 Years

INFLUENT MONITORING

Influent sampling shall take place at pump station No. 5 and 3. Samples of Influent to the wastewater treatment plant shall be collected and analyzed for the following constituents:

Constituent	Units	Sample Type	Minimum Sampling and Analyzing Frequency
Maximum Daily Flow	MGD	Metered	Daily
Suspended Solids	mg/l	Composite	Quarterly (Feb., May, Aug., Nov.)
BOD_5	mg/l	Composite	Quarterly (Feb., May, Aug., Nov.)

UPGRADIENT AND DOWNGRADIENT GROUNDWATER MONITORING

Representative samples from Shallow upgradient well 25S/12E-24B4 and shallow downgradient well MW-583817 shall be collected and analyzed for the following constituents:

Constituent	Units	Sample Type	Minimum Sampling and Analyzing Frequency
Static Water Level*	Feet	Measurement	Quarterly (Mar, Jun., Sep., Dec.)
Total Dissolved Solids	mg/l	Grab	Semi-Annually(Feb. & Aug.)
Sodium	mg/l	Grab	Semi-Annually(Feb. & Aug.)
Chloride	mg/l	Grab	Semi-Annually(Feb. & Aug.)
Sulfate	mg/l	Grab	Semi-Annually(Feb. & Aug.)
COD	mg/l	Grab	Quarterly (Mar, Jun., Sep., Dec.)
Nitrate (as N)	mg/l	Grab	Semi-Annually(Feb. & Aug.)
Total Nitrogen (as N)	mg/l	Grab	Semi-Annually(Feb. & Aug.)

* Static water levels shall be measured in all facility wells on a quarterly basis.

WATER SUPPLY MONITORING

Representative samples from the water supply to the City of Atascadero shall be collected and analyzed for the following constituents:

Constituent	Units	Sample Type	Minimum Sampling and Analyzing Frequency
Total Dissolved Solids	mg/l	City Composite	Semi-Annual (May – Nov.)
Sodium	mg/l	City Composite	Semi-Annual (May – Nov.)
Chloride	mg/l	City Composite	Semi-Annual (May – Nov.)
Boron	mg/l	City Composite	Semi-Annual (May – Nov.)
Nitrate (as N)	mg/l	City Composite	Semi-Annual (May – Nov.)
Total Nitrogen (as N)	mg/l	City Composite	Semi-Annual (May – Nov.)

BIOSOLID MONITORING

A representative sludge sample shall be sampled and analyzed for the following:

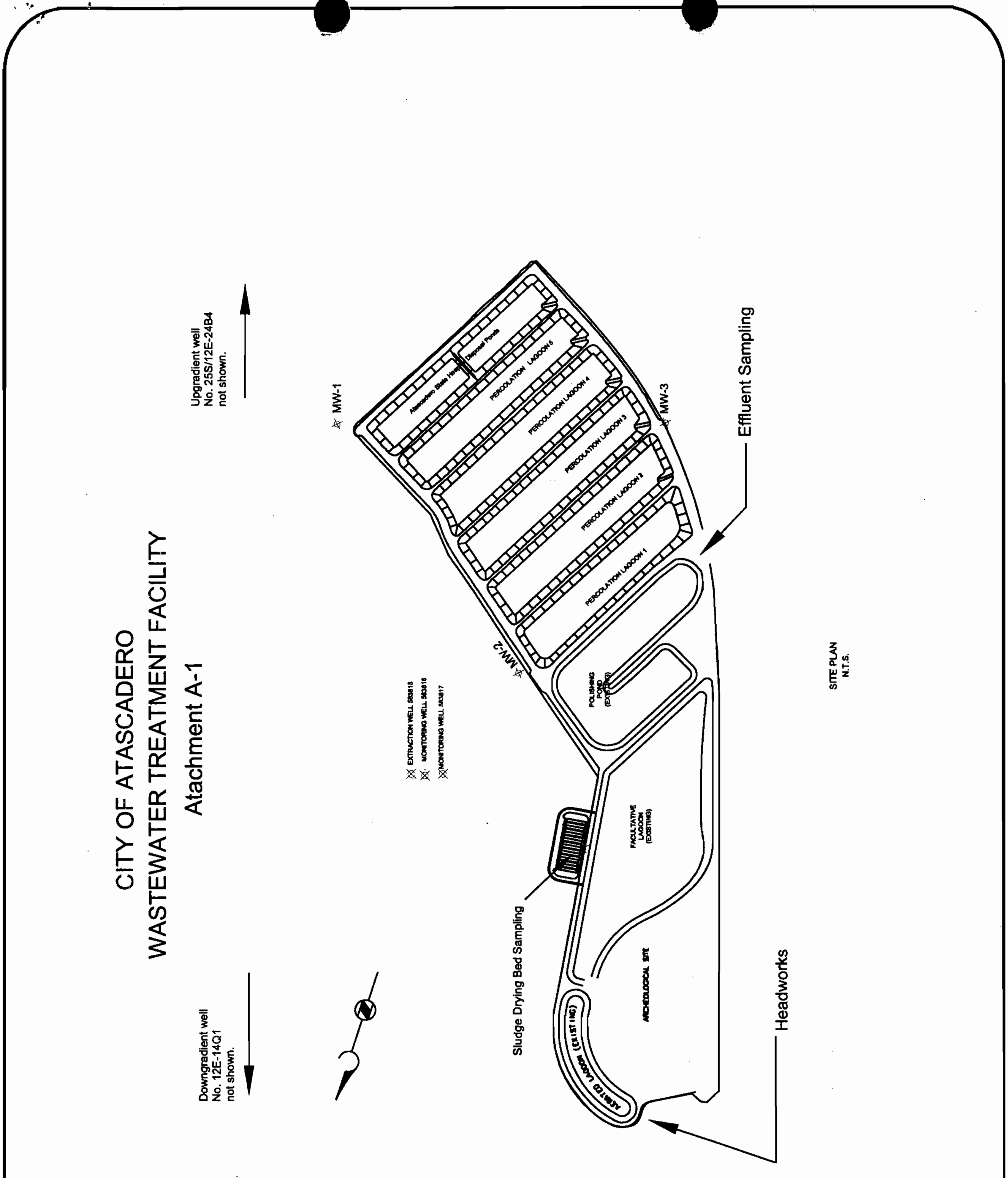
Constituent (Method)	Units	Sample Type	Minimum Sampling and Analyzing Frequency
Total Metals Antimony (6010) Arsenic (7060) Barium (6010) Beryllium (6010) Cadmium (6010) Chromium,VI (6010) Chromium Total(6010) Cobalt (6010) Copper (6010) Lead (7421) Mercury (7470) Nickel (6010) Selenium (7740) Silver (6010) Thallium (7841) Tin (6010) Vanadium (6010) Zinc (6010)	mg/kg	Grab	Once every two years
Flouride	mg/kg	Grab	Once every two years
Pesticides (standard USEPA method 8080 list, standard USEPA method 8150 list)	mg/kg	Grab	Once every two years
Trychloroethylene (8260)	mg/kg	Grab	Once every two years
Vinyl Chloride (8260	mg/kg	Grab	Once every two years
Biosolids Volume	lbs	Estimate	Quarterly
Organic Lead	mg/kg	Grab	Once every two years
PCBs	ug/kg	Grab	Once every two years

REPORTING

Reports shall be prepared semiannually and submitted by the 30th of January and July. A summary of the previous years data shall accompany the January 30th report. Yearly data shall be submitted in tabular format on a 3.5-inch diskette in Microsoft Excel® format. Yearly and historical data shall be submitted in graphical format. Reports shall contain all data collected or calculated and all observations made during the previous two quarters. It shall also contain a narrative summary of any exceptions to Waste Discharge Requirements. A map or aerial photograph shall accompany each report showing observation and monitoring station locations. Laboratory statements of results of analyses must also be included in each report. A copy of all reports submitted to the Board shall be also submitted to the San Luis Obispo County Division of Environmental Health.

ORDERED BY [signature]
Executive Officer

3-30-01
Date



Central Coast Regional Water Quality Control Board 81 Higuera Street, Suite 200 San Luis Obispo, CA 93401	City of Atascadero, California Wastewater Treatment Facility **Location Map**	Attachment **A-1**

APPENDIX B

Floodplain Evaluation

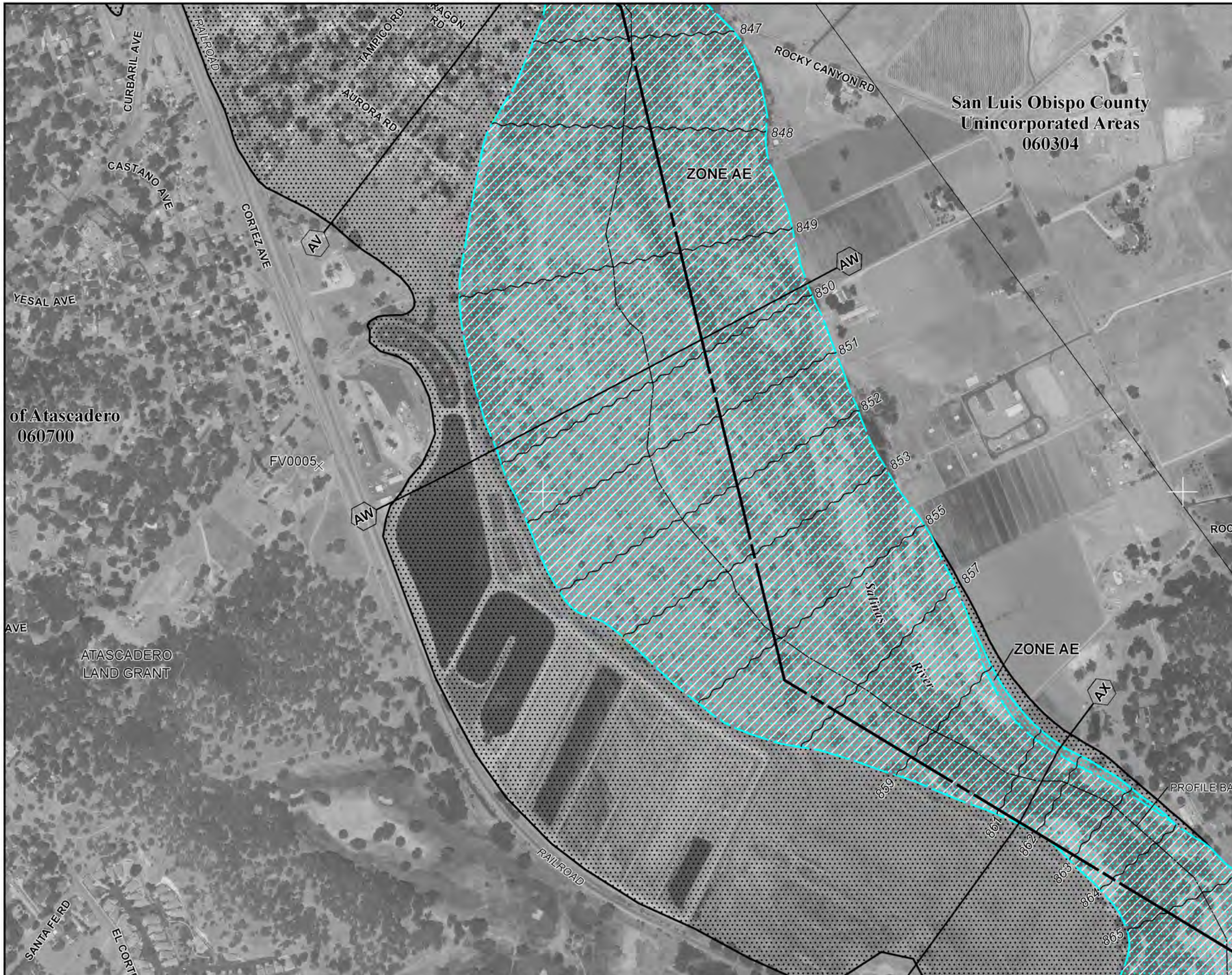
APPENDIX B FLOODPLAIN EVALUATION

If the City intends to expand the existing water reclamation facility outside its existing footprint, it is bound by private property to the north and south; railroad to the west; and Salinas River floodplain to the east. The City directed MKN to determine if expanding into the floodplain would be a viable option for expanding the plant footprint.

As shown in following figure, the regulatory floodplain (area covered by a 1% or 100-year base flood) is located adjacent to the drying beds on the east side of the WWTF. Construction in the floodplain can be allowed if approved by the delegated floodplain manager (in this case, the City Engineer), if the construction is not within the floodway, and if the construction does not cause a 1-ft rise in floodplain elevation. MKN reviewed the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for San Luis Obispo County (November, 2012) and the supporting hydraulic modeling files from the original HEC-2 analysis in August, 1977, for the reach of the Salinas River in the vicinity of the Atascadero WRF. This section of the FIS had not been reevaluated since 1977. Therefore, these files represent the most current floodplain analysis that is the basis of the FIS.

Based on a review of the FIS and the electronic files, MKN concluded the following:

- The floodway and floodplain are both aligned at the west end of the Salinas River, adjacent to the WRF sludge drying beds (See attached for FEMA FIRM excerpts).
- The topography represented by the cross-sections in the HEC-2 analysis appear to depict the current topography (including the steep slope from the area adjacent to the drying beds to the river floodplain).
- Without requesting a map revision from FEMA, it appears any construction to the east of the current sludge drying beds would conflict with the floodway.
- A hydraulic analysis could be conducted to contest the location of the floodway or to request a map revision. However, the model files appear to reasonably represent the topography in the vicinity of the WRF.
- An environmental review should be conducted before proceeding with any hydraulic analysis, or work in the floodplain, in case any endangered species habitat is present. This could further complicate any plans to expand into the floodplain, even if a map revision is granted.



ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0832G

FIRM
FLOOD INSURANCE RATE MAP
SAN LUIS OBISPO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 832 OF 2050

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ATASCADERO, CITY OF	060700	0832	G
SAN LUIS OBISPO COUNTY	060304	0832	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06079C0832G

MAP REVISED
NOVEMBER 16, 2012

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation

ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

NFIP

PANEL 0832G

FIRM
FLOOD INSURANCE RATE MAP

SAN LUIS OBISPO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 832 OF 2050

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ATASCADERO, CITY OF	060700	0832	G
SAN LUIS OBISPO COUNTY	060304	0832	G

Notice to User: The **Map Number** shown below should be used when placing map orders, the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 06079C0832G

MAP REVISED NOVEMBER 16, 2012

Federal Emergency Management Agency

Atascadero, City of:	The hydrologic and hydraulic analyses from the FIS report dated July 20, 1981, were performed by George S. Nolte and Associates, for the Federal Insurance Administration (FIA), under Contract No. H-4722. That work, which was completed in December 1979, covered all significant flooding sources affecting the City of Atascadero.
El Paso de Robles, City of:	The hydrologic and hydraulic analyses from the FIS report dated March 16, 1981, were performed by George S. Nolte & Associates, for the FIA, under Contract No. H-4722. That work was completed in December 1979.
Grover Beach, City of:	The hydrologic and hydraulic analyses from the FIS report dated August 1, 1984, were performed by the USACE and Tetra Tech, Inc., for FEMA, under Inter-Agency Agreement No. IAA-H-10-77 and Contract No. H-4543. That work was completed in January 1983. The FIS report dated November 5, 1997, incorporated a Letter of Map Revision (LOMR) issued on November 25, 1996. The LOMR showed the effects of revised hydraulic analyses based on updated topographic information along Meadow Creek.
Morro Bay, City of:	The hydrologic and hydraulic analyses from the FIS report dated December 18, 1979, were performed by the U.S. Geological Survey (USGS), for FEMA, under Inter-Agency Agreement Nos. IAA-H-17-75 and IAA-H-8-76, Project Order Nos. 8 and 13, respectively. The hydraulic analyses for this study were completed in June 1977. For the FIS report dated November 1, 1985, the coastal analysis was prepared by Dames & Moore for FEMA, under contract No. C-0970. The work was completed in 1984.
Pismo Beach, City of:	The hydrologic and hydraulic analyses from the FIS report dated February 1, 1984, were performed by the USACE and Tetra Tech, Inc., for FEMA, under Inter-Agency Agreement No. IAA-H-10-77 and Contract No. H-4543. That work was completed in January 1983. The FIS report dated November 5, 1997, incorporated a LOMR issued on November 25,

Each incorporated community within, and the unincorporated areas of, San Luis Obispo County, has a previously printed FIS report. The hydraulic analyses described in those reports have been compiled and are summarized below.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM (Published Separately).

The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Unless otherwise noted, water-surface elevations of floods of the selected recurrence intervals were computed through use of the USACE HEC-2 step-backwater computer program (USACE, 1973). For many streams, data for the program had to be modified with manual calculations to account for inlet control recurring at many bridges and culverts.

Cross sections were determined from topographic maps and field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry. All topographic mapping used to determine cross sections is referenced in Section 4.1.

Cross sections for the backwater analysis of the streams within the Salinas River drainage basin were obtained from aerial photographs, flown in September 1978, at scales of 1:12,000 in rural areas and 1:6,000 in urbanized areas (Earl Pugh and Associates, 1970). All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Starting water-surface elevations for Atascadero Creek, Carpenter Canyon Creek, Corbett Canyon Creek, Deleissigues Creek, Graves Creek, Los Berros Creek, Nipoma Creek, North Branch Los Berros Creek, Paloma Creek, Salinas River, Santa Margarita Creek, Tefft Road Tributary, Tefft Road Tributary East Fork, Toad Creek (Main and North Branches), Unnamed Creek No. 1, and Yerba Buena Creek were calculated using the slope/area method. Starting water-surface elevations for Old Garden, Prefumo, San Luis Obispo, and Stenner were determined by the slope/area method starting one mile downstream of the study reach.

On North Fork Paloma Creek, South Branch Toad Creek, and South Branch Unnamed Creek No. 1, the 1-percent-annual-chance floods coincide with their main stems; therefore, the water-surface elevations in the main stream channels were used for the tributary starting water-surface elevations. Starting water-surface elevations for Cayucos and Little Canyon Creeks were based on known elevations.

Starting water-surface elevations for Arroyo Grande, Carpenter Canyon, Corbett Canyon, Los Berros, and North Fork Los Berros Creeks and the areas of shallow flooding within the City of San Luis Obispo were determined by normal-depth computations, while those for Pismo, Santa Rosa, and San Luis Obispo Creeks were computed using critical-depth calculations. The starting water-surface

Table 8 – Vertical Datum Conversion

Stream	Conversion Factor (ft)
Arroyo Grande Creek	2.82
Atascadero Creek	3.15
Carpenter Canyon Creek	2.84
Cayucos Creek	2.76
Chorro Creek	2.79
Corbett Canyon Creek	2.84
Deleissigues Creek	2.77
Graves Creek	3.13
Little Cayucos Creek	2.76
Little Morro Creek	2.80
Los Berros Creek	2.82
Meadow Creek	2.84
Morro Creek	2.80
Mountain Springs Creek	3.13
Nipomo Creek	2.73
Noname Creek	2.78
North Fork Los Berros Creek	2.83
North Fork Paloma Creek	3.15
Old Garden Creek	2.86
Peachy Canyon Creek	3.16
Perfumo Canyon Creek	2.87
Perfumo Creek	2.87
Pismo Creek	2.86
Salinas River	3.15
San Luis Obispo Creek	2.89
Santa Margarita Creek	3.07
Santa Rosa Creek	2.73
Santa Rosa Creek Split Flow	2.71
See Canyon Creek	2.92
South Branch Toad Creek	3.12
South Branch Unnamed Creek No. 1	3.17
Stenner Creek	2.86
Tefft Road Tributary	2.77
Tefft Road Tributary East Fork	2.78
Toad Creek	3.14
Toro Creek	2.77
Unnamed Creek (Alva Paul Creek)	2.78
Unnamed Creek No. 1	3.15
Willow Creek	2.78
Yerba Buena Creek	2.96

Verified with model
conversion +3.2 from model

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Salinas River (continued)								
AA	675,206	1,044	10,595	4.0	746.8	746.8	747.2	0.4
AB	677,477	956	8,871	4.7	750.7	750.7	750.9	0.2
AC	679,536	677	6,314	6.6	755.8	755.8	756.1	0.3
AD	681,437	565	7,228	5.8	759.6	759.6	760.3	0.7
AE	682,334	499	5,627	7.5	761.3	761.3	761.9	0.6
AF	684,288	588	7,265	5.8	766.8	766.8	767.3	0.5
AG	686,347	760	8,918	4.7	770.1	770.1	771.1	1.0
AH	688,090	779	8,499	4.9	773.1	773.1	773.7	0.6
AI	689,832	685	5,727	5.9	776.0	776.0	776.4	0.4
AJ	691,944	923	6,900	4.9	780.9	780.9	781.2	0.3
AK	694,056	612	5,182	6.4	787.7	787.7	787.9	0.2
AL	696,432	1,325	9,468	3.4	792.9	792.9	793.0	0.1
AM	698,597	1,408	8,305	3.7	797.1	797.1	797.2	0.1
AN	700,498	1,107	6,762	4.5	801.1	801.1	802.0	0.9
AO	702,451	946	6,472	4.7	808.0	808.0	808.9	0.9
AP	704,299	852	6,310	4.7	814.1	814.1	814.4	0.3
AQ	705,989	664	5,661	5.2	817.7	817.7	818.2	0.5
AR	708,048	932	5,965	4.9	821.0	821.0	821.4	0.4
AS	709,685	590	4,521	6.2	826.4	826.4	826.4	0.0
AT	712,114	358	4,118	6.8	834.2	834.2	834.5	0.3
AU	713,856	224	2,910	9.6	841.3	841.3	841.6	0.3
AV	716,179	505	4,940	5.4	845.7	845.7	846.1	0.4
AW	718,661	1,810	8,443	3.1	849.9	849.9	850.0	0.1
AX	721,776	390	3,932	5.9	861.7	861.7	861.7	0.0
AY	724,099	1,267	7,793	3.0	865.6	865.6	865.6	0.0
AZ	726,211	1,356	7,241	3.1	869.0	869.0	869.0	0.0

[1]Feet above confluence with Pacific Ocean

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

SALINAS RIVER

TABLE 9

Same as 2008 2012

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Salinas River (continued)								
BA	728,534[1]	764	4,959	4.5	874.1	874.1	874.1	0.0
BB	730,805[1]	783	4,775	4.4	880.4	880.4	880.5	0.1
BC	733,286[1]	806	5,583	3.8	885.6	885.6	885.8	0.2
BD	736,190[1]	639	4,775	4.4	892.7	892.7	892.8	0.1
BE	738,197[1]	490	4,289	4.9	898.0	898.0	898.0	0.0
San Luis Obispo Creek								
A	143[1]	426	3,148	7.0	13.4	13.4	14.4	1.0
B	2,154[1]	295	3,690	6.0	15.5	15.5	16.2	0.7
C	2,640[1]	360	4,558	4.8	16.0	16.0	16.9	0.9
D	38,016[2]	241	3,231	4.1	101.7	101.7	102.5	0.8
E	38,886[2]	144	1,492	9.0	104.3	104.3	104.6	0.3
F	40,128[2]	206	2,020	6.6	111.9	111.9	112.0	0.1
G	41,184[2]	183	1,740	7.7	114.9	114.9	114.9	0.0
H	42,082[2]	163	1,564	8.6	118.5	118.5	118.5	0.0
I	42,768[2]	192	1,923	7.0	121.3	121.3	121.3	0.0
J	43,718[2]	80	804	16.7	126.8	126.8	126.9	0.1
K – AO*								

[1]Feet above Pacific Ocean
[2]Feet above mouth
*Data not available

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

SALINAS RIVER - SAN LUIS OBISPO CREEK

Same as 2008

2012

verified with model

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Salinas River (continued)								
AA	675,206	1,044	10,595	4.0	743.6	743.6	744.0	0.4
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AI	689,832	685	5,727	5.9	772.8	772.8	773.2	0.4
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AS	709,685	590	4,521	6.2	823.2	823.2	823.2	0.0
AT	712,114	358	4,118	6.8	831.0	831.0	831.3	0.3
AU	713,856	224	2,910	9.6	838.1	838.1	838.4	0.3
AV	716,179	505	4,940	5.4	842.5	842.5	842.9	0.4
AW	718,661	1,810	8,443	3.1	846.7	846.7	846.8	0.1
AX	721,776	390	3,932	5.9	858.5	858.5	858.5	0.0
AY	724,099	1,267	7,793	3.0	862.4	862.4	862.4	0.0
AZ	726,211	1,356	7,241	3.1	865.8	865.8	865.8	0.0

[1]Feet above confluence with Pacific Ocean

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

SALINAS RIVER

Same as 2012 not revised 2008

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
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BC	733,286	806	5,583	3.8	882.4	882.4	882.6	0.2
BD	736,190	639	4,775	4.4	889.5	889.5	889.6	0.1
BE	738,197	490	4,289	4.9	894.8	894.8	894.8	0.0
San Luis Obispo Creek								
A	143	426	3,148	7.0	10.5	10.5	11.5	1.0
B	2,154	295	3,690	6.0	12.6	12.6	13.3	0.7
C	2,640	360	4,558	4.8	13.1	13.1	14.0	0.9
D	38,016	241	3,231	4.1	98.8	98.8	99.6	0.8
E	38,886	144	1,492	9.0	101.4	101.4	101.7	0.3
F	40,128	206	2,020	6.6	109.0	109.0	109.1	0.1
G	41,184	183	1,740	7.7	112.0	112.0	112.0	0.0
H	42,082	163	1,564	8.6	115.6	115.6	115.6	0.0
I	42,768	192	1,923	7.0	118.4	118.4	118.4	0.0
J	43,718	80	804	16.7	123.9	123.9	124.0	0.1
K – AO*								

[1]Feet above Pacific Ocean
*Data Not Available

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

SALINAS RIVER - SAN LUIS OBISPO CREEK

Same as 2012

2008

APPENDIX C

Preliminary Review of Irrigated Area within City Limits

Table C-1: Irrigated Areas within City Limits				
SITE	APN	ACRES	LANDUSE	NAME
1	054-032-014	16.49	A	FRANK FRANKLIN F TRE ETAL
2	054-043-003	11.18	A	FRANK FRANKLIN F TRE ETAL
3	054-041-016	6.85	A	FRANK FRANKLIN F TRE ETAL
4	054-043-005	5.97	A	FRANK FRANKLIN F TRE ETAL
5	054-032-010	3.41	A	FRANK FRANKLIN F TRE ETAL
6	045-461-002	278.25	P	ATASCADERO STATE HOSPITAL
7	049-011-003	97.57	P	AMWC WELL SITES
8	028-421-001	75.37	P	ATASCADERO WRF
9	049-011-002	61.51	P	AMWC
10	049-011-001	49.08	P	AMWC
11	030-341-014	40.27	P	ATASCADERO HIGH SCHOOL
12	045-461-003	38.35	P	ATASCADERO STATE HOSPITAL
13	049-062-006	36.68	P	SAN BENITO ELEMENTARY SCHOOL
14	028-011-001	19.50	P	AMWC
15	056-191-016	12.23	P	SANTA ROSA ELEMENTARY SCHOOL
16	054-031-007	11.85	P	MONTEREY ROAD ELEMENTARY SCHOOL
17	054-241-021	10.01	P	SAN GABRIEL ELEMENTARY SCHOOL
18	045-321-003	8.41	P	SLO COUNTY BOARD OF EDUCATION
19	029-091-040	6.29	P	COLONY PARK
20	049-141-042	4.57	P	INTERNATIONAL CHURCH
21	045-332-005	4.43	P	CHURCH OF THE NAZARENE ATAS
22	054-151-031	4.41	P	EVANGELICAL FREE CHURCH OF ATASCADERO
23	045-342-012	4.26	P	UNITED METHODIST CHURCH OF ATASCADERO
24	056-361-018	3.74	P	SAN GABRIEL ELEMENTARY SCHOOL
25	030-192-018	3.73	P	ATASCADERO FIRST BAPTIST CHURCH
26	049-112-006	3.49	P	OAK HILLS HIGH SCHOOL
27	056-081-035	3.25	P	US POSTAL SERVICE
28	045-342-011	2.78	P	BRIDWELL JACK R ETAL
29	045-332-011	2.74	P	YOUNG EDWARD H TRE ETAL
30	045-332-010	2.67	P	YOUNG EDWARD H TRE ETAL
31	028-111-004	2.64	P	AMWC
32	045-332-003	2.36	P	ATASCADERO CHURCH OF THE NAZARENE A CA CORP
33	045-342-010	2.35	P	LANGFORD JON N & FRIEDA L
34	045-332-001	2.16	P	CREATIVE ALTERNATIVE FOR LEARNING & LIVING INC
35	049-141-035	1.96	P	FINOCCHIARO BETTY TR ETAL
36	049-141-043	1.89	P	ACTION FOR ANIMAL RIGHTS
37	045-332-012	1.87	P	FELDE JANICE L TRE
38	045-342-009	1.86	P	WITTSTROM CHAD C & OLIVIA B ETAL
39	045-332-004	1.77	P	CHURCH OF THE NAZARENE OF ATASCADERO CA
40	054-151-029	1.37	P	PACIFIC GAS & ELECTRIC CO
41	029-323-016	1.30	P	CITY OF ATASCADERO

Table C-1: Irrigated Areas within City Limits				
SITE	APN	ACRES	LANDUSE	NAME
42	054-151-030	1.27	P	CORNERSTONE COMMUNITY CHURCH OF ATASCADERO
43	056-151-033	0.93	P	CITY OF ATASCADERO
44	030-282-033	0.61	P	COUNTY OF SAN LUIS OBISPO
45	030-343-004	0.54	P	ATASCADERO BIBLE CHURCH A CA NONPRFT CORP
46	030-343-005	0.29	P	ATASCADERO BIBLE CHURCH
47	030-343-006	0.28	P	ATASCADERO BIBLE CHURCH A CA NON-PROPFIT CORP
48	056-191-024	0.24	P	NEGRETE SAMUEL & ISABEL
49	056-191-027	0.24	P	HEITZENRATER JEFFREY J
50	056-081-024	0.22	P	BROWN AJ TRE ETAL
51	030-193-002	0.17	P	CITY OF ATASCADERO
52	030-341-010	0.17	P	ATASCADERO HIGH SCHOOL
53	030-282-032	0.14	P	COUNTY OF SAN LUIS OBISPO
54	030-343-003	0.10	P	ATASCADERO HIGH SCHOOL
55	030-343-002	0.09	P	CITY OF ATASCADERO
56	049-112-010	0.05	P	CITY OF ATASCADERO
57	030-343-001	0.01	P	ATASCADERO HIGH SCHOOL
58	045-461-001	210.88	REC	CHALK MOUNTAIN GOLF COURSE
59	056-391-003	36.82	REC	THREE BRIDGES OAK PRESERVE
60	056-401-002	29.27	REC	THREE BRIDGES OAK PRESERVE
61	029-105-044	25.19	REC	STADIUM PARK
62	045-323-001	21.92	REC	PALOMA CREEK PARK
63	056-331-001	19.32	REC	ATASCADERO LAKE
64	056-341-002	17.85	REC	ATASCADERO LAKE
65	031-362-003	15.13	REC	ATASCADERO LAKE PARK
66	045-481-003	13.13	REC	CHALK MOUNTAIN GOLF COURSE
67	045-481-001	7.55	REC	CHALK MOUNTAIN GOLF COURSE
68	049-033-036	5.76	REC	VACANT LOT
69	028-401-011	4.48	REC	WRANGLERETTE ARENA
70	045-471-002	3.61	REC	CHALK MOUNTAIN GOLF COURSE
71	045-481-002	3.22	REC	CHALK MOUNTAIN GOLF COURSE
72	056-322-023	2.88	REC	ATASCADERO LAKE
73	045-471-001	2.67	REC	CHALK MOUNTAIN GOLF COURSE
74	029-346-001	1.72	REC	SUNKEN GARDENS
75	049-071-030	1.35	REC	VACANT LOT/NATIIVE TREE PLANTING
76	049-063-004	1.31	REC	CONGREGATION OHR TZAFON
77	049-071-029	1.31	REC	SINGLE FAMILY HOME
78	049-063-003	1.31	REC	CONGREGATION OHR TZAFON
79	030-451-006	0.91	REC	CHALK MOUNTAIN GOLF COURSE
80	056-312-016	0.55	REC	ATASCADERO LAKE
81	030-431-015	0.53	REC	CHALK MOUNTAIN GOLF COURSE
82	056-312-015	0.51	REC	ATASCADERO LAKE
83	030-431-016	0.50	REC	CHALK MOUNTAIN GOLF COURSE
84	056-322-018	0.43	REC	ATASCADERO LAKE

Table C-1: Irrigated Areas within City Limits				
SITE	**APN**	**ACRES**	**LANDUSE**	**NAME**
85	031-372-008	0.14	REC	ATASCADERO LAKE PARK PAVILION
86	056-322-017	0.13	REC	ATASCADERO LAKE
Total Acreages		**43.89**	**A**	
		812.33	**P**	
		430.35	**Rec**	

NOTES:
AERIAL BASEMAP PROVIDED BY
COUNTY OF SAN LUIS OBISPO.
NOT A LEGAL DOCUMENT. MAP
PRODUCED SEPTEMBER 2014.

CITY OF ATASCADERO

WASTEWATER COLLECTION SYSTEM AND TREATMENT PLANT
MASTER PLAN UPDATES

FIGURE: RECYCLED WATER ALTERNATIVE SITES

Scale: Varies

MICHAEL K NUNLEY & ASSOCIATES

WATER • WASTEWATER • WATER REUSE