Water

Submitted to
Santa Barbara County
Environmental Health Services
225 Camino Del Remedio
Santa Barbara CA 93110

Submitted by
AECOM
1194 Pacific St., Ste. 204
San Luis Obispo CA 93401
Date: January 8, 2013

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1 Introduction

Santa Barbara County Environmental Health Services has directed the development of this Preliminary Engineering Report (PER) in a continuing effort to address and recommend long-term solutions for the wastewater disposal issues in the Los Olivos Special Problems Area (SPA) of the Santa Ynez Uplands Groundwater Basin.

This PER provides technical recommendations to develop a communal wastewater treatment system for the community of Los Olivos as recommended in the Los Olivos Wastewater Management Plan[1] (LOWWMP). This Background and Introduction highlights and updates some important information from the LOWWMP and lends context and understanding to the goals, objectives and approach of this PER.

1.1 Site Location and Setting

The community of Los Olivos is located in the Santa Ynez Valley, north of the City of Santa Barbara along State Highway 154 and has a permanent population of approximately 1,000 residents. Due to the popularity of the area as a tourist destination, the community's population increases by two to three times this amount during weekends and holidays.

The study area contains approximately 418 parcels, 340 of which are located in the township of Los Olivos. The Santa Ynez Valley 2009 Community Plan Environmental Impact Report (2009 EIR)[2] identifies 400 existing residential units in Los Olivos and 228,990 square feet (sf) of developed commercial area. Many of the commercial businesses are located in the downtown area and consist of restaurants, hotels, wine tasting rooms and retail shops that support the high tourism the town experiences.

As displayed in Figure 1.1, the topography in the Los Olivos area slopes from north to south and towards Alamo Pintado Creek which runs north to south through the community. The soil types in the area can generally be described as relatively impermeable silts and clays. Groundwater depths vary but can be as shallow as 5 feet during wet winter months.

1.2 Background and Summary of Key LOWWMP Issues

1.2.1 History

The Los Olivos Special Problems Area designation was established in 1974. The limits of the SPA are shown on Figure 1.2. The SPA designation requires an additional review for development projects to mitigate any threats to public health. In addition, the Central Coast Regional Water Quality Control Board (RWQCB) has imposed wastewater flow restrictions on each parcel thereby limiting the owner's use of the property. There are currently ten "Special Problems Areas" in the County of Santa Barbara, with Los Olivos being the first management plan prepared to address onsite wastewater issues. More and more areas of California with increasing onsite wastewater effluent loads are identifying groundwater quality issues and are adopting management plans to address the problem.

[1] Santa Barbara County Los Olivos Wastewater Management Plan (Environmental Health Services, September 2010)
[2] Santa Ynez Valley Community Plan Environmental Impact Report (County of Santa Barbara, September 2009)

There are a number of factors that make the use of onsite wastewater treatment systems (OWTS) a problem in the Los Olivos Special Problem Area. These factors include:

- A high groundwater table exists seasonally in many areas of Los Olivos resulting in an inadequate separation of groundwater to existing leach fields and dry wells. In some cases, septic system effluent is being discharged directly into the shallow groundwater table.
- Many small lots in the Los Olivos SPA have inadequate area for proper sizing or set-backs for leach fields. The RWQCB has historically determined that a developed residential lot of less than one acre in size is insufficient for a competent leach field, and new State standards require 2.5 acres for new subdivisions using OWTSs.
- The age of many septic systems in the Los Olivos area exceed the expected life of septic tanks and/or dispersal systems. Many of these are no longer treating the wastewater or leaching effectively.
- Many of the existing systems are not designed to current codes and requirements. A number of existing systems were installed under antiquated design standards under marginal site conditions.
- The number of marginal or ineffective systems is exacerbated by the high density of OWTSs in Los Olivos. Based on the average annual rainfall of the Santa Ynez Valley, and the calculated effluent from the existing OWTS in the Special Problems Area, approximately 50% of the current groundwater recharge contributed by the surface rains directly over the Special Problem area is from area septic system effluent.

1.2.2 Water Quality Issues

The LOWWMP documents the upward trend of nitrates in both the shallow and deep aquifers, describes the issues with existing septic systems, and presents alternatives and recommendations for resolving the upward trend of this contamination and gradually improving ground water quality. The LOWWMP also recommends development of a community wastewater treatment system for the downtown core, and other lots that do not meet current or anticipated Onsite Wastewater Treatment System (OWTS) design requirements.

A great deal of information is presented in the LOWWMP on the water quality data from well testing performed in the Los Olivos area. Shallow wells in and around the problem area, and deeper wells immediately under or adjacent to the problem area, are most influenced by the nitrate contamination.

Since the LOWWMP was published, new water quality data has been obtained from 2011 and the first half of 2012 for various municipal wells down gradient or in the immediate vicinity of the Los Olivos Special Problem Area. Measured nitrate levels from 2011 and the first half of 2012 are generally consistent with earlier reported levels.

1.2.3 Community Wastewater Treatment System

As identified in the LOWWMP, there is currently some support within the business community to implement a community wastewater system for the benefit of the downtown commercial area as soon as feasible. This support stems from the fact that as substandard systems fail, there are few options for repair and replacement of these systems because of the small, compact lots in the downtown area. This condition also limits the extent that the businesses may be able to do business as they desire, or develop to the highest zoned use, add restrooms, wash facilities or sinks, or engage in high water use activities. There is also a desire by the business community to be able to construct public restrooms. Options for funding and operating are discussed in the PER. Key concerns for the community are local control and reasonable costs. One goal is to offset high initial capital improvement costs by tapping into grants, low-interest loans, and possibly other agencies.

Options for a package or expandable system are analyzed in greater technical detail in this PER than presented in the LOWWMP.

1.2.4 Centralized Sewer Option and Connection to the Solvang WWTP

The alternative of a centralized sewer collection and treatment system, including the option to pipe untreated wastewater to the Solvang Wastewater Treatment Plant (WWTP) is presented in a summary fashion in the LOWWMP. It is updated here, to give the option some discussion in this PER. A rigorous investigation of this option was not pursued for several reasons:

- Initial community comments during development of the LOWWMP,
- Policies of the Santa Ynez Valley Community Plan[3] (SYVCP), adopted during the preparation of the LOWWMP that limit sewer extensions across jurisdictional boundaries, and
- Preliminary capital improvement cost estimates non-competitive to other options, assuming Solvang WWTP improvements.

1.2.4.1 Wastewater Treatment

The Solvang wastewater treatment plant lies down-gradient approximately 6 miles from Los Olivos. There have been no formal discussions with the City of Solvang regarding the possibility of connecting to their plant, although the concept has been informally discussed within the Los Olivos community since the formation of the SPA in the 1970’s.

The City of Solvang WWTP collects and treats wastewater from within the Solvang city limits and the Santa Ynez Community Service District (SYCSD) service boundary. The plant has a capacity of 1.50 million gallons per day (mgd) that is contractually allocated between the City of Solvang (1.20 mgd) and SYCSD (0.30 mgd). A small amount of the SYCSD allocation is used by the Chumash Reservation.

The Solvang WWTP is currently operating at an average daily flow of approximately 0.72 mgd. Additional capacity is allocated for future build-out of the Skytt Mesa subdivision, as well as by some development infill on various underdeveloped or undeveloped lots in the City. There could be as many as 464 future residential units built as projected in section 5.13 of the Water System Master Plan Update EIR[4] (based on January 2011 accounting of dwelling units) and there is a potential for approximately 260,000 gpd in additional water consumption. Wastewater return is between 60-90% of water demand, thus the increase in wastewater would be between 0.16-0.23 mgd.

Typically the RWQCB requires reporting and planning activities leading plant capacity improvement once 80% of the average dry-weather flow design capacity of the plant is exceeded. This means that significant plant capacity improvements would need to be considered once the plant reaches 80% of capacity, or 1.2 mgd. Any detailed analysis of this option would need to consider this fact, and consider if flows from Los Olivos would cause plant capacity to exceed a total of 1.2 mgd at the time of completion or within projected build-out of the City and SYCSD. Potential plant improvements may need to be studied, planned, or implemented if this were the case.

If this option were to trigger capacity improvements at the Wastewater Treatment plant, modifications may be needed to primary and secondary treatment systems, solids drying and handling facilities, and may also trigger the imposition of the addition of tertiary treatment processes by the RWQCB sooner than otherwise required.

[3] Santa Ynez Valley Community Plan (County of Santa Barbara, October 2009)
[4] City of Solvang Water System Master Plan Update EIR (Meridian Consultants, June 2012)

It is unknown what the cost may be to increase the capacity of the Solvang WWTP. Also, operations and maintenance cost will be billed as customer use. There will be no co-ownership agreement between Solvang and Los Olivos if they were to connect to the Solvang WWTP.

Regional wastewater treatment has some advantages. They include cost sharing in the development of treatment improvements as future wastewater regulatory requirements for tertiary treatment are imposed by the RWQCB, a more efficient use of land for treatment, reducing land purchase costs, and a consolidation of O & M costs.

1.2.4.2 Wastewater Collection and Pipeline to Solvang

In addition to possible treatment plant modifications, a 6.7 mile long "carrier main" pipeline would be required which could be a separate main to the lift station at the Santa Ynez River, or may include up to a half mile of replacement of existing Solvang Trunk Mains if a common main through town is used. This would be in addition to the local collection system in the Los Olivos community.

The existing Lift Station at the Santa Ynez River and force main are relatively new, but the capacity of this facility at build-out would need to be evaluated to determine if modifications would be required to accommodate the additional flows from Los Olivos. Improvements required could range from wet-well capacity improvements to full system replacement.

The estimated cost of construction for this collection system and carrier main is presented in the LOWWMP, but is updated below based on increasing construction costs as represented also in the PER:

Table 1.1 – Cost to Pipe Los Olivos Effluent to Solvang

Item	Estimated Cost ($ Millions)
32,700 ft. 15" trunk main (includes project development costs)	12.1
2,280 ft. 24" and 30" Main Replacement	0.96
Total	**13.1**

1.2.4.3 Joint System With Ballard

Both the option to connect to Solvang, and connecting to a joint system with Ballard conflict with the Santa Ynez Valley Community Plan (SYVCP) policy WW-SYV-3, which discourages annexation or extension of sewer lines into other jurisdictions due to its growth-inducing impacts. Therefore, this option would require an amendment to the SYVCP or a Board of Supervisors' finding that the existing conditions constitute a threat to public health. In addition, a LAFCO action could be required or a non-contiguous service agreement between agencies may have to be developed.

1.2.4.4 Cost Considerations

In general, the following is a summary of cost considerations for this option. (A detailed study would be necessary to assign a detailed numerical estimate):

- Collection system costs would be similar to other options, or about $8.3 million.
- Carrier main project development and construction costs, at about $13.1 million.

- Operations and Maintenance costs of both the collection system as well as contributions to O&M at the WWTP. These costs could range as high as $250K-$300K annually.
- Administrative Annexation & Cooperative Agreement Costs.
- Potential cost to increase capacity at the Solvang WWTP, if determined that the Los Olivos WW contributes to the 80% capacity “trigger” at Solvang SYCSD build-out.
- Potential cost to modify existing lift station and force main, if required.
- Environmental studies and EIR development.
- Design and construction management and inspection costs for any non-pipeline elements.

1.3 New State Policies on OWTS from the SWRCB

Since the LOWWMP was published in the fall of 2010, the State Water Resources Control Board (SWRCB) has adopted new policy as a result of Assembly Bill 885 establishing criteria for the siting, installation and operation of OWTS throughout the State. The new standards contained in the policy are stricter than those that currently exist and make a community treatment facility more desirable. The new statewide standards for wastewater systems are organized by “tier”. A basic description of each tier follows:

Tier 0- Systems in this tier are existing previously permitted systems that are functioning as designed. These OWTS will remain in tier 0 until their status changes due to failure. The OWTSs on parcels of an acre or more in the Los Olivos area will be considered as Tier 0 until they are in need of repair. OWTS that are located on the small township lots are unlikely to remain in the Tier 0 category and will subject to the requirements of a Local Area Management Plan (LAMP).

Tier 1- These OWTS are considered “low risk” and the standards contained in tier 1 apply for all areas in California that do not have a Local Area Management Program. This tier establishes the requirement that all new and replacement systems be engineered and requires additional setbacks from water bodies, establishes vertical separation from groundwater and prohibits the use of seepage pits (drywells). This Tier also specifies other engineering requirements, application rates and minimum lot sizes of 2.5 acres for subdivisions proposing to use OWTSs. These requirements would certainly apply to entire County of Santa Barbara as well as Los Olivos unless a Local Area Management Plan is developed and adopted.

Tier 2- This is the “Local Area Management Plan” or LAMP tier that is a custom crafted, county wide plan that addresses the siting, installation and repair of OWTSs. Because the LAMP is written to reflect local conditions, it does not have to follow the Tier 1 requirements. However, it has to be approved and overseen by the RWQCB and it is certain that areas such as Los Olivos with substandard lots and groundwater concerns would have supplemental treatment requirements. If standards are proposed that are less stringent than the Tier 1 statewide requirements, an explanation must be provided to the RWQCB explaining how the lesser standards are as protective to groundwater and surface water. Any Local Area Management Plan would certainly impact Los Olivos.

Tier 3- This tier is specifically for impacted area where a Total Maximum Daily Load (TMDL) for contaminants has been established by the RWQCB or special provisions established within an approved Local Area Management Plan. These are the requirements for supplemental treatment which include installation, monitoring and maintenance. These standards will impact Los Olivos and could contain requirements for an operating permit, mandatory maintenance and a maintenance district.

Tier 4- These are repair standards which will impact all OWTSs countywide.

OWTS located in Los Olivos could not be considered as “low risk” due to the constraints previously noted. Therefore the OWTS could only be considered in a Tier 2 or Tier 3 wastewater program and would require that OWTS effluent be treated with supplemental treatment to remove constituents of concern.

1.4 Purpose and Scope

The purpose of this Preliminary Engineering Report (PER) is to discuss, evaluate, and make recommendations for a community wastewater collection, treatment and disposal system for the downtown core, as well as other parcels in the Los Olivos Special Problem Area.

The PER builds on the recommendations of the Los Olivos Wastewater Management Plan (LOWWMP). The LOWWMP provides recommendations to reduce septic system usage and address nitrate levels in groundwater. This PER further explores wastewater collection, treatment and disposal alternatives discussed in the LOWWMP. An assessment of two types of collection systems, four treatment system options, and four effluent disposal alternatives is provided. These alternatives were selected based on discussions with County staff, anticipated wastewater permit requirements, and AECOM’s understanding of the community’s needs.

In addition to collection, treatment, and disposal alternatives, preliminary evaluation criteria for siting a Wastewater Treatment Plant (WWTP) and disposal facilities are provided. Evaluation criteria include acreage requirements, zoning, and potential impacts to adjacent uses.

For discussion purposes, an Engineer’s Opinion of Construction Cost is presented and analyzes the costs of treatment, effluent disposal, and collection system components for the most likely project. Operations and maintenance costs were also estimated. To better understand the financial impact to the community, a preliminary estimate of the anticipated cost range per user is also provided. A brief discussion is provided on the formation of a managing body, such as a district that will be necessary to oversee the funding, operation and maintenance of the assumed WWTP and disposal facilities.

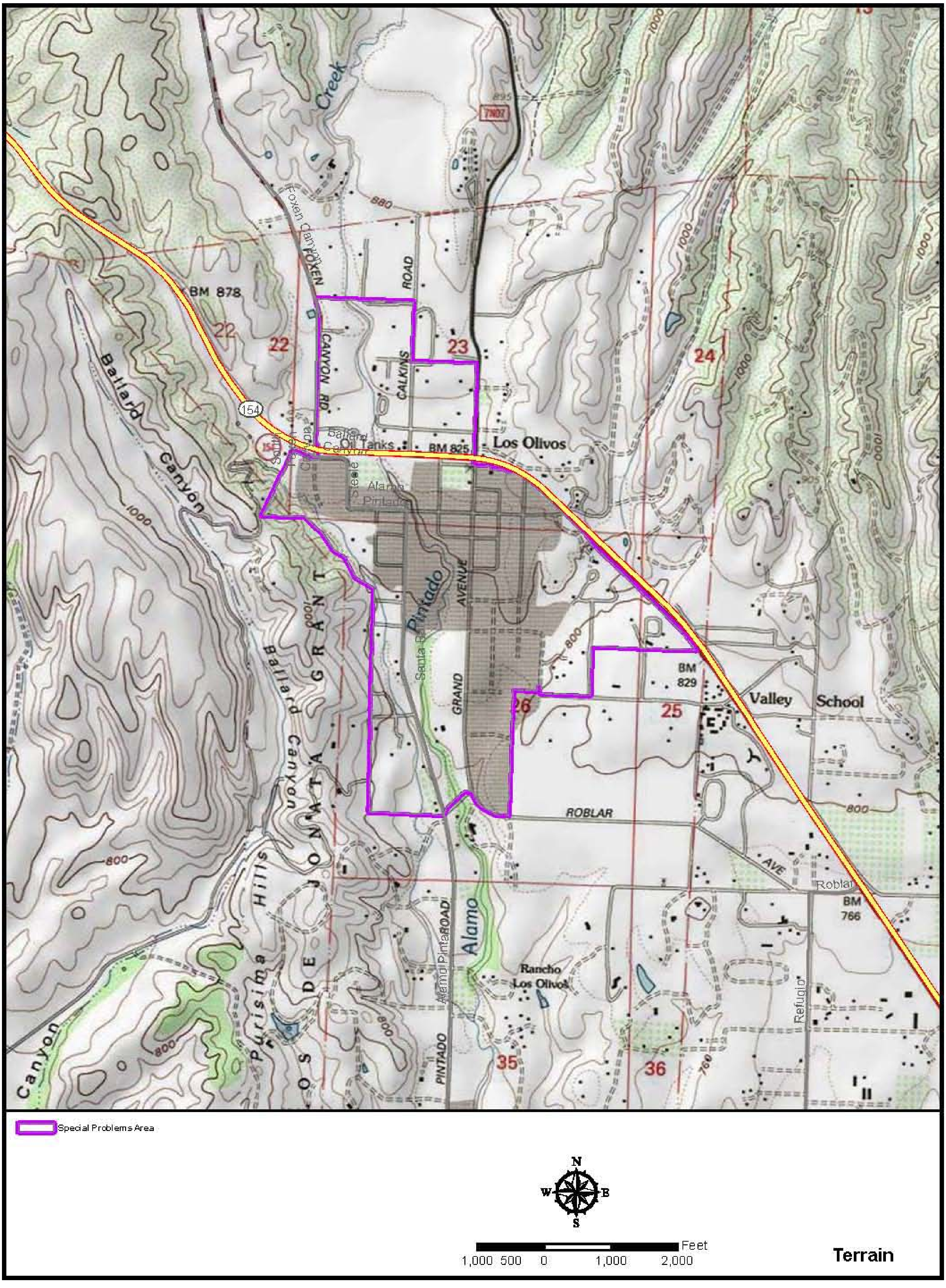

Figure 1.1 Area Topography

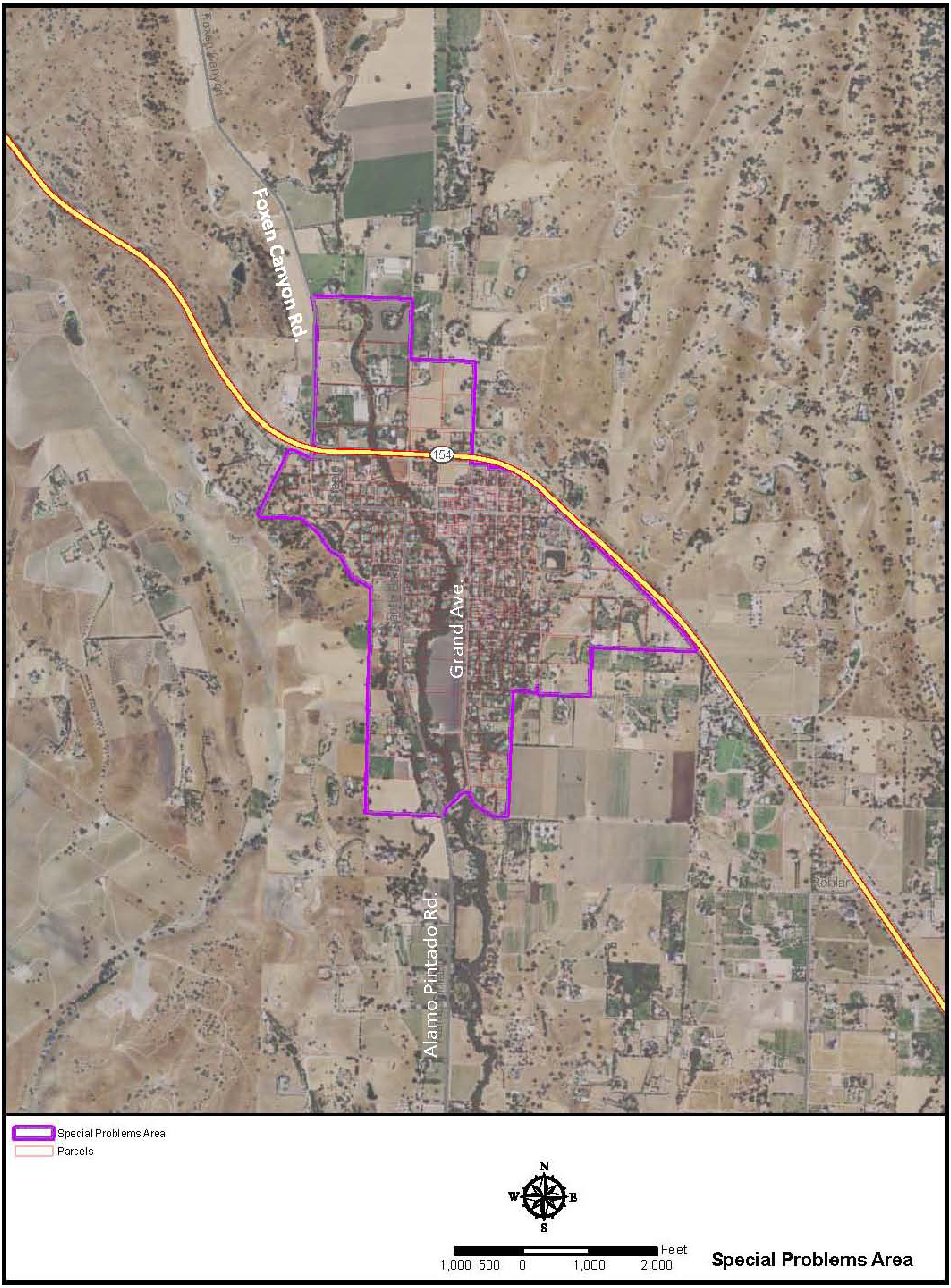

Figure 1.2 Special Problems Area

2 Project Phasing

The collection system and WWTP for the Los Olivos SPA may be implemented in one, two or three distinct phases. In this study it is assumed the collection system and WWTP would be developed in three (3) phases, although phase 1 and 2 can be combined if it would improve the affordability of the first phase, and if it is desired by the County. As discussed in the LOWWMP, the initial focus of the project will be on the largely commercial downtown core and in the future, facilities may be expanded to include more existing residential users as well as future residents and businesses. The specific phasing approach for the project is discussed in detail below.

2.1 Overview

Several factors have contributed to the specific focus on the downtown core including:

- Number and concentration of small lots;
- Higher water use per system connection; and
- Shallow groundwater table

In addition to these key factors, commercial business owners have been prevented from fully developing their property and adding sufficient public restroom facilities to support tourist traffic during the weekends. Implementation of a new centralized system will alleviate the wastewater impacts to the underlying groundwater basin and remove the restriction to expansion of local businesses.

2.2 Phase I (Existing Commercial and Select Residential)

The focus of the initial phase (Phase I) of the Los Olivos WWTP is the existing commercial area within the downtown core as shown in Figure 2.1. Estimates of the existing commercially developed area were obtained from the 2009 EIR. As part of the 2009 EIR, AECOM evaluated estimated water demands and wastewater generation factors for the communities located within the Santa Ynez Valley, including Los Olivos. The 2009 EIR was adopted by the Board of Supervisors (BOS) in October 2009. In addition to commercial development, a small number of residential lots will be included in Phase I due to their location and the convenience extending service to them while primarily serving the commercial area. Descriptions of the Phase I residential and commercial components are provided below.

2.2.1 Residential Component

According to County staff, there are a small number of residential parcels located near the downtown core that are less than a half-acre. Within this report, these lots will be referred to as substandard lots. Due to their small size and lack of sufficient area for adequate treatment and disposal of wastewater, significant challenges are present when upgrades to the onsite wastewater treatment systems (OWTSs) are required.

County staff has estimated there are a total of 40 substandard residential lots in the northern portion of the community near the downtown core. Of these, up to 25 are located on the east side of Alamo Pintado Creek contiguous to the downtown area. Therefore, for the purpose of this report, the capacity to serve 25 of these residences will be added to Phase I of the project. This additional capacity has been assumed since the property owner for a substandard residential parcel located adjacent to the downtown core's new collection system alignment may opt to connect to the community wastewater system rather than upgrade their existing OWTS.

2.2.2 Commercial Component

According to the 2009 EIR, there are currently 228,990 sf of commercially-developed area within the Los Olivos downtown area. This area, along with the wastewater generation factors developed in the 2009 EIR, will be used to develop the flow and loading contributions from the commercial component for the Phase I project. A discussion of the flows and loadings determinations is provided in Section 3 of this PER.

2.3 Phase II (Build-Out Commercial and Select Residential)

Like Phase I, Phase II of the Los Olivos WWTP will be primarily focused on the commercial component of the downtown core. Information obtained from the 2009 EIR was used to develop estimates for the commercial component of Phase II.

2.3.1 Residential

The residential component of the Phase II project will not change from Phase I.

2.3.2 Commercial

According to the 2009 EIR, the downtown core has a build-out capacity of approximately 1,018,000 sf. This figure, along with the wastewater generation factor developed in the EIR, is used to develop the flow and loading contributions from the commercial component for the Phase II project.

2.4 Phase III (Build-Out Commercial and Build-Out Residential)

Phase III of the project as shown in Figure 2.1 represents the ultimate build-out phase of the WWTP, and will add the capacity to treat the wastewater generated by the remaining local residences.

2.4.1 Residential

The 2009 EIR estimates the total residential units in Los Olivos at 400. The Phase III project will have the capacity to treat the wastewater generated by these 400 units or connections. Since 25 substandard residential lots were already accounted for in Phase I and II, Phase III will add capacity to serve the remaining 375 residences.

2.4.2 Commercial

Since Phase II of the project represents the build-out of the downtown core, the commercial component of the Phase III project remains unchanged from Phase II.

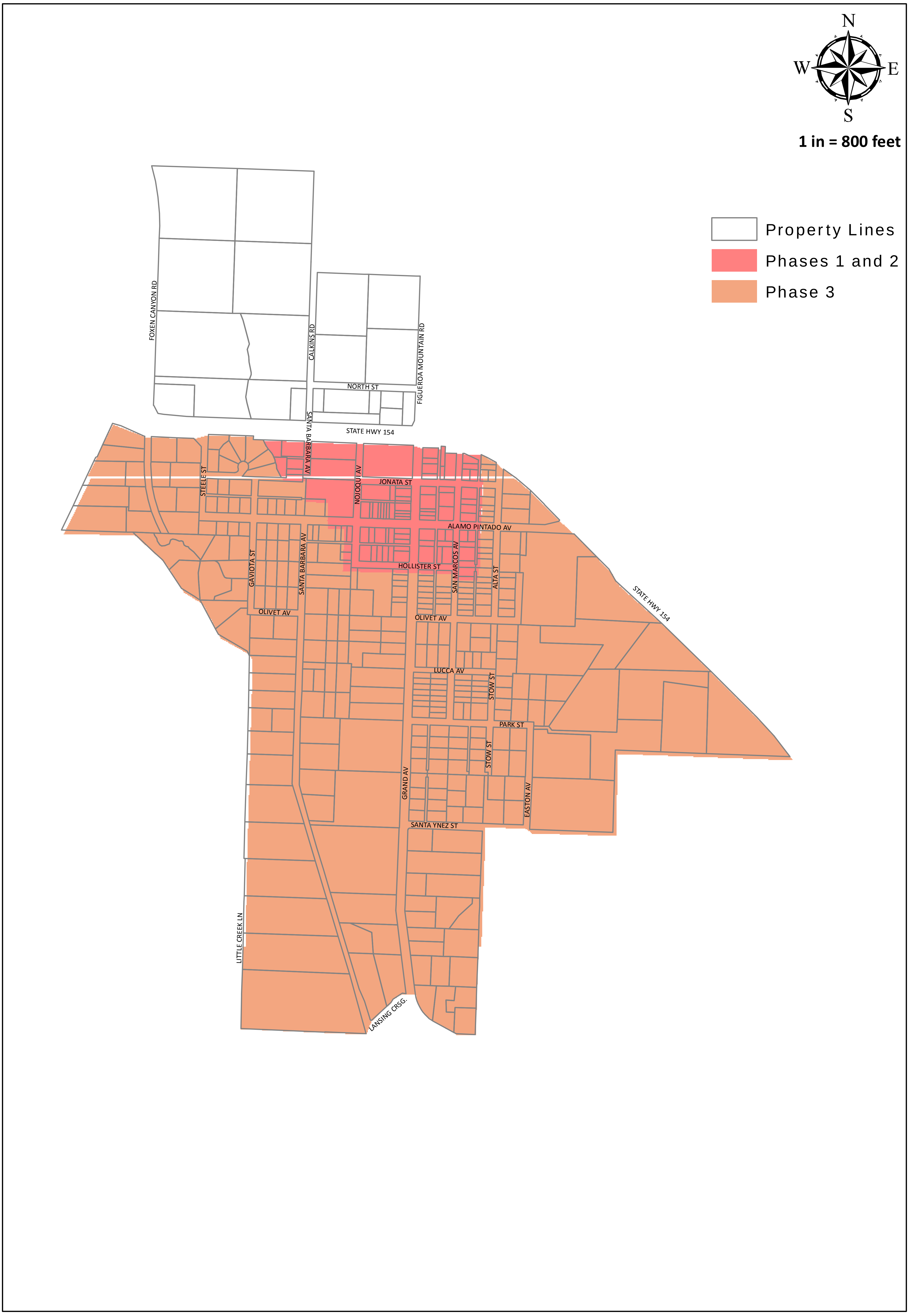

Figure 2.1 Project Phasing

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3 Flows and Loadings

The purpose of this section is to summarize the projected wastewater flows and loadings from commercial and residential development within Los Olivos. Estimates for average and peak flow conditions were previously provided in the LOWWMP. As described below, these flows and loadings have been refined in this report to develop design criteria for the treatment alternatives and properly size the components of the collection system.

3.1 Flow Projections

Wastewater estimates were previously developed in the LOWWMP and the 2009 EIR. The flow projections in the LOWWMP were developed using a method based on assumed septic tank volumes and a percentage of anticipated potable water usage. Based on this method, a maximum daily flow (MDF) of 323,000 gallons per day (gpd) and an associated average daily flow of 180,000 gpd were determined.

The 2009 EIR estimated residential wastewater flows using a factor of 215 gpd per connection. Commercial wastewater flows were estimated based on a factor of 0.056 gpd per sf of commercially-developed area. This commercial wastewater duty factor was determined in the EIR using 1,050 gpd per parcel divided by the average area of a commercial parcel in the Santa Ynez Valley.

3.1.1 Annual Average Flow

For the purposes of this PER, AECOM has revised the flow projection methods from the LOWWMP to make the annual average daily flow (AADF) consistent with the 2009 EIR. Rather than utilizing septic tank volumes and potable water usage to estimate wastewater flows, flow factors per residential unit and commercially-developed square footage are used in this PER.

3.1.1.1 Residential Flow Determination

In order to be consistent with the 2009 EIR, residential wastewater flows were determined using a factor of 215 gpd per connection. According to the Land Use Element of the Santa Barbara County Comprehensive General Plan[5], the approximate household size for urban areas with one unit per acre in the Los Alamos-Garey-Sisquoc area is 3.0 residents per household. Assuming a similar dwelling size for Los Olivos, the resulting per capita wastewater generation factor is 72 gpd. This factor is consistent with typical residential wastewater generation in the Central Coast of California.

3.1.1.2 Commercial Flow Determination

The method for determination of the commercial component of the Los Olivos wastewater flows is also adapted to be consistent with the 2009 EIR, and uses a factor of 0.056 gpd per sf for commercial development.

[5] County of Santa Barbara Comprehensive General Plan Land Use Element (Republished May 2010)

3.1.2 Summary

Based on the proposed phasing scheme and wastewater generation factors described previously, a summary of the AADF per phase is provided in Table 3.1.

Table 3.1 – Projected Average Annual Daily Flows

	Residential			Commercial			
Phase	Cumulative Connections	Factor (gpd/connection)[1]	AADF (gpd)	Area (sf)	Factor (gpd/sf)[1]	AADF (gpd)	Total[2] (gpd)
I	25		5,400	228,990		12,800	**19,000**
II	25	215	5,400	1,018,071	0.056	57,000	**63,000**
III	400		86,000	1,018,071		57,000	**143,000**

Notes:
1. Residential and commercial flow factors adapted from the Santa Ynez Valley Community Plan Environmental Impact Report adopted by the Board of Supervisors in October 2009.
2. Totals are rounded up.

3.1.3 Average Day Maximum Month Flow

The design of a WWTP is generally based on the average day maximum month flow (ADMMF). To calculate the ADMMF, a factor is applied to the AADF. For the purposes of this PER, a factor of 1.1 has been assumed. This factor is typical for a community with a high volume of tourist traffic such as Los Olivos. For example, a historical ADMMF factor of 1.1 has been observed for the City of Morro Bay/Cayucos Sanitary District WWTP located in the neighboring County of San Luis Obispo[6]. A summary of the ADMMF conditions is provided in Table 3.2.

Table 3.2 – Projected Average Day Maximum Month Flows

	AADF (gpd)			ADMMF: AADF Factor[1]	ADMMF (gpd)		
Phase	Residential	Commercial	Total		Residential	Commercial	Total[2]
I	5,400	12,800	19,000		5,900	14,100	**20,000**
II	5,400	57,000	63,000	**1.1**	5,900	62,700	**69,000**
III	86,000	57,000	143,000		94,600	62,700	**158,000**

Notes:
1. ADMMF factor typical of communities with large volumes of summer tourist traffic.
2. Totals are rounded up

3.1.4 Maximum Daily Flow

To estimate the MDF for the Los Olivos SPA, AECOM reviewed collection system master plans for nearby communities with a similar size and demographic. Based on this review, a MDF factor of 3.2 has been assumed for this PER. For example, this factor is consistent with the San Simeon Community Service District (SSCSD)[7]. The SSCSD has a population less than 1,000 people, and much like Los Olivos, experiences large numbers of tourists during the summer months. A summary of the MDF values for Phase I, II, and III of the Los Olivos WWTP are included in Table 3.3.

[6] City of Morro Bay/Cayucos Sanitary District WWTP Draft Facility Master Plan (Carollo, September 2007)
[7] San Simeon CSD Water System Master Plan and Wastewater Collection System Evaluation (Boyle, November 2007)

Table 3.3 – Projected Maximum Daily Flows							
	AADF (gpd)			**MDF: AADF Factor[1]**	**MDF (gpd)**		
Phase	**Residential**	**Commercial**	**Total**		**Residential**	**Commercial**	**Total[2]**
I	5,400	12,800	19,000		17,300	41,000	**59,000**
II	5,400	57,000	63,000	**3.2**	17,300	182,400	**200,000**
III	86,000	57,000	143,000		275,200	182,400	**458,000**

Notes:
1. MDF factor typical of communities with large volumes of summer tourist traffic.
2. Totals are rounded up.

3.1.5 Peak Hour Flow

The peak hour flow (PHF) is used as the design criteria to size the collection system, headworks facilities, process pipelines, meters, and other critical hydraulic appurtenances. Usually, wastewater flows increase during wet weather periods due to the influence of inflow and infiltration (I/I). Like determination of the MDF, the PHF is estimated using the AADF and an appropriate peaking factor.

Based on the existing population estimate of 1,000 residents for Los Olivos, the assumed peaking factor for this report is 4.5. For comparison, Wastewater Engineering: Treatment and Reuse (Metcalf & Eddy)[8] recommends using a peaking factor of 4.0 for communities with populations less than 4,000. A peaking factor of 4.5 is recommended to account for the large volume of tourists the downtown area can experience. A summary of the PHF conditions is provided in Table 3.4.

Table 3.4 – Projected Peak Hour Flows							
	AADF (gpd)			**PHF:AADF Factor[1]**	**PHF (gpd)**		
Phase	**Residential**	**Commercial**	**Total**		**Residential**	**Commercial**	**Total**
I	5,400	12,800	19,000		24,300	57,600	**82,000**
II	5,400	57,000	63,000	**4.5**	24,300	256,500	**281,000**
III	86,000	57,000	143,000		387,000	256,500	**644,000**

Notes:
1. PHF factor typical of communities with large volumes of summer tourist traffic.

[8] Metcalf & Eddy – McGraw-Hill (March 2002)

A summary of the various flow and peaking factors used to project flows for each phase of the Los Olivos WWTP project are summarized in Table 3.5.

Table 3.5 – Summary of Flow Projection Factors	
Flow Condition	**Flow Projection Factor**
Average Residential Wastewater Flow per Connection per Day (gpd/connection)	215
Average Commercial Wastewater Flow per Square Foot per Day (gpd/SF)	0.056
Average Annual Daily Flow (AADF)	1.0
Average Day Maximum Month Flow (ADMMF)	1.1
Maximum Daily Flow (MDF)	3.2
Peak Hour Flow (PHF)	4.5

These flow and peaking factors were used in conjunction with the residential connection and commercially developed square footage information from the Santa Ynez EIR to yield the various flow conditions for each phase of the project, summarized in Table 3.6.

Table 3.6 – Projected Flows Summary				
Phase	**AADF (gpd)**	**ADMMF (gpd)**	**MDF (gpd)**	**PHF (gpd)**
I	19,000	20,000	59,000	82,000
II	63,000	69,000	200,000	281,000
III	143,000	158,000	458,000	644,000

3.2 Loadings Projections

Generally, wastewater strength is defined by its five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and nitrogen content. Design loadings for a WWTP are typically determined by the ADMMF and the influent BOD, TSS, and nitrogen concentrations selected, as described below. These values are used to develop design criteria for the treatment process alternatives presented in this report.

3.2.1 Biochemical Oxygen Demand

The BOD concentration is described as the amount of oxygen required, over a five-day period at 20 degrees Celsius, by bacteria while stabilizing decomposable organic matter under aerobic conditions. In the absence of existing data, assumptions regarding the relative strength of the wastewater were made for this report. Due to the variances between residential and commercial wastewater, separate projections were developed for each source.

3.2.1.1 Residential

In order to develop organic loading projections for the residential component of the Los Olivos WWTP, recommendations from Metcalf & Eddy (2002)[1] were used. According to the text, the average BOD concentration for moderate-strength domestic wastewater is 190 milligrams per liter (mg/L). This value, along with the flows determined in Section 3.1 of this PER, was used to develop the design organic loading for each phase of the WWTP. As mentioned previously, often the ADMMF is used to size the biological components of a treatment facility. For the purposes of this PER, design loadings for each phase have been determined using the ADMMF and average constituent concentrations for BOD, TSS, and TKN.

3.2.1.2 Commercial

In order to dissect the anticipated organic loading from the commercial component of the wastewater flow, concentrations for both retail and non-retail/commercial wastewater dischargers were developed. A flow-weighted average was then used to determine a composite BOD concentration for the total commercial flow. The Santa Ynez EIR provides a breakdown of the total build-out commercial area of 1,018,071 sf between retail and non-retail/commercial, which is 48 and 52 percent respectively. With a BOD concentration of 650 mg/L for retail and 950 mg/L for non-retail/commercial, the weighted average is 810 mg/L. This concentration along with the ADMMF is used to determine the organic loading from the downtown core for each phase of the WWTP project.

3.2.1.3 Summary

The organic concentrations and loadings for the residential, commercial, and combined wastewater flows for the three phases of the Los Olivos WWTP are provided below. The total BOD loads, summarized in Table 3.7, are used in a latter section of this PER to develop design criteria for several different treatment alternatives.

Table 3.7 – Projected Influent BOD Loading

	Residential			Commercial			Total	
Phase	ADMMF (gpd)	BOD (mg/L)	BOD (ppd)	ADMMF (gpd)	BOD (mg/L)[1]	BOD (ppd)	BOD (mg/L)	BOD (ppd)
I	5,900		9	14,100		95	**630**	**105**
II	5,900	190	9	62,700	810	424	**755**	**435**
III	94,600		150	62,700		424	**435**	**575**

Notes:
1. Based on a weighted-average between retail and non-retail/commercial.

3.2.2 Total Suspended Solids

Along with BOD, TSS is one of the most common conventional pollutants regulated by an authority's Waste Discharge Requirements (WDRs). The TSS concentration is a measure of the suspended material in the influent.

3.2.2.1 Residential

The residential component of the total TSS loading to the WWTP was determined in accordance with the methodology previously described for organic or BOD loading. Metcalf & Eddy (2002) presents a typical moderate strength domestic wastewater average TSS concentration of 210 mg/L.

3.2.2.2 Commercial

The TSS loading for the commercial portion of the wastewater flow for the WWTP was determined using the same weighted-average method previously described for BOD loading. With a TSS concentration of 250 mg/L for retail and 750 mg/L for non-retail/commercial, the weighted-average is 510 mg/L. This concentration along with the ADMMF is used to determine the solids loading from the downtown core for each phase of the WWTP project.

3.2.2.3 Summary

The TSS concentrations and loadings for the residential, commercial, and combined wastewater flows for the three phases of the Los Olivos WWTP are provided below. The total TSS loads, summarized in Table 3.8, were used to develop design criteria for several different treatment alternatives.

Table 3.8 – Projected Influent TSS Loading								
	Residential			Commercial			Total	
Phase	ADMMF (gpd)	TSS (mg/L)	TSS (ppd)	ADMMF (gpd)	TSS (mg/L)[1]	TSS (ppd)	TSS (mg/L)	TSS (ppd)
I	5,900		10	14,100		60	**420**	**70**
II	5,900	210	10	62,700	510	267	**480**	**275**
III	94,600		166	62,700		267	**330**	**435**

Notes:
1. Based on a weighted-average between retail and non-retail/commercial.

3.2.3 Nitrogen

Nitrogen can be found in several different forms in raw wastewater including ammonia, organic nitrogen and nitrate. Typically, the nitrogen in untreated domestic wastewater is comprised of ammonia and organic nitrogen and is defined as the total Kjeldahl nitrogen (TKN). Since nitrogen is the main contaminant causing degradation of the groundwater basin, it is anticipated that any disposal method will require nitrogen removal or denitrification. Accurate determination of the influent nitrogen load is critical to development of design criteria for individual treatment alternatives.

3.2.3.1 Residential

The residential component of the total nitrogen load to the WWTP was determined in accordance with the methodology previously described for BOD and TSS loading. Again, Metcalf & Eddy (2002) was used to determine the average TKN concentration. Based on a moderate strength domestic wastewater, a value of 40 mg/L was used.

3.2.3.2 Commercial

Determination of the nitrogen loading for the commercial portion of the wastewater flow for the WWTP was determined using the same weighted-average method previously described for BOD and TSS loading. With a TKN concentration of 120 mg/L for retail and 75 mg/L for non-retail/commercial, the weighted-average is 100 mg/L. This concentration along with the ADMMF is used to determine the nitrogen loading from the downtown core for each phase of the WWTP project.

3.2.3.3 Summary

The TKN concentrations and loadings for the residential, commercial, and combined wastewater flows for the three phases of the Los Olivos WWTP are provided below. The total TKN loads, summarized in Table 3.9, are used in Section 6 of this PER to develop design criteria for several different treatment alternatives.

Table 3.9 – Projected Influent TKN Loading								
	Residential			Commercial			Total	
Phase	ADMMF (gpd)	TKN (mg/L)	TKN (ppd)	ADMMF (gpd)	TKN (mg/L)[1]	TKN (ppd)	TKN (mg/L)	TKN (ppd)
I	5,900		2	14,100		12	**90**	**15**
II	5,900	40	2	62,700	100	52	**95**	**55**
III	94,600		32	62,700		52	**65**	**85**

Notes:
1. Based on a weighted-average between retail and non-retail/commercial.

4 Regulations

4.1 Overview

Regulatory requirements for the WWTP will ultimately be determined by the selected effluent disposal method, and will be influenced by the type of treatment processes implemented. The Central Coast RWQCB is the agency responsible for issuing WDRs for this project. These requirements are administered to protect the State's waters under the California Water Code and Porter-Cologne Act, a provision of the California Water Code. The RWQCB develops and issues WDRs for treatment systems that discharge to land (percolation and/or irrigation), and National Pollutant Discharge Elimination System (NPDES) permits for discharges to surface waters. Where treated wastewater is to be recycled (reuse) additional regulations are required by the California Department of Public Health (CDPH) under California Code of Regulations (CCR) Title 22, Division 4, Chapter 3, Water Recycling Requirements (Title 22). The RWQCB implements the Central Coast Basin Plan (Basin Plan) [9] objectives by enforcing WDRs.

The following provides a general overview of the Central Coast RWQCB groundwater objectives for Los Olivos, water supply composition, descriptions of conventional and non-conventional pollutants typically regulated in wastewater and criteria for the production and reuse of recycled water. Discussion of general regulations required for surface water and land-based discharges is also included.

4.2 Basin Plan Groundwater Objectives

The Basin Plan and subsequent Triennial Reviews (2001, 2005, and 2009) form the basis for the WDRs developed by the RWQCB. The community of Los Olivos is located within the Los Olivos Hydrologic Area of the Santa Ynez Hydrologic Unit as defined by the Basin Plan. The Basin Plan provides groundwater quality objectives that are typically used to guide discharge requirements. Table 4.1 summarizes groundwater quality objectives for Los Olivos (Santa Ynez Sub-basin).

[9] Water Quality Control Plan for the Central Coast Basin (State of California, Central Coast Regional Water Quality Control Board, 1994)

Table 4.1 – Los Olivos Ground Water Quality Objectives

Constituent	Average Concentration	Units
Total Dissolved Solids (TDS)	600	mg/L
Chloride (Cl)	50	mg/L
Sulfate (SO_4)	10	mg/L
Boron (B)	0.5	mg/L
Sodium (Na)	20	mg/L
Nitrogen	1	mg/L

Notes:
1. Objectives shown are median values based on data averages.
2. Objectives are based on preservation of existing quality or water quality enhancement believed attainable following control of point sources.

The Basin Plan outlines additional objectives for groundwater in order for it to be used for municipal and agricultural supply. Wastewater that is discharged to land with the potential to affect municipal water supplies must be monitored for bacterial concentrations. The Basin Plan designates that the median concentration of coliform organism over any seven-day period shall be less than 2.2/100 milliliters (mL). Additionally, to protect groundwater used for agricultural supplies, wastewater discharged to land shall not contain concentrations of chemical constituents in amounts that adversely affect the beneficial uses established for groundwater aquifers that would be affected by the discharge. The interpretation of adverse effect can be derived from the University of California Agricultural Extension Service guidelines found in the Basin Plan.

4.3 Water Supply

Existing source water data was obtained from the 2009 Annual Water Quality Report (2009 Water Quality Report) for the Santa Ynez River Water Conservation District- Improvement District No. 1 (District). In 2009 the District utilized both active groundwater wells operated by the District and surface water supplies. Surface water from the State Water Project via the California Aqueduct accounted for 37 percent of the District's supply for 2009. Understanding source water quality is important in establishing a baseline and determining the allowable impacts as a consequence of domestic use. A summary of the source water quality data obtained from the 2009 Water Quality Report is shown in Table 4.2.

Table 4.2 – 2009 Source Water Quality Data for Los Olivos		
Constituent	**Average Concentration**	**Units**
Total Dissolved Solids (TDS)	486	mg/L
Chloride (Cl)	62	mg/L
Sulfate (SO_4)	122	mg/L
Boron (B)	0.17	mg/L
Sodium (Na)	56	mg/L

Notes:
1 Values are based on a flow-weighted average of both surface and groundwater sources.

4.4 Pollutants

4.4.1 Conventional Pollutants

Conventional pollutants are those typically found in municipal wastewater that are used to characterize it. Municipal wastewater treatment facilities are typically designed to reduce the concentrations of conventional pollutants. Federal Regulations [40 CFR 401.16] includes the following as conventional pollutants: BOD, TSS, fecal coliform bacteria, oil and grease, and pH. Typically BOD and TSS are the most common conventional pollutants regulated in the WDRs with numerical limits.

4.4.2 Non-Conventional Pollutants

Non-conventional pollutants are those not included in the previous category. The two most important non-conventional pollutants that will likely be addressed by the RWQCB as part of the WDRs for the Los Olivos WWTP are salinity or total dissolved solids (TDS) and nitrogen. A brief explanation of these pollutants is provided below. Further discussion of these constituents is provided in latter sections of this PER.

4.4.2.1 Salinity

Salinity is a measure of the amount of minerals dissolved in wastewater. As a consequence of domestic and agricultural use, water dissolves minerals and the salinity of the wastewater is higher than that of the source water. Typical domestic water use adds 200 to 300 milligrams per liter (mg/L) of dissolved minerals to the water supply.

Based on available data from the 2009 Water Quality Report, the average TDS of the delivered State Water varied between 131 and 493 mg/L with an average of 362 mg/L. Groundwater varied between 400 to 710 mg/L with an average of 555 mg/L. Using a flow-weighted average based on the percentage of deliveries from each of these sources, the average water supply TDS for 2009 was 486 mg/L. Assuming an increase of 250 mg/L from domestic use the estimated wastewater TDS would be 736 mg/L. However, the ultimate source water quality will be impacted by the amount of State Water Los Olivos receives in any given year. Therefore, a range 736 mg/L to 805 mg/L has been assumed for this PER. The high end of the range is based on the community using only groundwater with an average TDS concentration of 555 mg/L and a salt increase of 250 mg/L.

4.4.2.2 Nitrogen

Nitrogen is a non-conventional pollutant found in treated wastewater effluent. Nitrogen compounds most commonly include ammonia, nitrate and organic nitrogen. Total nitrogen (TN) is a measure of the nitrogen that gives rise to nitrate and nitrite ions. Total nitrogen is the sum of nitrate (NO_3-N), nitrite (NO_2-N), ammonia (NH_3-N) organically bonded nitrogen. Since the main regulatory driver behind establishment of a centralized treatment system for the Los Olivos SPA is nitrate groundwater contamination from the existing OWTSs, AECOM has assumed the WDRs issued by the RWQCB will include a numerical discharge limitation for TN regardless of the disposal method selected. Groundwater sampling in the immediate vicinity of the effluent disposal site will also most likely be a provision of the WDRs.

4.5 Discharge Requirements

WDRs issued to the Los Olivos WWTP by the Central Coast RWQCB will explicitly state the constituent concentrations that will be permitted for discharge. The WDR will be constructed in such a way that ensures that beneficial uses will be maintained for receiving waters. The WWTP will be required to meet these discharge requirements and performance will be regularly monitored and recorded according to the Monitoring and Reporting section of the WDR.

4.5.1 Surface Water Discharge

Los Olivos is located immediately adjacent to Alamo Pintado Creek, a tributary to the Santa Ynez River (at Solvang). The reach of the Santa Ynez River downstream of Lake Cachuma, including the convergence with Alamo Pintado Creek, is listed by the State Water Resources Control Board (SWRCB) as a 303(d) impaired water body. This means its beneficial uses are impaired. The Central Coast Basin Plan identifies the following uses for Alamo Pintado Creek:

- Municipal and Domestic Supply
- Agricultural Supply
- Industrial Service Supply
- Groundwater Recharge
- Water Contact Recreation
- Non-Contact Water Recreation
- Wildlife Habitat
- Warm Fresh Water Habitat
- Commercial and Sport Fishing

In particular, the concentrations of nutrients, salinity and sedimentation impair its beneficial uses according to the SWRCB listing. If a surface water discharge is pursued, nutrients and salinity are the two parameters that could be incorporated into the Los Olivos project's discharge requirements. Nutrients would include nitrogen and/or phosphorus. In most dry areas like the Central Coast, phosphorus is not included in the permits since nitrogen is usually the limiting nutrient for eutrophication in surface waters. Nitrogen limits in surface waters are related to the aquatic habitat impacts of eutrophication, which can be much more sensitive to nitrogen levels than health impacts for humans.

Unlike land-based discharge alternatives and water reuse, surface water discharges require compliance with 40 CFR Part 131 Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California, or the California Toxics Rule (CTR), implemented under the NPDES permit and WDR orders in California. In order to comply with these criteria, a high level of treatment for non-conventional pollutants is often required. A more in-depth discussion of the California Toxics Rule is included below.

A surface water discharge option is not recommended for the Los Olivos WWTP due to the following challenges:

- Discouraged by both federal and state water policies;
- Additional, stringent discharge requirements to eliminate aquatic toxicity in accordance with the CTR;
- Ongoing and expensive testing for compliance with the CTR;
- Uncertain, constantly evolving regulatory environment; and
- Difficulty ceasing discharge once established, particularly if the receiving water supports endangered species and the discharge is considered a significant contribution to base flows.

4.5.1.1 California Toxics Rule

The CTR was finalized in May 2000 and identifies over 130 contaminants that must be monitored and treated if observed in plant effluent. These contaminants include organics and metals typically present in trace amounts in domestic wastewater. If present in treated effluent, they must be removed to provide long-term protection of public health and aquatic ecology. Allowable concentrations of these parameters can be more stringent than drinking water requirements. In accordance with the CTR, surface water discharges require regular toxicity testing up to four times per year. This testing includes exposing sensitive organisms such as daphnia and minnows to the effluent for a specified period of time and recording the percentage of fatalities. Toxicity limits based on these statistics, are included in the NPDES permit issued for surface water discharges and violations result in fines.

The likelihood of receiving permit limitations based on CTR parameters is difficult to predict. The studies needed to comply with the monitoring requirements of the Rule, not including the studies required to isolate and identify the actual toxicants if toxicity is observed, typically can cost $50,000 or more (City of Lompoc, 2011 WDR). Limiting concentrations of the CTR parameters are calculated by RWQCB on a case-by-case basis. Often, drinking water supplies and house plumbing can have a significant impact on the quality of plant effluent and can cause exceedance of CTR-based limitations. For instance, trihalomethanes, lead, and copper can enter wastewater collection systems through the water supply itself and through reactions between water and disinfectants and/or household plumbing. Each of these are included in the CTR list and limitations can theoretically be established at concentrations that are considerably less than drinking water levels. These constituents can be very difficult to remove by biological wastewater treatment processes.

4.5.1.2 Discharge Design

The design of an instream discharge requires special consideration. The most common design issues are limiting or preventing in-stream erosion, providing adequate mixing with the receiving water to diffuse contaminants, and minimizing construction impacts to the streambed. While the percolation discharge can be accomplished with either percolation ponds or “off-the-shelf” subsurface infiltration systems, surface water discharges typically require either an infiltration gallery buried under the creek bed, a “polishing channel” to slow the water and promote mixing at the confluence with the creek/stream, or an outlet design with velocity dissipation (such as a headwall with riprap armament). Any option will require considerable coordination during the design phase and, ultimately, approvals from California Department of Fish and Game (CDFG), National Oceanic and Atmospheric Administration (NOAA) Fisheries, and the Army Corps of Engineers (ACOE).

4.5.1.3 Possible Cost Impacts

Two modes of surface water discharge could be pursued by the County; seasonal and year-round discharge. The treatment requirements for seasonal discharge would be the same as for year-round discharge, since the California Toxics Rule applies to any and all discharges regardless of schedule.

To provide a more detailed discussion on the potential cost impacts to the project for planning, treatment and monitoring the Central Coast RWQCB was contacted. Several questions regarding requirements and restrictions for a surface water discharge from a community WWTP in Los Olivos were posed and Board Staff has provided comments (Appendix A). It is important to note that until a specific project is submitted to the RWQCB detailed requirements of the WDR will not be available. The letter represents the opinions of staff and the decisions of the Board itself can vary significantly. Within this letter the Board has provided a general overview of the level of treatment, likely studies and monitoring required for a surface water discharge to the Alamo Pintado Creek.

In addition, the Board noted that certain mandatory minimum penalties apply only to surface water dischargers. Per California Water Code, Section 13385 a mandatory penalty of $3,000 for any effluent limit violation assessed. Depending on the number of violations assessed, the penalty amount could be significant. The City of Paso Robles recently faced fines of up to $10,000 per day if treatment and discharge upgrades were not performed to their existing plant to satisfy their NPDES requirements. The City of Lompoc wastewater facility discharges to the San Miguelito Creek, a tributary to the Santa Ynez River, and typically pays $30,000 to $50,000 a year in fines for discharge violations.

4.5.1.3.1 Required Studies

Several studies would be required during the planning stages of the project to assess the potential impacts associated with discharging to the Alamo Pintado Creek or any other water body. At a minimum the following studies would be required by the RWQCB.

- *Flow Studies*- This study would determine the effluent flows generated by the WWTP for each phase of the project and would include peak seasonal flows.
- *Hydrological Study*- These studies evaluate the downstream impacts associated with the flows generated. Included with this report would be a discussion of the baseline riparian and stream conditions, potential downstream erosion and sediment transport, and water quality impacts.
- *Groundwater Study*- The potential effects of the proposed discharge on groundwater quality would be studied. In-stream recharge would be evaluated as a mechanism for changing groundwater conditions. This study could include hydraulic connectivity studies if a groundwater basin or stream/river underflow is used as a drinking water source and could be affected by the discharge.
- *Endangered Species Study*- This study would identify and evaluate endangered species that would be affected by the discharge flows. Both federal and state species would be addressed and review by the California Department of Fish and Game and the US Fish and Wildlife Service would be required.
- *Reasonable Potential Analysis*- An analysis of the California Toxic Rule pollutants discussed above and their presence in the discharge would be performed to determine if there is a reasonable potential for the effluent to exceed water quality standards.

Provided below in Table 4.3 is a comparison list of required studies for a surface water discharge and a land-based discharge such as percolation ponds.

Table 4.3 – Required Discharge Studies

Study	Surface Water Discharge	Land-Based Discharge
Groundwater Studies	✓	✓
Hydrological Study	✓	Rarely
Flow Studies	✓	✓
Endangered Species Study	✓	✓[1]
Reasonable Potential Analysis	✓	

Notes:
1 Limited to areas directly in conflict with pipelines or facilities.

Costs to perform these studies can vary significantly. The studies listed above in Table 4.3 would likely be performed as part of the project EIR. The cost to perform an EIR for a surface water discharge would likely be on the order of 2 to 4 times the cost of an EIR for a land-based discharge ($75,000 to $100,000). This would be a result of the additional types of studies required and the physical area the study would cover downstream of the proposed discharge location.

4.5.1.3.2 Required Monitoring

As previously stated, the monitoring program (parameters, location, and frequency) would be established by the RWQCB in the plant's WDR based on the type of discharge. The flowing monitoring types have been identified by the RWQCB that would be required for Los Olivos at a minimum for surface water discharge.

- *Influent Monitoring*- Influent wastewater would be monitored to allow calculation of removal efficiency and loading rates.
- *Effluent Monitoring*- Effluent would be monitored to verify federal secondary standards, Basin Plan objectives, and California Toxics Rule objectives are being achieved.

  Receiving Water Monitoring- Monitoring points would be established both upstream and downstream of the discharge location. Monitoring would include assessing the chemical contribution from the discharge, verifying permit compliance, and determining downstream impacts as a result of the discharge.
- *Groundwater Monitoring-* Similarly to receiving water monitoring, groundwater would be monitored upstream and downstream of the discharge location to evaluate potential impacts to groundwater quality as a result of the discharge

Provided below in Table 4.4 is a list of monitoring parameters required for a surface water discharge and a land-based discharge such as percolation ponds. In addition, monitoring required for recycled water systems is included (see Section 4.5.2).

Table 4.4 – Required Discharge Monitoring[1]

Monitoring	Surface Water Discharge	Land-Based Discharge	Recycled Water
Influent	✓	✓	✓
Effluent	✓	✓	✓
Groundwater	✓	✓	✓
Receiving Water	✓		

Notes:
1 As required by the RWQCB for Los Olivos.

Table 4.5 below provides example monitoring frequency for typical constituents for a surface water discharge, land based discharge, and recycled water use. Actual monitoring requirements for Los Olivos would be determined by the RWQCB.

Table 4.5 – Typical Minimum Sampling Frequencies			
Constituents	**Surface Water Discharge**[1]	**Land-Based Discharge**[2]	**Recycled Water**[3]
Flow	Continuously	Continuously	Continuously
BOD_5	Weekly	Weekly	Weekly
Temperature	5/Week	-	Monthly
pH	Daily	Weekly	Daily
DO	Monthly	-	Monthly
Total Suspended Solids	Weekly	Weekly	Weekly
Turbidity	Every ten days	-	Continuous
Oil and Grease	Monthly	-	Monthly
Total Coliform Organisms	5/Week	-	Daily
Fecal Coliform Organisms	5/Week	-	Daily
Nitrogen[4]	Monthly	Semiannually	Monthly
Total Dissolved Solids	Quarterly	Semiannually	Monthly
Residual Chlorine	Daily	-	Monthly
Sodium	Quarterly	Semiannually	-
Chloride	Quarterly	Semiannually	Monthly
Sulfate	Quarterly[5]	Semiannually	Monthly
Acute Toxicity	Annually	-	-
Chronic Toxicity	Annually	-	-
Priority Toxic Pollutants	Annually	-	Semi-Annually
Title 22 Pollutants[6]	Annually	Semiannually[5]	-

Notes:

1. Reference: City of San Luis Obispo Water Reclamation Facility Waste Discharge Requirements (WDR) Order No. R3-2002-0043 and National Pollutant Discharge Elimination System (NPDES) Permit No. CA0049224.
2. Reference: Nipomo Community Services District – Southland Wastewater Treatment Facility WDR Order No. R3-2012-0003
3. Reference: City of Fillmore WDR Order No. R4-2006-0049 and NPDES No. CAG0059021
4. Total Kjeldahl Nitrogen, Ammonia as N, Nitrite as N, and Nitrate as N
5. Reference: City of Lompoc Regional Wastewater Reclamation Plant WDR Order No. R3-2011-0211 and NPDES No. CA0048127.
6. The Title 22 pollutants are those for which primary Maximum Contaminant Levels (MCLs) have been established by the Department of Health Services and which are listed in Tables 64431-A and 64444-A of the California Code of Regulations, Title 22, Division 4, Chapter 15.

Estimated costs for each of these discharge types are provided in Table 4.6 and were based on a survey of monitoring costs of several local facilities. Costs for monitoring include sampling and laboratory expenses. These expenses typically do not vary significantly based on plant size (up to approximately 10 MGD) since monitoring is based on discharge type not plant capacity.

Table 4.6 – Typical Monitoring Costs	
Discharge Type/Use	**Cost per Year**
Surface Water Discharge	$150,000 to $200,000
Land-Based Discharge	$6,000 to $10,000
Recycled Water (Title 22 Requirements)	$25,000 to $50,000

4.5.1.3.3 Capital Costs

Additional treatment process may be required to satisfy federal secondary standards, Basin Plan objectives, and California Toxics Rule objectives. Both cooling of the effluent prior to discharge and additional de-nitrification (including carbon addition to promote a higher level of nitrogen removal) may be required to meet surface water discharge requirements.

Cooling of the effluent is typically performed using cooling towers. Effluent is required to be cooled to a temperature of no more than five degrees (F) above the receiving water. Effluent water leaving the treatment process can often have a temperature that varies from 10 to 30 degrees higher than the receiving water. This requirement varies among surface water dischargers and is dependent on the properties of the receiving water.

Additional denitrification could be required to reduce nitrogen levels to within limits established by the RWQCB. This reduction is achieved by adding carbon upstream of anoxic reactors in the form of chemical additives. The additional capital cost for chemical addition (typically methanol) would likely be in the $10,000 to $20,000 range, but the impact on operations and maintenance could be higher since there would be a recurring cost to purchase the carbon source

4.5.1.3.4 Other Costs and Funding Impacts

Some other significant impacts related to funding the project design and construction, which are not capital cost impacts but are considerable, are discussed in the letter from RWQCB and are listed below.

- RWQCB staff noted that a surface water discharge project with no significant reuse component would not attract funding. It would be anticipated that a project with no surface water discharge that relies on groundwater disposal and water reuse would be a candidate for recycled water grants and/or low interest loans. An example is the City of Fillmore's Water Recycling Program which qualified for nearly $16M in grant funding (20% of the total project cost) from the state since it relied entirely on water reuse and groundwater percolation for discharge.
- If habitat is created or enhanced by directing the discharge into a surface water body, the discharger may be required to preserve that discharge in perpetuity. The City of San Luis Obispo cannot eliminate plant flow discharge to San Luis Obispo Creek since the removal would negatively impact aquatic habitat.
- The additional studies and monitoring requirements have been discussed in the paragraphs above and are also significant considerations.

4.5.2 Land-Based Discharge

Land-based discharge includes effluent disposal methods such as percolation or irrigation (restricted or unrestricted). The quality of the treated effluent required is dictated by the selected land-based discharge method. Soil characteristics, groundwater depth, recognized beneficial uses, access to the disposal areas, and ultimate use of the crops being grown are factors that dictate the quality of the effluent. Wastewater characteristics of particular concern are salinity, nitrate, boron, pathogenic organisms, and toxic chemicals.

As mentioned earlier in this section, Los Olivos is located within the Los Olivos Hydrologic Area of the Santa Ynez Hydrologic Unit, which is used extensively as a source of agricultural and domestic-municipal water supply. The groundwater basin has been identified by the RWQCB as one of three basins in the County experiencing increases in nitrate concentrations.

Land-based discharge alternatives considered in this section include: percolation ponds, subsurface dispersal system (leachfields), irrigation of feed and fodder crops (undisinfected secondary), and unrestricted irrigation (disinfected tertiary). The treated effluent quality will be dictated primarily by the discharge alternative selected. Table 4.7 provides the anticipated effluent limits for the discharge alternatives considered. The design of these disposal systems is discussed in detail in Section 7 of this PER.

Table 4.7 – Anticipated Effluent Limits for Land-Based Discharge Alternatives

Disposal/Reuse Option	Treatment Level	Monthly Mean TSS (mg/L)	Monthly Mean BOD (mg/L)	Monthly Mean Total N[2] (mg/L)
Percolation Ponds	Undisinfected Secondary	30	30	10
Leachfields	Undisinfected Secondary	30	30	10
Restricted Irrigation	Undisinfected Secondary	30	30	10
Unrestricted Irrigation [1]	Disinfected Tertiary-2.2	10	10	10

Notes:
1. California Code of Regulations Title 22
2. Nitrogen or Total Nitrogen limit anticipated in accordance with primary drinking water MCL

4.5.2.1 Restricted Irrigation

CCR Title 22, Division 4, Chapter 3, Sections 60301 through 60355 is used to regulate recycled wastewater and is administered jointly by CDPH and RWQCB. If reuse is implemented, involved agencies will also include the County Environmental Health Services (Title 17). Local farmers and ranchers may also be involved as the end users. Allowed uses are limited to fenced areas with controlled access. Acceptable applications would include irrigation of animal feed or fodder crops, non food-bearing trees, orchards, and sod farms.

The treatment process for undisinfected secondary includes oxidation. This option would not require the addition of a disinfection process, such as chlorination or ultraviolet (UV) radiation. If disinfection was provided, Title 22 requirements include a median total coliform requirement of 23 most probable number (MPN)/100mL for seven consecutive days, and a maximum total coliform requirement of 240 MPN/100mL in one sample over a 30-day period for disinfected secondary-23 recycled water. Additional opportunities that accompany the addition of disinfection would include cemeteries, highway landscaping, restricted access golf courses, and pasture for animals producing milk for human consumption.

4.5.2.2 Unrestricted Irrigation

Potential users of disinfected tertiary-2.2 wastewater would include food crops, parks and playgrounds, school yards, unrestricted access golf courses, and residential and commercial landscaping. This level of treatment will meet the most stringent requirements for all uses allowed under the Title 22 criteria. Owners of these facilities, CDPH, RWQCB, the County, and possibly local authorities will be involved in wastewater reuse contracts and permitting. The WDRs for the future WWTP would need to include permitting requirements for reuse of plant effluent for irrigation.

Disinfected tertiary treatment requires the following treatment processes: oxidation, coagulation[10], filtration, and disinfection. These treatment stages will need to be added to the WWTP as part of the upgrades if this reuse option is pursued. According to Title 22 requirements, the 7-day median total coliform limit is 2.2 MPN/100mL, and the maximum total coliform limit is 23 MPN/100mL. The median total coliform is ascertained from samples collected over the last seven days of analysis. The maximum total coliform should not be exceeded in one sample for 30 consecutive days. Water quality objectives as discussed for the restricted irrigation option would also be applicable.

For all irrigation alternatives, contracts with local water purveyors and/or irrigation district(s) are required for recycling treated wastewater. In addition, facilities and appurtenances needed for recycling include transmission pipelines, pump stations, storage reservoirs, and property or easements for locating these facilities.

4.5.2.3 Percolation (Basins & Subsurface Disposal)

Groundwater degradation is a major concern for the Los Olivos SPA. The RWQCB policies would require the addition of disinfection for this disposal method if seasonal groundwater levels are within five feet of the infiltration surface. Therefore, considerations such as distance to the nearest well, depth to groundwater, and mounding potential must be considered in addition to water quality. Sizing and siting requirements for the percolations ponds will depend on the types of soils, and the results percolation testing.

4.5.2.4 Groundwater Monitoring

As part of any land-based discharge, groundwater monitoring wells would be required both up gradient and down gradient of the discharge area(s). By monitoring the quality in wells, the impacts of the wastewater disposal can be observed. The number of wells and the frequency of testing would be outlined in the WDR issued to the Los Olivos WWTP.

[10] Coagulation is not typically required if turbidity requirements are met and/or membrane filtration is used.

5 Collection System Evaluation

5.1 Overview

As part of the Los Olivos centralized treatment system, a sanitary sewer collection system will be required to convey wastewater flows to the WWTP. In Phase I the system would serve the downtown commercial businesses, and in subsequent phases the collection system would expand to the rest of the community. With proper planning during the initial phase, the collection system would be adequately sized to handle future flows without requiring upgrades during subsequent phases.

5.2 Collection System Types

Conventional gravity collection systems convey wastewater using open channel flow sewer pipe lines and manholes. The depth of the lines varies depending on surface topography and slope requirements. Typically, when pipelines reach a depth of 20 feet or more, lift stations are required to pump wastewater to a shallower depth. Maintenance of the system includes cleaning and inspection of the lines and performing the recommended maintenance for lift stations when necessary.

As discussed in the LOWWMP, pressure sewers, small diameter gravity sewers, and vacuum sewers can also be used as an alternative to conventional gravity systems. These alternatives are viable in smaller communities and in areas where topography is such that a conventional gravity system will require deep sewer lines and a large number of lift stations.

Pressure sewer collection systems use small diameter pipes, usually between two and four inches, at shallow depths (less than three feet) to convey wastewater pumped from each connection. Smaller pipes and shallow depths minimize soil disturbance, and construction costs can be significantly less than those for gravity lines. Pressure sewer collection systems can accommodate solids or have solids removed before entering the system. A solids handling system requires grinder pumps to reduce the sizes of solids to be transported through the small diameter pipes without plugging. Alternatively, solids can be removed prior to entering the system with the use of conventional septic tanks. These tanks would be similar to those used for OWTSs and would remove solids through settling prior to reaching the pumps. Both solids handling and non-solids handling systems would require equipment to be located at each household (grinder pump or tank) on private property. Pumps could either be located at each connection or a larger pump station could be used to serve several connections. Grinder pumps and tanks would require regular maintenance including periodic septage removal to ensure system performance. In addition to regular maintenance, power to the grinder pumps would be required from the utility company or from each residence or business.

Small diameter gravity sewers are similar to non-solids handling pressure systems but use gravity instead of pumps to convey the wastewater. Grinder pumps or septic tanks would still be required to process the solids before entering the system. Similar maintenance and power requirements would apply to this system. However, shallower excavation depths than those for a conventional gravity system would be possible where site topography allows.

Vacuum sewers use differential pressure to convey wastewater. This type of system typically uses a central vacuum pump with valve pits at each connection. Since a closed system is required, the valves in each pit open when a predetermined amount of wastewater enters the pit. The valve pits can either be located on each property or in the public right-of-way (ROW) in sidewalks or streets. The main advantage of this system is the ability to convey wastewater uphill without the use of conventional lift stations. This could be beneficial to the community of Los Olivos if the WWTP is located in the northern portion of the SPA. Similar to pressure systems and small diameter gravity systems, scheduled maintenance would be required at each valve pit and the central vacuum pump station.

Based on our preliminary review of the collection systems discussed above, a typical gravity-type system is recommended for the Los Olivos system. As previously discussed, the Los Olivos SPA generally slopes to the south in gentle fashion without irregular grade breaks and a gravity system could be installed to take advantage of this topography. It is likely that conventional excavation depths of five to six feet could be maintained along the majority of the alignments. This anticipated excavation depth would not be significantly deeper than those required for an alternative system. Shallow depths would have significant cost impacts where shallow groundwater is present. However, mitigation measures such as limiting construction to the drier summer months could be implemented in areas where groundwater is known to be particularly shallow during wet winter months.

Based on the assumed flows, the majority of collection pipes will likely be 8 inches in diameter while some main lines could have a diameter up to 15 inches to accommodate projected Phase III flows. Although some cost savings would be realized by using smaller diameter pipelines with some of the alternative collections systems, additional equipment (grinder pumps and tanks) and associated maintenance costs at each connection would negate these potential savings.

5.3 Collection Layout Design

Using the flow estimates presented in Section 3 of this report, a preliminary layout of the collection system was prepared to develop estimated construction costs and operation and maintenance (O&M) costs. The layout was prepared using industry standard design parameters.

It is assumed that treatment and disposal will occur at one or several of the large agricultural properties located north or south of Los Olivos just outside of the SPA. Two alternative layouts using a northern and a southern route are presented below. Both layouts follow the natural topography of the area and utilize gravity flow while minimizing the use of lift stations. It is important to note that the layouts provided within this PER are conceptual and should only be used as a basis to evaluate the projects overall feasibility. A more detailed analysis will be required to adequately size and align the collection system.

A schematic layout of backbone collection pipelines was developed for both routes and potential lift stations were identified. The SPA was divided into individual service areas based on project phasing (Section 2) and site topography. In general, Service Area 1 represents the downtown core (Phase I) and several residences within the downtown area. Service Area 2 represents the full commercial build-out and the few residential connections included in Service Area 1 (Phase II). The remaining residential areas to be added in Phase III (A, B & C) were divided into service areas based on geographical features (Alamo Pintado Creek and State Highway 154) and likely directions for treatment and disposal facilities. Wastewater flows from each service area and design parameters discussed in Section 5.3 were used to size the collection system pipelines, lift stations, and force mains.

5.4 Design Parameters

The gravity sewer pipelines were sized based on the ratio of the depth of flow to the diameter of the pipe (d/D) during the PHF period. These ratios were calculated using the Manning's equation for open channel flow with minimum allowable pipe slopes and a coefficient of "n" equal to 0.013.

The flow velocity in the pipeline was also considered and is primarily a function of the slope of the pipe for self cleaning. As previously stated, minimum allowable slopes were used resulting in conservative velocity values. The minimum velocity was analyzed at AADF and the peak velocity was analyzed at PHF. For this PER, a minimum pipe diameter of 8 inches was used. The following table lists the assumed d/D ratios and minimum slopes used for pipe size selection for the collection system.

Table 5.1 – Minimum Gravity Sewer Grades and Design Depth Ratios

Pipe Size (inches)	Minimum Grade (%)	Liquid Depth to Diameter Ratio (d/D)
8	0.4	0.5
10	0.28	0.5
12	0.22	0.5
15	0.16	0.75
18	0.12	0.75
21	0.1	0.75
24	0.08	0.75

Lift stations were analyzed based on pump capacity during PHF, with one standby pump.

Force mains were sized based on the hydraulic capacity of the lift station using a minimum design velocity of 3 feet per second (fps) and a maximum velocity of 6 fps. Higher velocities generally result in higher pumping costs since the friction losses in a pipe are proportional to the square of the velocity. The scouring velocity is the minimum velocity to prevent solids from settling in the pipe. A value of 2 fps is widely recognized as the velocity required to prevent solids deposition. Due to the cyclic operation of sewage lift stations, the liquid in the force main will sit without flowing for long periods of time and will need a velocity of 3 fps to help keep the force main clean. Lower velocities could lead to the need for frequent cleaning and increased force main maintenance costs.

5.5 Northern Routing Option (Option No. 1)

5.5.1 Overview

As previously discussed, the general topography of the Los Olivos SPA slopes to the south. A northern routing option requires lift stations fed by gravity pipelines to convey wastewater to a treatment site. Based on AECOM’s preliminary layout, three lift stations would likely be required for this routing.

5.5.1.1 Treatment Site Location

Several existing pastures are located to the north along Foxen Canyon Road and Calkins Road. A treatment site location was assumed to be near the northern most perimeter of the SPA. Again, it is important to note that the layouts provided are conceptual and are only used as a basis to evaluate the projects overall feasibility.

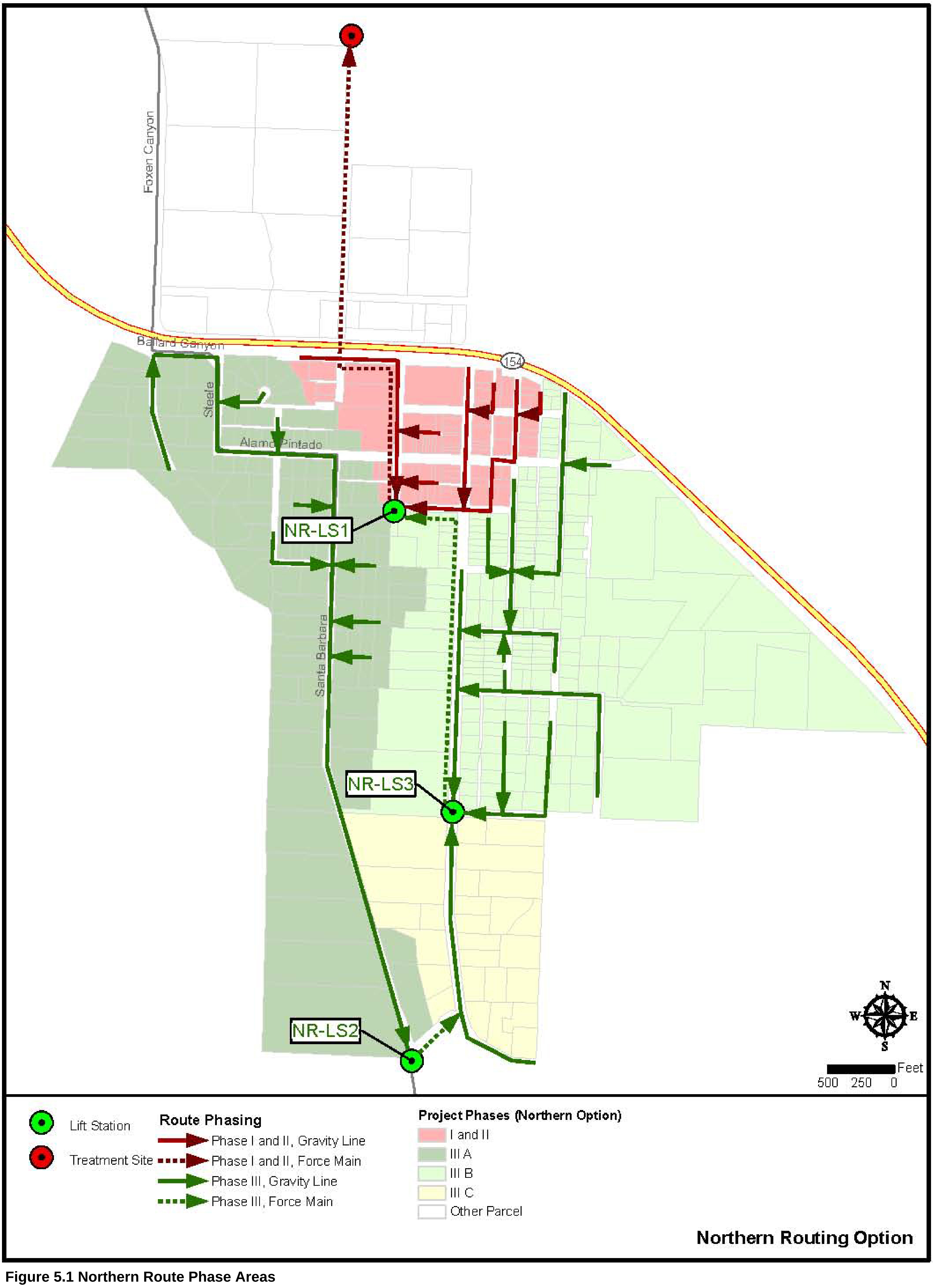

Figure 5.1 Northern Route Phase Areas

5.5.1.2 Layout Phasing

The initial collection system (Phase I) to serve the downtown core could be limited to serve businesses along Grand Avenue from Railway Avenue (State Highway 154) to Hollister Street and a limited number of residences with substandard lots (see Section 2.2). A network of gravity collection pipelines would be installed and connected to a lift station at the area's lowest point around the corner of Hollister Road and Nojoqui Road (NR-LS1). The collection system piping would be sized to handle any future build-out commercial flows (Phase II). The lift station installed for Phase I would need to be upsized (larger pumps) to handle the increased flows during Phase II. During Phase III, the remaining residences could be served using gravity collection pipelines emptying to lift stations to the south of the downtown core. A lift station will likely be required around the intersection of Santa Ynez Street and Grand Avenue (NR-LS3). Another lift station (NR-LS2) would be required to drain gravity flow from the west side of town and would be located near Santa Barbara Avenue and Lansing Crossing. NR-LS2 would lift the wastewater across Alamo Pintado Creek and into a gravity line along Grand Avenue. NR-LS3 would take flows from both the west side of town (NR-LS2) and the southern portion of town and pump it to NR-LS1. Again NR-LS1 would be upsized to accommodate increased flows from Phase II.

5.5.2 Design Flows and Sizing

Using the estimated flows discussed in Section 2, wastewater flow contributions were calculated for those service areas shown on Figure 5.1. Phases I and II of the project consist mainly of the downtown core and wastewater flows increase significantly with the build-out of the commercial properties. Phase III was separated into four separate service areas due to their geographic location to develop loadings and sizing calculations for the collection system. Table 5.2 details the calculated flows associated with the phases.

Table 5.2 – Estimated WW Generation by Phase Area- Northern Route

Phase	AADF (gpd)	PHF (gpd)
I	19,000	82,000
I + II	63,000	281,000
III – A	30,000	135,000
III – B	44,000	198,000
III – C	6,000	27,000
III A+B+C	80,000	360,000
Total Flow	**143,000**	**644,000**

The major pipelines for the collection system were sized based on the design parameters presented in Section 5.3. Only the major collection pipelines were analyzed assuming, that due to the relatively small flows, the remaining lines would be 8 inches in diameter (recommended minimum size). Table 5.3 below represents the results of AECOM's analysis.

Table 5.3 – Estimated Pipeline Sizing for Northern Route			
Phase	**Description**	**Estimated Capacity Required (gpd)**	**Pipeline Diameter[1] (inches)**
I	Phase I to NR-LS1	82,000	8
I+II	Phase I & II to NR-LS1	281,000	10
IIIA	Phase IIIA to NR-LS3	135,000	8
IIIA+IIIC	Phase IIIA & IIIC to NR-LS2	162,000	8
IIIB	Phase IIIB to NR-LS2	198,000	8

Notes:
Designed for Peak Hour Flow

As shown in Table 5.3, an 8-inch pipeline can handle wastewater flows in Phase I. However, with the increased flows from commercial build-out in Phase II, the required pipe size is 10 inches. It is assumed that the larger pipe would be installed during Phase II since the cost of installing the larger diameter pipe during construction of Phase II would be significantly less than if a larger diameter pipe was installed at a later date.

Lift station capacities were calculated and the corresponding force main size using the design parameters previously discussed. These results are presented below in Table 5.4.

Table 5.4 – Estimated Lift Station Capacity Requirements for Northern Route at Build-Out		
Lift Station	**Estimated capacity required for Build-Out (gpm)**	**Force Main Diameter[1] (inches)**
NR-LS1	447	6
NR-LS2	250	4
NR-LS3	94	4

Notes:
Designed for Peak Hour Flow averaged over 24 hours.

The pipe sizes presented in this PER are based on minimum design requirements and may differ from the sizes required after a detailed analysis of the system is performed. These calculations are provided for initial planning and feasibility discussions.

5.6 Southern Routing (Option No. 2)

5.6.1 Overview

The natural topography of the area makes a gravity-type system flowing to the south a viable option. Using this alternative routing, lift stations are only needed for the portion of the system west of Alamo Pintado Creek.

5.6.1.1 Treatment Site Location

Similar to the area north of Los Olivos, several existing agricultural fields are located to the south along Grand Avenue. A treatment site location was assumed to be near the southern perimeter of the SPA. Again, it is important to note that the layouts provided are conceptual and are only used as a basis to evaluate the projects overall feasibility.

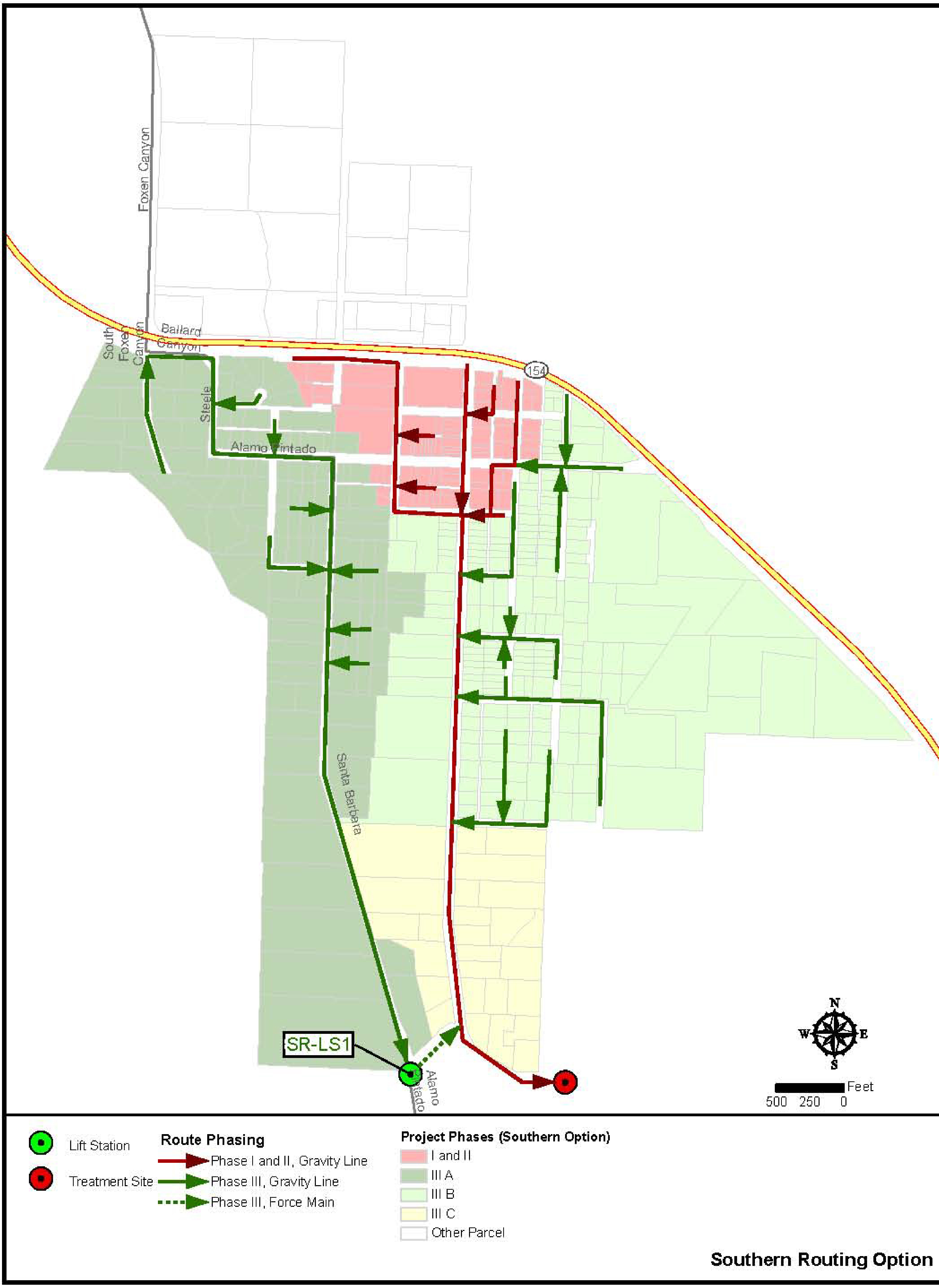

Figure 5.2 Southern Route Phase Areas

5.6.1.2 Layout Phasing

The initial collection system (Phase I) would be similar to the northern layout (Option No. 1) and would serve the downtown area along Grand Avenue from Railway Avenue (State Highway 154) to Hollister Street. A network of gravity collection pipelines would be installed and connected to a main trunk line that would continue down Grand Avenue to the treatment site. Future phases would connect to the trunk line as service areas are added. In order to serve the west side of the community it is necessary to cross Alamo Pintado Creek. As shown on Figure 5.2, a lift station (SR-LS1) will be placed near Lansing Crossing to pump wastewater flows across the creek and into the main trunk line.

5.6.2 Design Flows and Sizing

Using the estimated flows discussed in Section 3, wastewater flows were calculated for those service areas shown on Figure 5.2. Phases I and II of the project consist mainly of the downtown core and wastewater flows increase significantly with the build-out of the commercial properties. Phase III is separated into three separate service areas due to their geographic location to perform sizing calculations of the collection system. Table 5.5 summarizes the flows determined for each phases.

Table 5.5 – Estimated WW Generation by Phase Area- Southern Route

Phase Area	AADF (gpd)	PHF (gpd)
I	19,000	82,000
II	63,000	281,000
III – A	6,000	27,000
III - B	30,000	135,000
III - C	44,000	198,000
III -Total	80,000	360,000
Total Flow	**143,000**	**644,000**

The major lines for the collection system were sized based on the design parameters present in Section 5.3. Only the major collection lines were analyzed assuming that due to the relatively small flows the remaining lines would be 8 inches in diameter (recommended minimum size). Table 5.6 below represents the results of our calculations.

Table 5.6 – Estimated Pipeline Sizing for Southern Route

Phase	Description	Estimated Capacity Required (gpd)	Pipeline Diameter[1] (inches)
I	Phase I to Treatment Area	68,000	8
I+II	Phase I & II to Treatment Area	288,000	10
I+II+IIIA	Phase I, II and IIIA to IIIC	308,000	10
IIIB	Phase IIIB to SR-LS1	135,000	8
I+II+IIIA+ IIIC	Phase I, II, IIIA & IIIC to SR-LS1 connection	506,000	12
I+II+III (A+B+C)	All Phases to Treatment Area	644,000	15

Notes:
1. Designed for Peak Hour Flow

Like the northern route, an 8-inch pipe size would be adequate to serve Phase I. However, the pipe will need to be upsized to 10 inches and 15 inches in Phases II and III respectively.

The lift station capacity and corresponding force main size was determined using the design parameters previously discussed. These results are presented below in Table 5.7

Table 5.7 – Estimated Lift Station Capacity Requirements for Southern Route at Build-Out

Lift Station	Estimated Capacity Required for Build-Out (gpm)	Force Main Diameter[1] (inches)
SR-LS1	94	4

Notes:
1. Designed for Peak Hour Flow.

The pipe sizes presented in this PER are based on minimum design requirements and may differ from sizes required after a detailed analysis of the system is performed. These calculations are provided for initial planning and feasibility discussions

5.7 Opinion of Probable Costs

5.7.1 Capital Cost Summary

Opinions of probable construction cost for the collection system were developed based on estimated costs of materials, preparation, earthwork, installation, and roadwork. Design and administration costs were estimated at 35 percent of total construction costs and an additional 20 percent contingency was included. Cost criteria are summarized in Table 5.8.

Table 5.8 – Sewer Improvement Cost Criteria			
Item Description	**Estimated Construction cost**	**Including Contingency (20 Percent)**	**With Engineering/Administration (35 Percent)**
4-in Force Main	$107/LF	$128/LF	$173/LF
6-in Force Main	$117/LF	$140/LF	$190/LF
8-in Gravity Sewer	$158/LF	$190/LF	$256/LF
10-in Gravity Sewer	$178/LF	$214/LF	$288/LF
12-in Gravity Sewer	$198/LF	$238/LF	$321/LF
15-in Gravity Sewer	$229/LF	$275/LF	$371/LF

These cost opinions are based on the following assumptions:

- Except where other data are available, cost opinions are generally derived from bid prices from similar wastewater projects, with adjustments for inflation, size, complexity, and location.
- Cost opinions are in 2012 dollars;
- When budgeting for future years, appropriate escalation factors should be applied (ENR Construction Cost Index of: 9175.94 for January 2012);
- Cost opinions are "budget-level" and may not fully account for site-specific conditions that will affect the actual costs; and
- Cost opinions do not include the cost to purchase or acquire the land needed to accommodate the collection system.

The opinions of probable cost prepared by AECOM represent our judgment and are supplied for the general guidance of the County. Since AECOM has no control over the cost of labor and material, or over competitive bidding or market conditions, AECOM does not guarantee the accuracy of such opinions as compared to contractor bids or actual costs.

The project cost summaries presented in Tables 5.9 and 5.10 were developed using the cost criteria from Table 5.8 and the collection layouts displayed in Figures 5.1 and 5.2. Lift station cost estimates are based on actual cost of recent lift station projects in the area of similar size. The lift station required for Phase 1 and II would be larger than the additional two required at project build-out as shown below. A more detailed cost estimate is provided in Section 9 for an assumed project. The cost estimated provided in the tables below are provided for the purpose of evaluating the benefits and disadvantages between a northern and southern collection system route.

Table 5.9 – Northern Route - Collection System Project Cost Summary

	Phase I & II		**Phase III**		**Total**	
Component	**Quantity**	**Value**	**Quantity**	**Value**	**Quantity**	**Value**
4-in Force Main	-	$ -	2,950 LF	$316,000	2,950 LF	$316,000
6-in Force Main	3,700 LF	$433,000	-	$ -	3,700 LF	$433,000
8-in Gravity Sewer	5,200 LF	$822,000	21,700 LF	$3,424,000	26,900 LF	$4,246,000
10-in Gravity	1,650 LF	$294,000	-	$ -	1,650 LF	$294,000
Lift Station #1	1	$600,000	-	$ -	1	$600,000
Lift Station #2	-	$ -	1	$450,000	1	$450,000
Lift Station #3	-	$ -	1	$450,000	1	$450,000
Subtotal		**$2,149,000**		**$4,640,000**		**$6,789,000**
Contingency (20 Percent)		$430,000		$928,000		$1,358,000
Total		**$2,579,000**		**$5,568,000**		**$8,147,000**
Engineering, Administration, and Legal (35 Percent)		$903,000		$1,949,000		$2,852,000
Total Project		**$3,482,000**		**$7,517,000**		**$10,999,000**

Table 5.10 – Southern Route - Collection System Project Cost Summary						
Component	**Phase I & II**		**Phase III**		**Total**	
	Quantity	Value	Quantity	Value	Quantity	Value
4-in Force Main	-	$ -	500 LF	$54,000	500 LF	$54,000
8-in Gravity Sewer	6,900 LF	$1,091,000	17,000 LF	$2,686,000	23,900 LF	$3,777,000
12-in Gravity Sewer	3,700 LF	$733,000	-	$ -	3,700 LF	$733,000
15-in Gravity Sewer	500 LF	$115,000	-	$ -	500 LF	$115,000
Lift Station #1	-	$ -	1	$450,000	1	$450,000
Subtotal		**$1,939,000**		**$3,190,000**		**$5,129,000**
Contingency (20 Percent)		$388,000		$638,000		$1,026,000
Total Construction		**$2,327,000**		**3,828,000**		**$6,155,000**
Engineering, Administration, Legal (35 Percent)		$815,000		$1,340,000		$2,155,000
Total Project		**$3,142,000**		**$5,168,000**		**$8,310,000**

5.7.2 Operations and Maintenance

Another important component of the overall life-cycle cost for a collection system is O&M. Typical maintenance items for the system include periodic cleaning and inspection of the sewer lines and maintenance of the pumps at the lift stations.

5.7.2.1 Sewer Line and Manhole Cleaning and Inspection

Collection system cleaning and inspection is typically recommended for 20 percent of the system each year. Through these inspections, high maintenance areas (HMAs) are identified along with any other issues in the line (root intrusion, pipe damage, etc.). Cleaning and inspection frequency can be modified to target those areas that require more frequent cleaning.

5.7.2.2 Lift Station Maintenance

Periodic inspection of lift stations is required to identify potential problems not detected by the control system. Lift stations typically have specific O&M manuals to guide inspection and maintenance activities. During the inspection the following tasks are generally performed:

- Observation of pumps, motors and drives for unusual vibration, noise, heat;
- Observation of controls for proper settings;
- Check pump suction and discharge lines and suction and discharge pressures;
- Check pumping rates, runtimes, speed;
- Confirm chemical storage levels where applicable; and
- Preventative maintenance: list of parts needing periodic replacement, log of inspections and note anticipated problems or repairs.

Operational checks of lift stations are typically conducted daily or weekly and include evaluation of pumps and motors, drive shafts, bearings, seals, packing, electrical systems, controls, pumping cycles and levels, piping, air releases, compressors, ventilation, and auxiliary equipment.

5.7.2.3 Estimated Operations and Maintenance Cost

O&M cost estimates for the collection system are provided in the following tables. These estimates provide general items typically required and AECOM has assumed 20 man-hours will be required per week to perform these items. A 20-year net present value is also provided for each estimate. Similarly to the construction cost estimates the O&M cost estimates provided are for the purpose of evaluating the benefits and disadvantages between a northern and southern collection system route. More detailed cost estimates are provided in Section 9 for an assumed project.

Table 5.11 provides estimated O&M cost for Phase 1 of the northern route.

Table 5.11 – Northern Route - Phase I Annual O&M Cost Estimate

Component	Unit Cost	Unit	Quantity	Unit	Total
Power	$0.16	$/kWh	2,072	kWh	$332
Line Cleaning	$0.64	$/LF	1,730	LF	$1,107
Line Inspection (CCTV)	$1.07	$/LF	1,730	LF	$1,851
Line Replacement[4]	$15.00	$/LF	87	LF	$1,298
Labor	$58.37	$/hour	1,043	hours	$60,880
Maintenance[2]	2.0	%	$100,000	-	$2,000
Misc. Equipment Replacement[2]	4.0	%	$100,000	-	$4,000
Total					**$71,500**
20-Year Net Present Value					**$1,084,000**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the total Phase I equipment cost.
3. 20-Year Net Present Value determined using 2 percent inflation and 4 percent interest rate.
4. Percentage of total average pipeline cost.

Table 5.12 provides estimates for the southern route for Phase I.

Table 5.12 – Southern Route - Phase I Annual O&M Cost Estimate

Component	Unit Cost	Unit	Quantity	Unit	Total
Power	$0.16	$/kWh	179	kWh	$29
Line Cleaning	$0.64	$/LF	1,840	LF	$1,178
Line Inspection (CCTV)	$1.07	$/LF	1,840	LF	$1,969
Line Replacement[4]	$15.00	$/LF	92	LF	$1,380
Labor	$58.37	$/hour	1,043	hours	$60,880
Maintenance[2]	2.0	%	$ -	-	$ -
Misc. Equipment Replacement[2]	4.0	%	$ -	-	$ -
Total					**$65,500**
20-Year Net Present Value					**$990,000**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the total Phase I equipment cost.
3. 20-Year Net Present Value determined using 2 percent inflation and 4 percent interest rate.
4. Percentage of total average pipeline cost.

6 Treatment Alternatives Evaluation

This section of the report describes and compares feasible treatment alternatives for the Los Olivos WWTP project. Since the impacts of nitrogen on the underlying groundwater in the Santa Ynez sub-basin is a major focus for the RWQCB, AECOM has assumed that any WDRs developed for the Los Olivos WWTP will include a TN limit of less than 10 mg/L. The four treatment alternatives which will be evaluated in-depth in this PER include:

- Extended Aeration Activated Sludge Modified Ludzak-Ettinger (MLE)
- Sequencing Batch Reactor (SBR)
- Membrane Bioreactor (MBR)
- AdvanTex

The MLE, SBR, and MBR systems have a successful track record of meeting typical secondary treatment and nitrogen removal requirements in situations similar to this project in California. Information provided by the AdvanTex vendor also claims success in meeting a TN limit less than 10 mg/L; however, AECOM requested performance data specifically for similarly-sized, publicly-owned community systems in California and data was not provided at the time of this report.

The following provides descriptions, process flow diagrams, detailed design criteria, and capital and O&M cost estimates for each of these alternatives. The information developed for these various treatment alternatives will be used in a latter section of this PER to determine the final recommended project for the Los Olivos WWTP project.

6.1 Basis of Cost Evaluation

In order to develop preliminary cost estimates for the four treatment alternatives considered in this report, the following major equipment manufacturers were consulted. These manufacturers are presented in Table 6.1. Relative costs are included for each option and may not include all necessary construction elements however, estimated costs are provided as a basis for comparison. More inclusive costs are provided in Section 9 of this report.

Table 6.1 – Basis for Evaluated Equipment Costs

Process	Manufacturer/Model
Spiral Screen[1]	Parkson Hycor® Helisieve Plus®/HLS300P
SBR Equipment	Aqua-Aerobic Systems, Inc. AquaSBR®
Activated Sludge Equipment	Siemens Davco Biological Treatment System
Cloth Media Disk Filters	Aqua-Aerobic Systems, Inc. AquaMiniDisk®
MBR Equipment	GE Z-MOD M™6 Dual and 44 Dual ZeeWeed® MBR
AdvanTex	AX100 AdvanTex® Filter
UV Disinfection Equipment[2]	TrojanUVFit™ 18AL40 Reactor

Notes:
1. GE Z-MOD package provided with internally-fed fine screens.
2. AdvanTex package provided with Hallet 30 UV disinfection equipment.

6.1.1 Sludge Treatment and Disposal

AECOM has assumed a common sludge treatment and disposal scheme for the four alternatives considered in this report. Due to the size of the WWTP needed to accommodate the Los Olivos SPA, waste sludge resulting from the secondary process will be sent to an aerated sludge holding tank or aerobic digester for stabilization. These facilities will provide storage and the potential for some volatile solids reduction (VSR) to help minimize the amount of sludge that must be disposed of by the community. Following a period of approximately 15 days, the solids will be hauled offsite by a liquid hauler and disposed of at another wastewater treatment facility in the County, or a neighboring county, that accepts sludge or septage. The cost of this aerated tank has been included in the construction cost estimates for each treatment alternative. The impacts of the aeration and disposal of this material have also been included in the O&M cost estimates provided for each alternative.

6.2 Alternative No. 1 – Extended Aeration Activated Sludge MLE

6.2.1 Overview

The activated sludge process is a suspended growth system where the microorganisms break down and consume the waste that is suspended in the liquid or mixed liquor (ML). There are many variations in the activated sludge process including conventional activated sludge, extended aeration, and extended aeration with MLE.

The activated sludge process configuration applicable for the Los Olivos WWTP is known as a packaged activated sludge system where the different components of the treatment process are housed in an aboveground bolted, or welded steel tank configured with two concentric rings. The secondary clarifier is housed in the inner tank, while the equalization, aerobic, anoxic, and aerobic digestion zones are housed in the outer tank. Like a typical activated sludge system, package systems can be configured to accommodate biological nutrient removal (BNR) via the MLE process to achieve low total nitrogen levels.

Nitrification and denitrification is accomplished by using an extended aeration activated sludge process coupled with a MLE configuration. The MLE process consists of an anoxic zone upstream of the aerobic zone. In the aerobic zone, ammonia and organic nitrogen are converted to nitrate. Nitrified effluent from this zone is then recycled back to the anoxic zone for denitrification where the nitrate is converted to nitrogen gas and released into the atmosphere. The wastewater flows from the preliminary treatment facilities to the anoxic stage and continues to the aerobic stage before being sent the secondary clarifiers. At the secondary clarifiers, return activated sludge (RAS) is returned to the anoxic zone to maintain the proper solids inventory in the system.

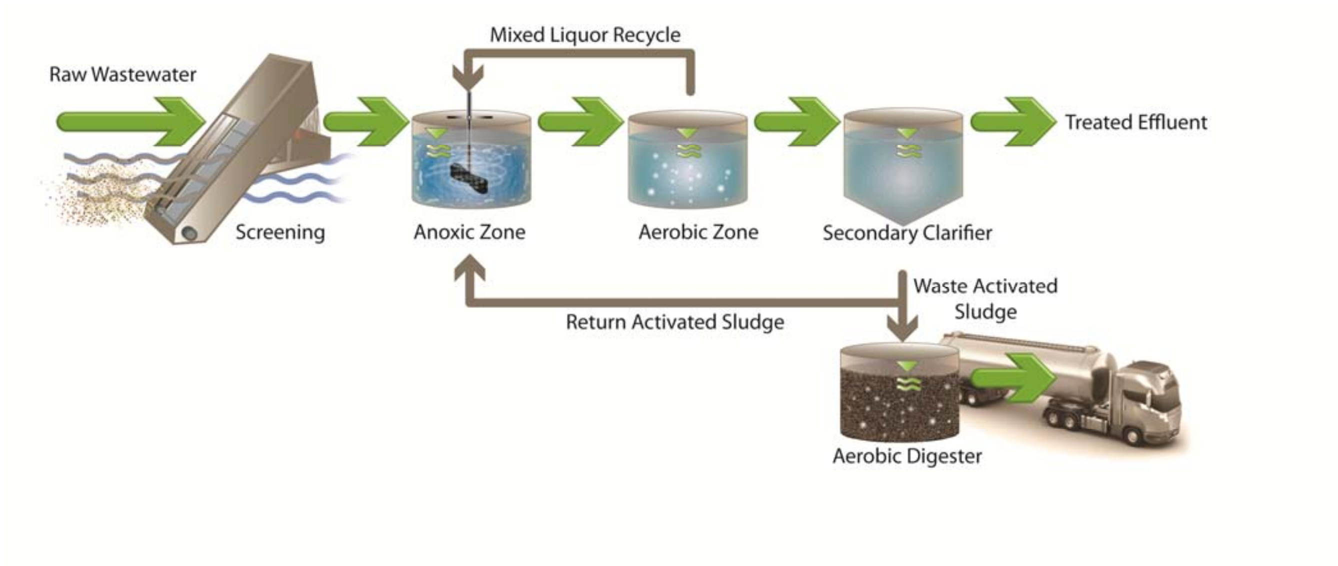

Figure 6.1 Typical Extended Aeration Activated Sludge MLE Configuration Flow Schematic

6.2.2 Additional Processes

Alternative effluent disposal methods are discussed in Section 7 of this PER. In order to achieve the level of treatment necessary for several of these alternatives, the MLE process would need to be followed by several ancillary processes including filtration and disinfection. A description of the filtration and disinfection facilities considered for the Los Olivos WWTP as well as detailed design criteria are included in this PER.

6.2.2.1 Filtration

One viable effluent disposal alternative evaluated in this PER is agricultural irrigation of food crops. In order to meet CDPH Title 22 requirements for this recycled water use, disinfected tertiary effluent would be required. The regulations govern not only the method of disinfection, but also the amount of suspended and colloidal solids in the effluent. The specific effluent requirements for disinfected tertiary reuse are detailed in Section 4.5.2 of this PER.

In order to limit the amount of solids and colloidal particles in the effluent to below the levels dictated by Title 22, coagulation and filtration would be required.

For the Los Olivos WWTP project, AECOM has evaluated the use of cloth media disk filters for tertiary filtration. This technology has several advantages to other filtration technologies including:

- Smaller footprint;
- Simple operation; and
- Lower capital.

Cloth media disk filters include multiple disks installed in carbon steel, stainless steel, or concrete tanks. The disks care constructed of needle felt or pile media consisting of nylon fibers attached to a polyester backing. The disks operate while fully submerged in the effluent and can operate during the backwash cycle. The disks are connected to a filtrate header that collects and transports filtrate generated by gravity flow of filtered effluent through the media. The eventual increase in head loss caused by the accumulation of solids in the media causes the level in the tank to rise. An automatic backwash cycle is initiated once a preset level is reached.

While cloth media disk filters are well-suited for the Los Olivos WWTP, several other cost-effective technologies may be viable for the project. The investigation of additional technologies and manufacturers should be evaluated at a later time as part of preliminary or final design efforts.

6.2.2.2 Disinfection

As mentioned previously, some of the evaluated effluent disposal options will require the addition of disinfection to the main treatment process. In order to meet the requirements for disinfected tertiary effluent in accordance with Title 22, the WWTP would need provisions to reliably reduce total coliform to less than 2.2 MPN/100 mL. In order to achieve this level of disinfection, UV light has been considered for this PER.

UV disinfection is a technology that is prevalent in the wastewater industry. UV light inactivates pathogens by damaging the cellular structure and nucleic acids of microorganisms. There are two types of reactors available including in-vessel and open channel. The in-vessel-type is a self-contained aboveground unit that installs between two pipe flanges. A benefit of an in-vessel system is its small footprint.

6.2.3 Design Criteria

Detailed design criteria have been developed for the extended aeration activated sludge MLE process as well as the filtration and disinfection facilities that may be required for this alternative.

6.2.3.1 Extended Aeration Activated Sludge MLE

A separate packaged activated sludge unit or tank is needed for each phase of the Los Olivos WWTP project. Each package unit contains a pre-equalization zone, anoxic zone, aerobic zone, post-anoxic zone, aerobic digester, and integral clarifier. Provisions for flow diversion to accurately apportion flow to each of the units are required. For Phase I, a single 54-foot diameter tank with an internal 12-foot diameter clarifier would be installed to treat a design ADMMF flow of 20,000 gpd.

6.2.3.2 Cloth Media Filtration

As part of Phase I, a single filter basin would be constructed with the capacity to hold six separate disks. The CDPH has developed a maximum hydraulic loading rate of six gallons per minute per square foot (gpm/sf) for this type of cloth media filter. In order to remain below this maximum rate, only two disks are needed to serve the initial downtown core project. An additional two disks would be installed in the basin for both Phase II and Phase III.

6.2.3.3 UV Disinfection

For the initial phase of the Los Olivos WWTP project, one low-pressure, high-intensity in-vessel reactors would be installed. A single reactor is needed to treat the maximum day flow for Phase I and Phase II projects. A second duty reactor would be installed to treat the Phase III MDF of 458,000 gpd.

6.2.4 Summary

The detailed design criteria for each component of the MLE alternative is summarized in Table 6.2.

Table 6.2 – Alternative No. 1 - Extended Aeration Activated Sludge MLE Design Criteria

Parameter	Phase I	Phase II	Phase III
Influent Characteristics			
Average Annual Daily Flow (gpd)	19,000	63,000	143,000
Average Day Maximum Month Flow (gpd)	20,000	69,000	158,000
Maximum Daily Flow (gpd)	59,000	200,000	458,000
Peak Hour Flow (gpd)	82,000	281,000	644,000
BOD			
(mg/L)	630	755	435
(ppd)[1]	105	435	575
TSS			
(mg/L)	420	480	330
(ppd)[1]	70	275	435
TKN			
(mg/L)	90	95	65
(ppd)[1]	15	55	85
Activated Sludge Basins			
Total Design Capacity (gpd)	20,000	69,000	158,000
Number of Units	1	2	3
Design Capacity per Unit (gpd)	20,000	34,500	52,667
Equalization Volume (gal)	5,000	17,150	39,325
Anaerobic Volume (gal)	2,500	8,575	19,663
Pre-Anoxic Volume (gal)	2,182	5,017	24,854
Aerobic HRT (hours)	41	44	27
Aerobic Volume (gal)	33,770	124,325	175,629
Post-Anoxic Volume (gal)	3,000	10,492	24,057
Total Basin Volume (gal)	46,452	165,559	283,528
Unit Diameter (feet)[2]	-	50	66
SRT (days)[3]	14.2	13.1	13.1
MLSS (mg/L)	3,500	3,500	3,500
F:M (lb BOD/lb MLSS x day)	0.107	0.120	0.112
Internal Clarifiers			
Number of Units	1	2	3

Table 6.2 – Alternative No. 1 - Extended Aeration Activated Sludge MLE Design Criteria

Parameter	Phase I	Phase II	Phase III
Overflow Rate at MDF (gpd/sf)	590	910	865
Diameter (feet)[4]	-	17	26
Tertiary Filtration			
Type	Cloth Media	Cloth Media	Cloth Media
Number of Units	1	1	1
Number of Disks per Unit	2	4	6
Surface Area per Disk (sf)	12	12	12
Total Surface Area (sf)	24	48	72
HLR at ADMMF (gpm/sf)	0.6	1.0	1.6
HLR at MDF (gpm/sf)	1.8	2.9	4.5
Disinfection			
Type	Ultraviolet	Ultraviolet	Ultraviolet
Number of Units	1	1	2
Number of Units in Service	1	1	2
Transmittance (%)	65	65	65
Dose (mJ/cm^2)	80	80	80
Number of Lamps per Reactor	18	18	18
Number of Lamps	18	18	36
Sludge Holding			
WAS Loading			
Hydraulic (gpd)	1,205	4,725	6,700
Solids (ppd)	70	275	390
HRT(days)	16.6	16.8	17.2
Volume (gal)	6,986	27,756	40,315
Number of Basins	1	2	3
Volume per Basin (gal)	6,986	13,878	13,438
Hauled Sludge Volume (gal/month)	9,620	37,800	53,610
Oxygen Required (ppd)	35	145	205

Notes:
1. Loading based on the ADMMF condition.
2. Phase I project will be supplied as a modular package plant with separate tanks.
3. SRT for aerobic zone only.
4. Phase I project will be supplied with a separate 10-foot square hopper clarifier.

6.2.5 Opinion of Probable Costs

Based on these design criteria, project cost estimates were developed for the MLE alternative. It should be noted that these costs represent the highest level of treatment and therefore cost for the MLE alternative since the costs include provisions for filtration and disinfection. As discussed in a latter section of this PER, different effluent disposal options may not require these ancillary processes.

The construction cost estimate for the MLE alternative is included in Table 6.3.

Table 6.3 – Alternative No. 1 - Extended Aeration Activated Sludge MLE Project Cost Summary

	Value			
Component	**Phase I**	**Phase II**	**Phase III**	**Total**
Equipment				
Screening	$177,000	$ -	$ -	$177,000
Activated Sludge	$425,000	$625,000	$625,000	$1,675,000
Filtration	$197,000	$ -	$ -	$197,000
Disinfection	$103,000	$ -	$103,000	$206,000
Civil/Yard Piping	$81,000	$65,000	$73,000	$219,000
Structural	$145,000	$166,000	$166,000	$477,000
Process Mechanical	$159,000	$100,000	$116,000	$375,000
Electrical & Instrumentation	$322,000	$258,000	$289,000	$869,000
Subtotal	**$1,609,000**	**$1,214,000**	**$1,372,000**	**$4,195,000**
Tax	$71,000	$57,000	$64,000	$192,000
Contractor Overhead & Profit	$168,000	$135,000	$151,000	$454,000
Contingency (20 Percent)	$369,000	$296,000	$332,000	$997,000
Total Construction Cost	**$2,217,000**	**$1,702,000**	**$1,919,000**	**$5,838,000**
Engineering, Administration, Legal (35 Percent)	$775,000	$621,000	$697,000	$2,093,000
Total Project Cost	**$2,992,000**	**$2,323,000**	**$2,616,000**	**$7,931,000**

6.2.5.1 Operations and Maintenance

The O&M cost estimate for the MLE alternative is included in Table 6.4. It should be noted that these O&M costs were developed for the Phase I project and are based on an AADF of 19,000 gpd. A 20-year net present value is also provided for the Phase I project.

Table 6.4 – Alternative No. 1 - Extended Aeration Activated Sludge MLE Annual O&M Cost Estimate

Component	Unit Cost	Unit	Quantity	Unit	Total
Sludge Disposal	$0.22	$/gallon	125,850	gallons	$27,687
Power	$0.16	$/kWh	177,984	kWh	$28,477
Filter Replacement	$991.17	$/filter	0.8	filters	$793
UV Bulb Replacement	$297.14	$/bulb	18	bulbs	$5,349
Labor	$58.37	$/hour	522	hours	$30,469
Maintenance[2]	2.0	%	$791,468	-	$15,829
Misc. Equipment Replacement[2]	4.0	%	$791,468	-	$31,659
Total					**$140,300**
20-Year Net Present Value					**$2,180,000**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the total Phase I equipment cost.
3. 20-Year Net Present Value determined using 2 percent inflation and 4 percent interest rate.

6.3 Alternative No. 2 – Sequencing Batch Reactor (SBR)

6.3.1 Overview

The SBR treatment process is a true batch system where equalization, treatment, and clarification is achieved within the confines of a single reactor. The typical treatment cycle of a SBR includes separate fill, react, settle, and decant treatment phases. Since all of these processes occur in a single basin, footprint requirements are reduced and mixed liquor recycle (MLR) pumping needed to achieve denitrification is eliminated.

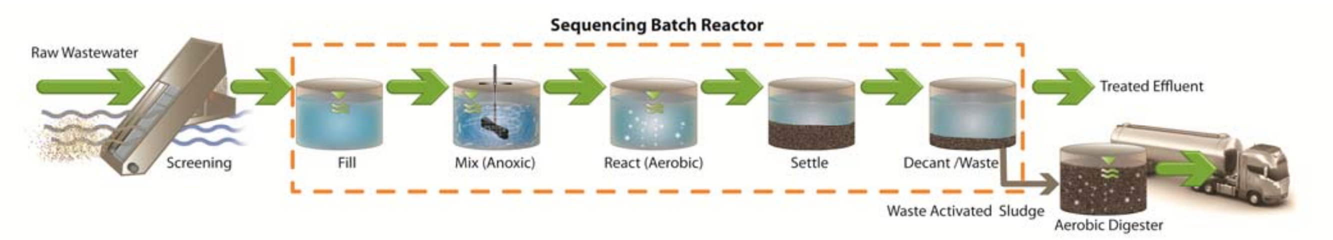

Figure 6.2 Typical SBR System Flow Schematic

6.3.2 Additional Processes

As discussed previously, several additional treatment processes may need to be added to the SBR in order to achieve the level of treatment required for effluent disposal alternatives presented in a latter section of this PER. Like the MLE alternative, these processes include filtration and disinfection.

6.3.2.1 Filtration

Like the MLE alternative, cloth media disk filtration has been evaluated for the SBR alternative. Detailed filtration design criteria for the SBR alternative are presented in a latter section of this PER.

6.3.2.2 Disinfection

Like the MLE alternative, UV disinfection has been evaluated for the SBR alternative. Detailed disinfection design criteria for the SBR alternative are presented in a latter section of this PER.

6.3.3 Design Criteria

Detailed design criteria have been developed for the SBR process as well as the filtration and disinfection facilities that may be required for this alternative.

6.3.3.1 SBR

For Phase I of the WWTP project, a single SBR basin and pre-equalization basin will be provided to attenuate diurnal peak flows and store influent wastewater while the SBR is in operation. Once the SBR cycle is completed, and the effluent has been decanted, the influent in the pre-equalization basin would be pumped into the SBR and the cycle would be repeated. During Phase II, a new SBR would be constructed and the existing basins would be used as a larger pre-equalization basin. The operation of the Phase II process would be similar to that in Phase I where a single SBR is in operation while the pre-equalization basin provides influent storage. However in Phase II, a post-equalization basin would be used to equalize the decant flow from the SBR to reduce the hydraulic impact on downstream facilities such as filtration and disinfection. For Phase III, a new SBR would be constructed and the existing pre-equalization basin would be eliminated. However, the post-equalization basin would continue to be used to equalize the decant flow for build-out conditions.

6.3.3.2 Cloth Media Filtration

Like the MLE alternative, a single filter basin would be constructed with the capacity to hold six separate disks as part of the Phase I project. However, because of the intermittent decant of the SBR, a total of six disks would be installed in the basin in order to achieve the desired hydraulic loading rate. During Phase II and Phase III when a new post-equalization basin is constructed, the instantaneous peak flow to the filters would be significantly reduced. Therefore, one filter unit with a total of six disks would be adequate for the build-out project.

6.3.3.3 UV Disinfection

For the SBR alternative, an additional in-vessel reactor is required to treat the high peak flows caused by the SBR decant cycle. During Phase II when the post equalization basin is constructed, a single reactor would be sufficient to treat the equalized flow. However, the second reactor would be required to treat the MDF of 458,000 gpd for Phase III.

6.3.3.4 Summary

The detailed design criteria for each component of the SBR alternative is summarized in Table 6.5.

Table 6.5 – Alternative No. 2 – SBR Design Criteria

Parameter	Phase I	Phase II	Phase III
Influent Characteristics			
Average Annual Daily Flow (gpd)	19,000	63,000	143,000
Average Day Maximum Month Flow (gpd)	20,000	69,000	158,000
Maximum Daily Flow (gpd)	59,000	200,000	458,000
Peak Hour Flow (gpd)	82,000	281,000	644,000
BOD			
(mg/L)	630	755	435
(ppd)[1]	105	435	575
TSS			
(mg/L)	420	480	330
(ppd)[1]	70	275	435
TKN			
(mg/L)	90	95	65
(ppd)[1]	15	55	85
Sequencing Batch Reactor (SBR) Basins			
Total Design Capacity (gpd)	20,000	69,000	158,000
Number of Basins	1	1	2
Design Capacity per Basin (gpd)	20,000	69,000	79,000
Length (ft)	34	34	34
Width (ft)	12	46	46
Depth			
Minimum (ft)	11.2	11.7	11.1
Average (ft)	12.8	13.2	12.8
Maximum (ft)	16.0	16.0	16.0
Total Volume (gal)	39,060	154,420	299,490
HRT (hours)	47	54	46
SRT (days)	18.3	17.4	22.7
MLSS (mg/L)	4,500	4,500	4,500
F:M (lb BOD/lb MLSS x day)	0.072	0.075	0.051
Tertiary Filtration			
Type	Cloth Media	Cloth Media	Cloth Media
Number of Units	1	1	1

Table 6.5 – Alternative No. 2 – SBR Design Criteria

Parameter	Phase I	Phase II	Phase III
Number of Disks per Unit	6	6	6
Surface Area per Disk (sf)	12	12	12
Total Surface Area (sf)	72	72	72
HLR at ADMMF (gpm/sf)	1.6	0.7	1.6
HLR at MDF (gpm/sf)[2]	4.6	2.0	4.5
<u>Disinfection</u>			
Type	Ultraviolet	Ultraviolet	Ultraviolet
Number of Units	2	2	2
Number of Units in Service	2	1	2
Transmittance (%)	65	65	65
Dose (mJ/cm^2)	80	80	80
Number of Lamps per Reactor	18	18	18
Number of Lamps	36	36	36
<u>Sludge Holding</u>			
WAS Loading			
Hydraulic (gpd)	840	3,545	5,170
Solids (ppd)	70	295	430
HRT(days)	20.0	16.1	11.0
Volume (gal)	8,380	28,480	28,480
Number of Basins	1	1	1
Volume per Basin (gal)	8,380	28,480	28,480
Hauled Sludge Volume (gal/month)	9,620	40,550	59,110
Oxygen Required (ppd)	35	155	225

Notes:
1. Loading based on the ADMMF condition.
2. Phase I does not include post-equalization. Decant and filter loading rate is equal to 8 x MDF or 472,000 gpd.

6.3.4 Opinion of Probable Costs

Based on these design criteria, project cost estimates were developed for the SBR alternative. These costs represent the highest level of treatment, and therefore the highest cost for the SBR alternative, since the costs include provisions for filtration and disinfection.

6.3.4.1 Construction

A construction cost estimate for the SBR alternative is included in Table 6.6.

Table 6.6 – Alternative No. 2 - SBR Project Cost Summary

	Value			
Component	**Phase I**	**Phase II**	**Phase III**	**Total**
Equipment				
Screening	$177,000	$ -	$ -	$177,000
Sequencing Batch Reactor	$344,000	$295,000	$223,000	$862,000
Filtration	$197,000	$ -	$ -	$197,000
Disinfection	$205,000	$ -	$ -	$205,000
Civil/Yard Piping	$83,000	$37,000	$29,000	$149,000
Structural	$175,000	$213,000	$172,000	$560,000
Process Mechanical	$142,000	$46,000	$35,000	$223,000
Electrical & Instrumentation	$330,000	$148,000	$115,000	$593,000
Subtotal	**$1,653,000**	**$739,000**	**$574,000**	**$2,966,000**
Tax	$73,000	$33,000	$25,000	$131,000
Contractor Overhead & Profit	$173,000	$77,000	$60,000	$310,000
Contingency (20 Percent)	$379,000	$170,000	$132,000	$681,000
Total Construction Cost	**$2,278,000**	**$1,019,000**	**$791,000**	**$4,088,000**
Engineering, Administration, Legal (35 Percent)	$796,000	$356,000	$276,000	$1,428,000
Total Project Cost	**$3,074,000**	**$1,375,000**	**$1,067,000**	**$5,516,000**

6.3.4.2 Operations and Maintenance

The O&M cost estimate for the SBR alternative is included in Table 6.7. Like the MLE alternative, these O&M costs are for the Phase I project treating an AADF of 19,000 gpd. A 20-year net present value is also provided for the Phase I project.

Table 6.7 – Alternative No. 2 - SBR Annual O&M Cost Estimate

Component	Unit Cost	Unit	Quantity	Unit	Total
Sludge Disposal	$0.22	$/gallon	115,440	gallons	$25,397
Power	$0.16	$/kWh	172,815	kWh	$27,650
Filter Replacement	$991.17	$/filter	7.2	filters	$7,136
UV Bulb Replacement	$297.14	$/bulb	18	bulbs	$5,349
Labor	$58.37	$/hour	783	hours	$45,704
Maintenance[2]	2.0	%	$708,482	-	$14,170
Misc. Equipment Replacement[3]	4.0	%	$708,402	-	$28,339
Total					**$153,800**
20-Year Net Present Value					**$2,387,000**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the total Phase I equipment cost.
3. 20-Year Net Present Value determined using 2 percent inflation and 4 percent interest rate.

6.4 Alternative No. 3 – Membrane Bioreactor

6.4.1 Overview

The MBR process consists of activated sludge reactors or aeration basins that use membrane filtration for solids separation. Membrane filtration is a solids separation process which utilizes polymeric filtration media with extremely small pore sizes ranging from 0.04 (hollow fiber) to 0.4 microns (flat sheet) to sieve and separate solids from the treated effluent. These systems are used to replace the secondary clarification and filtration steps normally associated with the activated sludge process. Without the limitations set by solids flux in conventional secondary clarification, the mixed liquor suspended solids (MLSS) concentration can be as high as 10,000 mg/L, which is much higher than conventional suspended growth processes. The higher MLSS concentration and the elimination of secondary clarifiers reduce the footprint of the overall MBR process. A MBR also produces a higher-quality effluent compared to that produced by secondary clarification paired with tertiary filtration.

The biological process for a MBR is controlled similarly to conventional activated sludge, where the solids retention time (SRT) is adjusted to achieve the desired removal efficiencies and sludge characteristics. The aeration basins of the MBR can also be configured for nitrification and denitrification with the addition of anoxic stages and MLR associated with the MLE process.

In order to protect the membranes downstream, the influent must be screened using fine screens with openings of two millimeters (mm) or less, prior to entering the aeration basins. MBR systems typically have higher operations and maintenance costs as compared to other activated sludge systems due to the following:

- Higher power costs due to membrane air scouring requirements;
- Higher chemical costs due to the need for periodic maintenance and recovery membrane cleaning; and
- Periodic membrane replacement approximately every ten years.

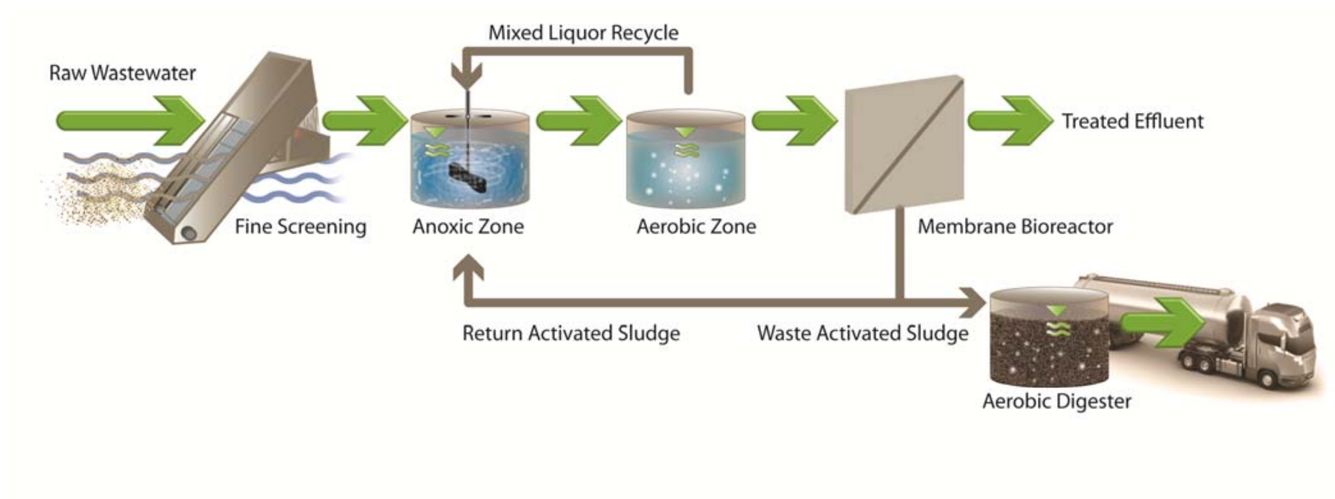

Figure 6.3 Typical MBR System Flow Schematic

6.4.2 Additional Processes

As discussed previously, additional treatment processes may need to be added to the MBR in order to achieve the level of treatment required for effluent disposal alternatives presented in a latter section of this PER. However, unlike the MLE and SBR alternatives, only disinfection is required for the MBR alternative since the membranes provide an equivalent level of solids treatment to filtration.

6.4.2.1 Disinfection

Like the previous alternatives, UV disinfection has been evaluated for the MBR alternative. Detailed disinfection design criteria for the MBR alternative are presented in a latter section of this PER.

6.4.3 Design Criteria

Detailed design criteria have been developed for the MBR process as well as disinfection facilities that may be required for this alternative.

6.4.3.1 MBR

For Phase I of the Los Olivos WWTP a single biological treatment train followed by two membrane trains would be constructed. Each biological treatment train consists of pre-anoxic, aerobic, and post-anoxic zones. The anoxic zone is required to achieve denitrification, but also serves as an equalization basin to attenuate peak hourly flow events. The post-anoxic zone is required to minimize the amount of dissolved air that is recycled to the post-anoxic zone that could inhibit the denitrification process. For Phase II, the existing biological treatment train would be expanded and a second train of equal volume would be added. A total of four membrane trains would be installed for Phase II. For Phase III, a third biological treatment train with two additional larger membrane trains would be added to increase the total treatment capacity to 158,000 gpd.

6.4.3.2 UV Disinfection

For the MBR alternative, a single in-vessel reactor is required to treat the MDF from Phase I and Phase II. During Phase III an additional reactor would be required to treat the MDF of 458,000 gpd.

6.4.3.3 Summary

The detailed design criteria for each component of the MBR alternative is summarized in Table 6.8.

Table 6.8 – Alternative No. 3 - MBR Design Criteria

Parameter	Phase I	Phase II	Phase III
Influent Characteristics			
Average Annual Daily Flow (gpd)	19,000	63,000	143,000
Average Day Maximum Month Flow (gpd)	20,000	69,000	158,000
Maximum Daily Flow (gpd)	59,000	200,000	458,000
Peak Hour Flow (gpd)	82,000	281,000	644,000
BOD			
(mg/L)	630	755	435
(ppd)[1]	105	435	575
TSS			
(mg/L)	420	480	330
(ppd)[1]	70	275	435
TKN			
(mg/L)	90	95	65
(ppd)[1]	15	55	85
Membrane Bioreactor (MBR)			
Total Design Capacity (gpd)	20,000	69,000	158,000
Number of Treatment Units	1	2	3
Pre-Anoxic Zone			
Volume per Train (gal)	2,200	4,300	4,300
Total Volume (gal)	2,200	8,600	12,900
Aerobic Zone			
Volume per Train (gal)	14,000	28,000	28,000
Membrane Tank Volume (gal)	2,400	2,400	2,400
Total Volume (gal)	16,400	60,800	91,200
Post-Anoxic Zone			
Volume per Train (gal)	1,400	2,700	2,700
Total Volume (gal)	1,400	5,400	8,100
HRT (hours)	24	27	18
SRT (days)	17.2	16.8	17.1
MLSS (mg/L)[2]	8,000	8,000	8,000
F:M (lb BOD/lb MLSS x day)	0.076	0.086	0.075
Trains per Units	2	2	2

Table 6.8 – Alternative No. 3 - MBR Design Criteria

Parameter	Phase I	Phase II	Phase III
Total Trains	2	4	6
Cassettes Per Train	1	1	1
Total Cassettes	2	4	6
Modules per Cassette	6	7	22
Total Modules	12	28	76[1]
Total Membrane Area (sf)	6,000	14,000	27,000
Total Membrane Area (sf)[3]	3,000	10,500	21,500
Flux at MDF (gpm/sf)	20	20	22
Flux at PHF (gpm/sf)	28	27	30
Disinfection			
Type	Ultraviolet	Ultraviolet	Ultraviolet
Number of Units	1	1	2
Number of Units in Service	1	1	2
Transmittance (%)	65	65	65
Dose (mJ/cm^2)	80	80	80
Number of Lamps per Reactor	18	18	18
Number of Lamps	18	18	36
Sludge Holding			
WAS Loading			
Hydraulic (gpd)	960	3,595	5,275
Solids (ppd)	80	300	440
HRT (days)	12.0	12.8	13.1
Volume (gal)	4,610	18,440	27,660
Number of Basins	1	2	3
Volume per Basin (gal)	4,610	9,220	9,220
Hauled Sludge Volume (gal/month)	10,995	41,240	60,485
Oxygen Required (ppd)	40	160	230

Notes:
1. Loading based on the ADMMF condition.
2. Number of modules based on 4 cassettes with 8 modules each and 2 larger cassettes with 22 modules each.
3. Total membrane area is with one of the largest cassettes out of service.

6.4.4 Opinion of Probable Costs

Based on these design criteria, project cost estimates were developed for the MBR alternative. These costs represent the highest level of treatment, and therefore cost for the MBR alternative, since the costs include provisions for disinfection.

6.4.4.1 Construction

A construction cost estimate for the MBR alternative is included in Table 6.9. The GE Z-MOD package is provided with internally-fed fine screens.

Table 6.9 – Alternative No. 3 - MBR Project Cost Summary

	Value			
Component	**Phase I**	**Phase II**	**Phase III**	**Total**
Equipment				
Membrane Bioreactor	$894,000	$900,000	$993,000	$2,787,000
Disinfection	$103,000	$ -	$103,000	$206,000
Civil/Yard Piping	$87,000	$81,000	$95,000	$263,000
Structural	$147,000	$163,000	$147,000	$457,000
Process Mechanical	$154,000	$139,000	$169,000	$462,000
Electrical & Instrumentation	$346,000	$321,000	$377,000	$1,044,000
Subtotal	**$1,731,000**	**$1,604,000**	**$1,884,000**	**$5,219,000**
Tax	$76,000	$71,000	$83,000	$230,000
Contractor Overhead & Profit	$181,000	$168,000	$197,000	$546,000
Contingency (20 Percent)	$397,000	$368,000	$432,000	$1,197,000
Total Construction Cost	**$2,385,000**	**$2,211,000**	**$2,596,000**	**$7,192,000**
Engineering, Administration, Legal (35 Percent)	$834,000	$773,000	$907,000	$2,514,000
Total Project Cost	**$3,219,000**	**$2,984,000**	**$3,503,000**	**$9,706,000**

6.4.4.2 Operations and Maintenance

The O&M cost estimate for the MBR alternative is included in Table 6.10. These O&M costs are for the Phase I project. A 20-year net present value is also provided for the Phase I project.

Table 6.10 – Alternative No. 3 - MBR Annual O&M Cost Estimate

Component	Unit Cost	Unit	Quantity	Unit	Total
Sludge Disposal	$0.22	$/gallon	131,940	gallons	$29,027
Power	$0.16	$/kWh	283,680	kWh	$45,389
Membrane Replacement	$3,035.06	$/module	2	modules	$6,070
Membrane Cleaning					
Chemical - NaOCl	$0.28	$/gallon	36	gallons	$10
Chemical - Citric Acid	$5.49	$/gallon	14.0	gallons	$77
UV Bulb Replacement	$297.14	$/bulb	18	bulbs	$5,349
Labor	$58.37	$/hour	522	hours	$30,469
Maintenance[2]	2.0	%	$766,684	-	$15,334
Misc. Equipment Replacement[3]	4.0	%	$766,684	-	$30,667
Total					**$162,400**
20-Year Net Present Value					**$2,527,000**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the total Phase I equipment cost.
3. 20-Year Net Present Value determined using 2 percent inflation and 4 percent interest rate.

6.5 Alternative No. 4 – AdvanTex

6.5.1 Overview

The AdvanTex system is manufactured by Orenco Systems, Inc., and is a packed bed aerobic system. The system consists of a reactor with media and an effluent recirculation chamber to keep the media wet continuously. The bed is composed of a textile-covered, plastic media that promotes attached growth of microorganisms, similar to a trickling filter process. Ventilation fans are utilized to aerate the reactor and provide sufficient oxygen to the attached-growth communities to convert the incoming organics to biomass. The recirculation chamber includes pumps for both recirculation and discharge of treated effluent.

The AdvanTex filter system has been utilized for commercial applications in California, however, no project examples or studies were provided with similar sizing for a community system in California at the time of this report. Several examples were provided for other community installations across the county. However, these installations used a step-type collection system. The proposed system consists of multiple, parallel treatment trains, each equipped with a media filter and effluent recirculation system including a dedicated set of recirculation and effluent pumps.

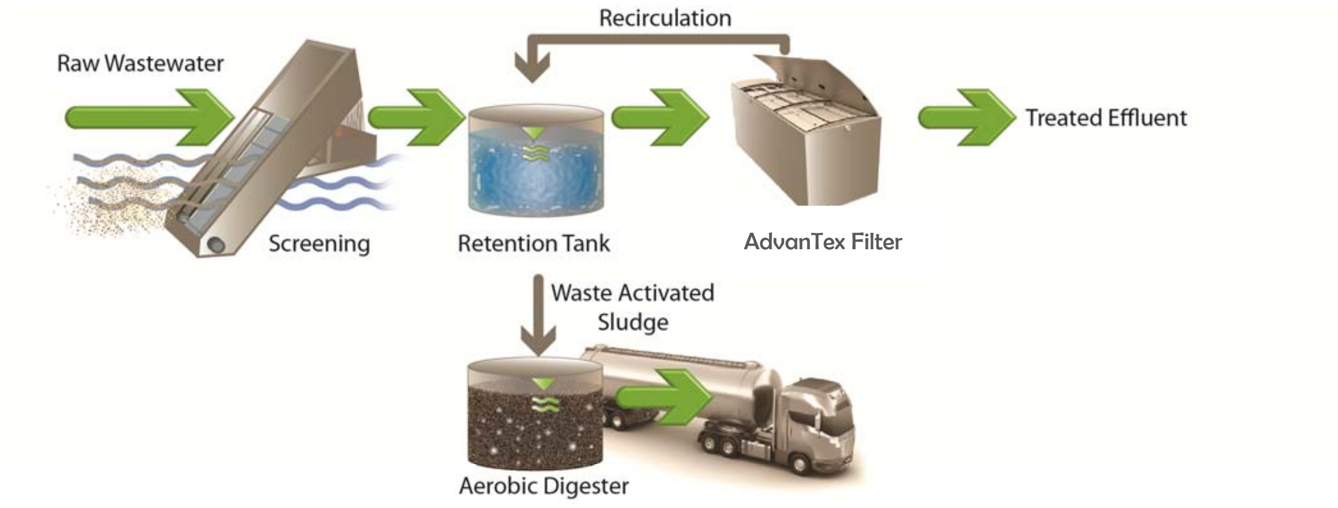

Figure 6.4 Typical AdvanTex System Flow Schematic

6.5.2 Additional Processes

In addition to the AdvanTex treatment system described above, raw sewage will require screening and a pretreatment tank that provides primary settling and flow equalization upstream of the AdvanTex system. To meet the anticipated nitrogen goals and Title 22 unrestricted reuse requirements, denitrification, filtration, and disinfection units will be needed downstream of the AdvanTex system to achieve the design effluent limits.

6.5.2.1 Screening

Similar to the processes described earlier in this section, the AdvanTex process will also require influent screening. Although not proposed by the vendor, screening will prevent ragging issues and other nonorganic solids from passing further into the treatment process. These inorganic solids would be disposed of in a landfill.

6.5.2.2 Primary Treatment

Primary treatment of the screened incoming effluent is necessary prior the AdvanTex system, since the textile media requires constant wetting and relatively steady flows and loadings. Primary treatment would consist of large septic tanks allowing both primary settling of solids and retention of incoming flows.

6.5.2.3 Denitrification

To achieve denitrification a Blue NITE™ nitrogen and phosphorus removal system would be included in the overall treatment process. The Blue NITE™ achieves denitrification with a continuous backwash, center upflow sandfilter. An external carbon source will likely be required to achieve the denitrification goals described in this report.

6.5.2.4 Disinfection

Similar to the previous alternatives, UV disinfection has been proposed by the vender for the AdvanTex alternative. For this project the Hallet 30 by UV Pure has been proposed. Although not currently California Title 22 accepted, certification of the units is being performed and acceptance is expected by April 2013.

6.5.3 Design Criteria

Design criteria have been provided for the AdvanTex system by Orenco Systems, Inc.

6.5.3.1 Primary Treatment

To achieve a two day hydraulic retention time (HRT) a 40,000 gallon tank will be required for Phase I of the project. An additional 100,000 gallon retention capacity will need to be added for Phase II of the project. Phase III of the project will require a total volume of 300,000 gallons to achieve retention.

6.5.3.2 AdvanTex

The AdvanTex system is sized based on the ADMMF. Phase I of the project will require 645 square feet (sq. ft.) of media. An additional 2749 sq. ft. of media will be required for Phase II of the project. For Phase III of the project, an additional 3287 sq. ft. of media will be required. The filter material would be placed over cast in place concrete channels as flows increase. The channels for phase 1 and phase 2 would be placed at phase 1 and would be approximately 80 feet by 120 feet in total dimensions. For phase 3 additional concrete channels would be constructed and would match the shape and size constructed for the earlier phases.

6.5.3.3 Denitrification

For Phase I and Phase II of the project a single unit measuring 5 feet in diameter and 14.75 feet high will be required. Phase III flows will require an additional unit of similar size.

6.5.3.4 UV Disinfection

For the Phase I loading 3 Hallet 30 units would be required. During Phase II an additional 4 units would be installed. To accommodate Phase III flows, an additional 7 units would be installed for a total of 14 units.

6.5.3.5 Summary

The design criteria for each component of the AdvanTex alternative are summarized in Table 6.11.

Table 6.11 – Alternative No. 4 – AdvanTex

Parameter	Phase I	Phase II	Phase III
Influent Characteristics			
Average Daily Flow (gpd)	19,000	63,000	143,000
Maximum Month Flow (gpd)	20,000	69,000	158,000
Maximum Daily Flow (gpd)	59,000	200,000	458,000
Peak Hour Flow (gpd)	82,000	281,000	644,000
BOD			
(mg/L)	630	755	435
(ppd)	105	435	575
TSS			
(mg/L)	420	480	330
(ppd)	70	275	435
TKN			
(mg/L)	90	95	65
(ppd)	15	55	85
AdvanTex			
Total Design Capacity (gpd)	20,000	69,000	143,000
Primary Treatment Volume (gal)	40,000	140,000	300,000
Pump Packages	1	2	2

Table 6.11 – Alternative No. 4 – AdvanTex

AdvanTex Textile Media (sq. ft)	645	3,394	6,681
Design Loading Rate (gpd/sq. ft.)	31	20	21
AdvanTex Channels	3	15	30
Recirculating Tank Volume (gal)	100,000	100,000	260,000
Pump Packages			
Recirculating Pumps	3	15	30
Discharge Pumps	2	12	24
Vent Fan Assemblies	1	6	12
Denitrification			
Number of Treatment Units – Blue NITE			
Number of Units	1	1	2
Diameter (ft.)	5	5	5
Height (ft.)	14.75	14.75	14.75
Disinfection			
Type	Ultraviolet	Ultraviolet	Ultraviolet
Number of Units	3	7	14
Number of Lamps	6	14	28
Sludge Holding[1]			
WAS Loading			
Hydraulic (gpd)	1,090	4,160	5,990
Solids (ppd)	75	290	415
HRT (days)	14.3	14.8	15.2
Volume (gal)	5,800	23,100	33,990
Number of Basins	1	2	3
Volume per Basin (gal)	5,800	11,550	11,330
Hauled Sludge Volume (gal/month)	10,310	39,520	57,050
Oxygen Required (lb/day)	40	160	220

1. Sludge Holding design criteria data was assumed to be an average of an Activated Sludge and Membrane Bioreactor system since no comparison system was available to provide an estimation of sludge production. Actual sludge production could be less than estimated.

6.5.4 Opinion of Probable Costs

Based on these design criteria, project cost estimates were developed for the AdvanTex alternative. These costs represent the highest level of treatment (appropriate for unrestricted reuse of effluent under Title 22 requirements), and therefore the highest cost for the AdvanTex alternative, since the costs include provisions for disinfection.

6.5.4.1 Construction

A construction cost estimate for the AdvanTex alternative is included in Table 6.12.

Table 6.12 – Alternative No. 4 - AdvanTex Project Cost Summary

	Value			
Component	**Phase I**	**Phase II**	**Phase III**	**Total**
Equipment[1]				
Screening[2]	$177,000	$ -	$-	$177,000
Primary Treatment Tank	$173,000	$586,000	$1,213,000	$1,972,000
AdvanTex	$553,000	$750,000	$1,572,000	$2,875,000
DeNite & Disinfection	$401,000	$-	$711,000	$1,112,000
Civil/Yard Piping	$50,000	$10,000	$10,000	$70,000
Structural	$119,000	$ -	$ -	$119,000
Process Mechanical	$ -	$ -	$ -	$ -
Electrical & Instrumentation	$100,000	$25,000	$25,000	$150,000
Subtotal	**$1,573,000**	**$1,371,000**	**$3,531,000**	**$6,475,000**
Tax	$64,000	$60,000	$155,000	$279,000
Contractor Overhead & Profit	$152,000	$143,000	$369,000	$664,000
Contingency (20 Percent)	$334,000	$315,000	$811,000	$1,460,000
Total Construction Cost	**$2,123,000**	**$1,889,000**	**$4,866,000**	**$8,878,000**
Engineering, Administration, Legal (35 Percent)	$701,000	$661,000	$1,703,000	$3,065,000
Total Project Cost	**$2,824,000**	**$2,550,000**	**$6,569,000**	**$11,943,000**

Notes:
1. Based on revised proposal dated November 2, 2012. Equipment costs include labor and installation.
2. Screening not included in proposal. Screens as proposed for MLE and SBR systems used.

6.5.4.2 Operations and Maintenance

The O&M cost estimate for the AdvanTex alternative is found in Table 6.13. The O&M costs presented in the table reflect costs for Phase I of the project. A 20-year net present value is also provided for the Phase I project.

Table 6.13 – Alternative No. 4 - AdvanTex Annual O&M Cost Estimate					
Component	**Unit Cost**	**Unit**	**Quantity**	**Unit**	**Total**
Sludge Disposal	$ 0.22	$/gallon	125,850	gallons	$27,687
Power	$0.16	$/kWh	76,241	kWh	$12,039
UV Bulb Replacement	$ 275.92	$/bulb	3	bulbs	$828
Labor	$ 58.37	$/hour	522	hours	$30,469
Maintenance[2]	2.0	%	$912,800	-	$ 18,256
Misc. Equipment Replacement[3]	4.0	%	$912,800	-	$36,512
Total					**$125,800**
20-Year Net Present Value					**$1,951,000**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the total Phase I equipment cost.
3. 20-Year Net Present Value determined using 2 percent inflation and 4 percent interest rate.

6.6 Summary

A summary of the cost for each alternative is presented in Table 6.14. As mentioned previously, the cost for these alternatives includes ancillary facilities such as filtration and disinfection needed to achieve the highest level of treatment necessary for the level of treatment anticipated in this PER, which is disinfected tertiary effluent.

Table 6.14 – Phase I Total NPV Cost Summary

	Alternative			
Component	**No. 1 – MLE**	**No.2 – SBR**	**No. 3 – MBR**	**No. 4 – AdvanTex**
Construction Cost	$2,217,000	$2,278,000	$2,385,000	$2,123,000
Project Cost	$2,992,000	$3,074,000	$3,219,000	$2,824,000
Annual O&M Cost	$140,300	$153,800	$162,400	$125,800
O&M NPV Cost	$2,180,000	$2,387,000	$2,527,000	$1,951,000
Total Project & O&M NPV Cost	$5,172,000	$5,461,000	$5,746,000	$4,775,000

A summary of equipment and installation costs for each phase of the project is shown in Table 6.15. The costs shown in Table 6.15 do not reflect state tax or contractor markup. Detailed cost comparison tables for each phase are provided in Appendix B.

Table 6.15 – Equipment and Installation Cost Comparison

Treatment Alternative	Phase I	Additional for Phase II	Additional for Phase III	Total
MLE	$1,609,000	$1,214,000	$1,372,000	$4,195,000
SBR	$1,653,000	$739,000	$574,000	$2,966,000
MBR	$1,731,000	$1,604,000	$1,884,000	$5,219,000
AdvanTex	$1,573,000	$1,371,000	$3,531,000	$6,475,000

Figure 6.5 on the next page displays the four treatment alternatives and associated equipment and installation costs for each phase.

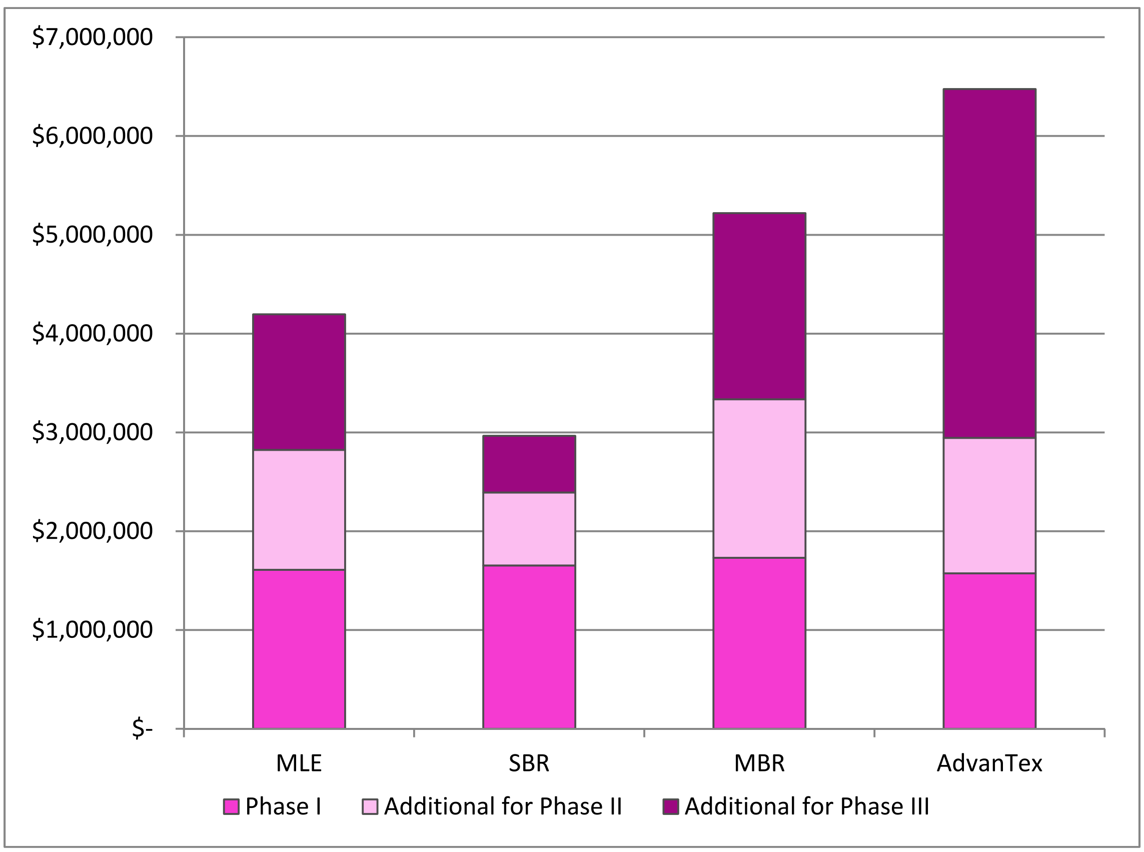

Figure 6.5 Treatment Alternative Cost Comparison

A summary of advantages and disadvantages associated with each treatment alternative considered for this PER are included in Table 6.16.

Table 6.16 – Viable Treatment Alternatives Advantages and Disadvantages

	Alternative			
Criteria	**No. 1 – MLE**	**No. 2 – SBR**	**No. 3 – MBR**	**No. 4 – AdvanTex**
Construction Cost	0	0	-	-
O&M Cost	+	+	-	+
Ease of Unattended Operation	+	-	0	+
Footprint	-	+	+	-
Expandability	-	0	+	0
Effluent Quality	0	0	+	0
Visual Impacts	-	+	+	+

Legend:
(+) Advantage
(0) Neutral
(-) Disadvantage

7 Effluent Disposal

The community of Los Olivos currently relies on individual OWTSs for treatment and disposal of wastewater. The most common disposal method is subsurface dispersal fields, which can include shallow dispersal fields, conventional leachfields, or seepage pits. The LOWMMP provided an in-depth discussion of these types of systems. Since OWTSs only provide a minimum level of treatment in a septic tank, the disposal field is used to provide further treatment before the effluent reaches the groundwater table. Ideally, the disposal field is designed to maintain aerobic conditions in the vadose zone underlying the infiltration surface to promote removal of organics and nutrients from the effluent. Due to shallow groundwater and influence of OWTS's in the SPA, nitrate concentrations in the groundwater of the Santa Ynez sub-basin are increasing.

Since this PER addresses the implementation of a new WWTP, an evaluation of additional effluent disposal options needs to be provided. Effluent disposal will ultimately dictate the quality of effluent required. This PER evaluates the feasibility of four effluent disposal methods:

- Percolation
- Subsurface disposal (leachfields)
- Agricultural Reuse – Undisinfected Secondary
- Agricultural Reuse – Disinfected Tertiary

The fundamental difference between the effluent disposal methods described in this PER and those encountered for conventional OWTSs is reliance on the effluent disposal practice for additional treatment. For example, all the treatment systems evaluated in this PER can reduce the level of TN in the effluent to below 10 mg/L. Due to the impacts of existing OWTSs resulting in the presence of elevated nitrate concentration in the groundwater, and the RWQCB's sensitivity to this issue, AECOM recommends nitrogen removal even with a disposal method such as agricultural reuse, which is often used to reduce the level of nitrogen in the effluent.

A summary of the effluent disposal alternatives evaluated in this PER are presented in Table 7.1. A discussion of each of these alternatives is included that considers pertinent issues such as anticipated regulatory requirements, siting and area requirements, detailed design criteria, and construction cost estimates are provided in this section.

Table 7.1 – Summary of Viable Effluent Disposal Alternatives			
Disposal/Reuse Alternative	**Filtration Required**	**Disinfection Required**	**Nitrogen Removal Required**
Percolation	No	No[3]	Yes
Subsurface Disposal (Leach field)	Yes[1]	No[3]	Yes
Agricultural Reuse – Undisinfected Secondary	No	No	Partial[2]
Agricultural Reuse – Disinfected Tertiary	Yes	Yes	Partial[2]

Notes:
1. Filtration may be implemented to increase the expected life of the leachfields.
2. Due to concerns with nitrate infiltration to the groundwater, denitrification to a TN of 10 mg/L has been assumed for all disposal options, even surface irrigation.
3. Regional Water Quality Control Board may require disinfection if groundwater levels are within 5 feet of the infiltration area.

7.1 Percolation

Percolation ponds are reservoirs where water is stored and allowed to either percolate into the ground or evaporate. The pond bottoms are managed to maintain percolation rates by periodically drying, ripping, and conditioning the soils.

Groundwater degradation is a major consideration for this type of disposal practice. Regulations are continually changing and becoming more restrictive to protect groundwater quality. Considerations such as distance to the nearest well, depth to groundwater, and mounding potential must all be considered in addition to water quality. Sizing and siting requirements for the percolations pond depends on these groundwater issues, the types of soils, and percolation capacity.

7.1.1 Regulatory Requirements

As discussed previously, nitrate concentrations in the groundwater underlying the SPA and surrounding areas are increasing due to the use of OWTSs. In order to minimize future degradation from the Los Olivos WWTP, the concentration of nitrogen in the effluent would be reduced to within the primary drinking water MCL of 10 mg/L nitrate (as N) or 10 mg/L TN. The shallow groundwater in the SPA highlights the need for nitrogen removal with percolation since natural nitrification/denitrification in the soil matrix is expected to be limited.

7.1.2 Design Criteria

The most important criterion for development of the percolation disposal method is selecting a site with adequate area based on the sites percolation rate. Based on an initial evaluation of the area, the location of the disposal sites will be either northeast or southeast of the SPA. According to the LOWWMP, the soils northeast of the special problem area are dominated by Salinas silty clay loam (SdA) with a permeability of 0.20 to 0.63 inches per hour. The soils in the area southeast of the SPA are dominated by Ballard gravelly fine sandy loam (BhC) with a permeability of 2.0 to 6.3 inches per hour. Typically, percolation rates are estimated at between 4 and 10 percent of the saturated vertical permeability.[11] Therefore, four percent of the lowest expected permeability results in a percolation rate of approximately 0.20 inches per day (inches/day). To develop the size and cost of the percolation facilities, this percolation rate has been assumed for this PER.

[11] Land Treatment EPA 2006

In order to calculate the volume and area of percolation basins necessary for each phase of the Los Olivos WWTP project, water balances have been developed. The water balances take into account not only the water lost through percolation, but also water lost from evaporation and the contribution of rainfall. Table 7.2 summarizes the climatic characteristics used to develop the water balances for the percolation alternative. The water balances are included in the Appendix C.

Table 7.2 – Evaporation and Precipitation Data for the Los Olivos Area

Month	Pan Evaporation (inches/month)[1]	Evaporation (inches/month)[2]	Precipitation (inches/month)[3]
January	2.44	1.83	3.10
February	3.53	2.65	3.14
March	4.41	3.31	2.55
April	6.01	4.51	1.12
May	7.55	5.66	0.27
June	8.56	6.42	0.03
July	9.50	7.13	0.02
August	8.98	6.74	0.03
September	7.00	5.25	0.18
October	5.42	4.07	0.52
November	3.49	2.62	1.53
December	2.79	2.09	2.27
Total	**69.68**	**52.26**	**14.76**

Notes:
1. Western Regional Climate Center – Cachuma Lake (1952 – 2002).
2. Pan Evaporation (inches/month) x 0.75.
3. Western Regional Climate Center – Lompoc (1917 – 2010).

Detailed design criteria for Phase I, II, and III of the Los Olivos WWTP are provided in Table 7.3.

Table 7.3 – Percolation Design Criteria

Parameter	Phase I	Phase II	Phase III
Influent Characteristics			
Average Annual Daily Flow (gpd)	19,000	63,000	143,000
Average Day Maximum Month Flow (gpd)	20,000	69,000	158,000
Maximum Daily Flow (gpd)	59,000	200,000	458,000
Peak Hour Flow (gpd)	82,000	281,000	644,000
Effluent Characteristics			
BOD (mg/L)[1]	20	20	20
TSS (mg/L)[1]	20	20	20
Total Nitrogen (mg/L)	10	10	10
Percolation Basins			
Nitrogen Loading (lb/year)	389	1,283	2,911
Percolation Rate (in/day)	0.14	0.18	0.20
Total Percolation Area (acres)	3.6	8.9	17.8
Total Basin Area (acres)	4.6	11.4	22.7
Total Volume (AF)	14.2	35.4	70.8
Number of Basins[2]	2	5	10
Basin Dimensions			
Length (ft)	498	498	498
Width (ft)	198	198	198
Side Water Depth (ft)	4	4	4
Freeboard (ft)	2	2	2
Side Slope (H:V)	4	4	4

Notes:
1. Typical effluent limits for BOD and TSS of 30 mg/L are anticipated. Treatment facilities will be designed for 20 mg/L to ensure a limit of 30 mg/L can be reliably achieved.
2. A redundant basin is provided in Phase I to allow for periodic drying and conditioning of the percolation basins.

It is important to note the hydraulic loading rate, and therefore the basis of design for this alternative, is based on assumed soil characteristics and vertical permeability. Once potential disposal sites are identified infiltration tests should be conducted by a hydrogeologist to determine the suitability of this disposal method for a particular location.

7.1.3 Siting and Area Requirements

As mentioned previously, percolation basins should be located in areas with high infiltration rates such as coarse sandy soils. While expansive clay soils should be avoided, very fine sandy soils also have limited percolation capacity and a propensity for clogging or fouling. Percolation testing should be done at prospective sites to determine the applicability of percolation and accurately determine the necessary basin capacity.

Based on a percolation rate of 0.20 inches/day, approximately 5 acres of percolation basins would be required for Phase I. With accommodations for dikes and set-backs, the County would need to acquire roughly 10 acres of land. At build-out, a total pond area of approximately 24 acres would be required with an associated land requirement of 40 acres.

7.1.4 Opinion of Probable Costs

Cost estimates for implementation of percolation have been developed for Phases I, II, and III. The costs for the percolation alternative are summarized in Table 7.4.

Table 7.4 – Percolation Alternative Project Cost Summary

	Value			
Component	**Phase I**	**Phase II**	**Phase III**	**Total**
Percolation Basins	$64,000	$99,000	$165,000	$330,000
Subtotal	**$66,000**	**$99,000**	**$165,000**	**$330,000**
Tax	$3,000	$5,000	$7,000	$15,000
Contractor Overhead & Profit	$7,000	$10,000	$17,000	$34,000
Contingency (20 Percent)	$15,000	$42,000	$70,000	$127,000
Total Construction Cost	**$91,000**	**$156,000**	**$259,000**	**$506,000**
Engineering, Administration, Legal (35 Percent)	$31,000	$88,000	$146,000	$265,000
Total Project Cost	**$122,000**	**$244,000**	**$405,000**	**$771,000**

For the purpose of this PER it has been assumed effluent will flow by gravity to the percolation basins and no effluent pumping is required. In addition, the costs presented in this PER do not include the cost to purchase or acquire the land needed to accommodate the percolation basins.

7.2 Subsurface Disposal (Leachfields)

7.2.1 Overview

Subsurface disposal is a common method for effluent disposal for OWTSs. Most individual parcels in the SPA rely on either conventional leachfields or seepage pits to dispose of wastewater from septic tanks. However, unlike the subsurface disposal methods used by existing OWTSs, which apply effluent with a BOD concentration between 100 and 200 mg/L, the subsurface disposal systems evaluated in this PER will be used to dispose of effluent with a BOD concentration less than 20 mg/L and a TN concentration less than 10 mg/L. Therefore, further soil aquifer treatment to avoid contamination of the groundwater and risks to public health is not needed.

While the most common forms of subsurface disposal are conventional leachfields and seepage pits, shallow drip systems are also gaining popularity and were discussed in detail in the LOWWMP. Both of these systems are discussed in detail below.

7.2.1.1 Shallow Drip System

Subsurface disposal via a shallow drip system discharges treated effluent directly to the active soil layer, typically six to ten inches beneath the ground surface. These systems typically consist of pressurized small diameter tubing (1/2 inch) with integrated emitters. Operating pressures for drip systems range from 7 to 60 pounds per square inch (psi) and can deliver up to two gallons per hour (gph) per emitter depending on the supply characteristics.

There are several advantages to the use of shallow drip systems for wastewater disposal. The main benefit of this system is its ability to deliver effluent to the root-zone of plants to facilitate additional treatment. Nutrients are removed from the effluent and utilized by the plants. In addition, since dispersal occurs near the ground surface, a separation distance to groundwater as little as three feet is needed. Because of these benefits and others such as the ability to install on varying topography and irregular shaped areas, drip systems have become a popular method for treatment and disposal for OWTSs. Shallow drip irrigation is particularly well suited for large areas of turf and other landscaped areas.

Although a shallow drip system is a potential disposal alternative for the Los Olivos WWTP, the major benefit of nitrogen removal would not be realized since the treatment alternatives presented previously include nitrogen removal.

7.2.1.2 Leachfields

Conventional leachfields consist of shallow trenches approximately two feet in depth. Small diameter perforated piping is installed in the trenches, and gravel backfill is placed several inches above and below the pipe. A layer of geotextile fabric is placed over the gravel to prevent the intrusion of fines and fouling of the leachfield and the remaining trench depth is backfilled with native or imported fill. Treated wastewater flows by gravity to a simple distribution structures that evenly distribute effluent to individual trenches several hundred feet in length. The effluent leaves the perforated pipe and percolates through the gravel to the infiltration surface, which is the bottom of the narrow trenches.

Conventional leachfields are a proven wastewater disposal technology for both small decentralized systems as well as larger community treatment facilities. Due to the smaller area requirements, lack of pumping, reduced O&M requirements, and reduced fouling potential as compared to a drip system, conventional leachfields have been assumed for this PER.

7.2.2 Regulatory Requirements

As mentioned previously, the impact of nitrogen on the groundwater is a major regulatory concern for subsurface disposal and the new WWTP cannot contribute to that contamination. Incorporating nitrogen removal into the selected treatment alternative can mitigate this concern. Nitrogen reduction is anticipated for the Los Olivos WWTP for any of the disposal alternatives evaluated, but in particular percolation or subsurface disposal.

7.2.2.1 Total Suspended Solids

Conventional secondary treatment requirements of approximately 30 mg/L for TSS are anticipated in the WDRs issued for the Los Olivos WWTP if subsurface disposal is pursued. However, AECOM recommends this alternative be accompanied by filtration. While not dictated by the regulations, minimizing the solids loading to the leachfield would extend their useful life expectancy and minimize the frequency of costly excavation and maintenance.

7.2.3 Design Criteria

Soil characteristics and hydraulic loading are critical design criteria for leachfields. According to the Onsite Wastewater Treatment Systems Manual[12], typical hydraulic loading rates for fine sandy loam and very fine sandy loam are between 0.5 and 0.8 gallons per day per square foot (gpd/sf) for secondary effluent with a BOD concentration of 30 mg/L. Organic loading guidelines for these soil types is 0.13 to 0.20 pounds of BOD per 1,000 square feet (ppd/1,000 sf) for secondary treated effluent. For the purposes of this PER, a hydraulic loading factor of 0.6 gpd/sf has been assumed. Based on the design criteria and the assumed effluent quality of 10 mg/L for BOD, the expected organic loading is 0.05 ppd/sf.

Another important consideration for the design of leachfield systems is redundancy. Redundancy is needed to both preserve the infiltration capacity of the leachfield as well as provide adequate capacity for prolonged shutdowns associated with periodic disruptive maintenance. For the purpose of this PER, full redundancy has been provided for the leachfield alternative.

Detailed design criteria are provided in Table 7.5.

Table 7.5 – Subsurface Disposal (Leachfield) Design Criteria

Parameter	Phase I	Phase II	Phase III
<u>Influent Characteristics</u>			
Average Annual Daily Flow (gpd)	19,000	63,000	143,000
Average Day Maximum Month Flow (gpd)	20,000	69,000	158,000
Maximum Daily Flow (gpd)	59,000	200,000	458,000
Peak Hour Flow (gpd)	82,000	281,000	644,000
<u>Effluent Characteristics</u>			
BOD (mg/L)[1]	10	10	10
TSS (mg/L)[1]	10	10	10
Total Nitrogen (mg/L)	10	10	10

[12] Onsite Wastewater Treatment Systems Manual (EPA/625/R-00/008), February 2002

Table 7.5 – Subsurface Disposal (Leachfield) Design Criteria			
Parameter	**Phase I**	**Phase II**	**Phase III**
Subsurface Disposal			
Type	Conventional/ Gravity	Conventional/ Gravity	Conventional/ Gravity
Number of Leachfields (Total)[2]	2	2	2
Number of Leachfields (In Service)	1	1	1
Nitrogen Loading (lb/year)	574	1,935	4,395
Hydraulic Loading Rate (gpd/sf)	0.58	0.60	0.60
Infiltration Area per Leachfield (sf)	30,645	70,968	129,032
Organic Loading (ppd/1000 sf)	0.05	0.05	0.05
Trench Dimensions			
Width (ft)	3	3	3
Length (ft)	500	500	500
Depth (ft)	2	2	2
Bed Depth (in)	8	8	8
Number of Trenches per Leachfield (ft)	21	67	152
Trench Spacing (ft)	6	6	6
Disposal Field			
Area (acres)	2.2	6.9	15.7
Length (ft)	500	500	500
Width (ft)	183	597	1,362
Total Disposal Field Area (acres)	4.4	13.8	31.4

Notes:
1. Typical effluent limits for BOD and TSS of 30 mg/L are anticipated. Treatment facilities will be designed for 10 mg/L prolong the potential life of the leachfields.
2. Full redundancy for the leachfield area required for each phase is provided to allow for prolonged outages due to maintenance and to preserve disposal capacity by alternating leachfields.

The sizing for the infiltration area is based on limited soil information and typical infiltration rates for soil, textural classes. In order to determine the feasibility of leachfields at a particular site, infiltration testing and analysis by a hydrogeologist is recommended.

7.2.4 Siting and Area Requirements

The presence of shallow groundwater and expansive clay soils can have negative impacts on the capacity of a leachfield. Therefore, areas with seasonal or sustained high groundwater levels and these types of soils should be avoided for leachfield construction.

Based on the design criteria detailed in Table 7.5, an infiltration area of approximately 5 acres is required for redundant leachfields to handle flows for Phase I. This infiltration area translates to a total disposal area of approximately 10 acres for Phase I. At build-out, an infiltration area of approximately

32 acres is needed to accommodate an AADF of 143,000 gpd. The total land requirement for build-out for the leachfield alternative is 50 acres.

7.2.5 Opinion of Probable Costs

Cost estimates for implementation of percolation have been developed for Phases I, II, and III. The costs for the percolation alternative are summarized in Table 7.6.

Table 7.6 – Subsurface Disposal (Leachfield) Alternative Project Cost Summary

	Value			
Component	**Phase I**	**Phase II**	**Phase III**	**Total**
Leachfields	$209,000	$459,000	$847,000	$1,515,000
Subtotal	**$209,000**	**$459,000**	**$ 847,000**	**$1,515,000**
Tax	$10,000	$21,000	$38,000	$69,000
Contractor Overhead & Profit	$22,000	$48,000	$89,000	$159,000
Contingency (20 Percent)	$48,000	$106,000	$195,000	$349,000
Total Construction Cost	**$289,000**	**$634,000**	**$1,169,000**	**$2,092,000**
Engineering, Administration, Legal (35 Percent)	$101,000	$221,000	$409,000	$731,000
Total Project Cost	**$390,000**	**$855,000**	**$1,578,000**	**$2,823,000**

For the purpose of this PER it has been assumed effluent will flow by gravity to the leachfields and no effluent pumping is required. In addition, the costs presented in this PER do not include the cost to purchase or acquire the land needed to accommodate the leachfields.

7.3 Agricultural Reuse

The Los Olivos SPA is surrounded by agriculture sites. Crops grown in the area vary widely and include alfalfa, barley, beets, beans, vineyards, olives, walnuts, miscellaneous row crops, and organically grown vegetables. In order to encompass this diversity, AECOM has evaluated two options for agricultural reuse: feed and fodder crops such as alfalfa and human consumption crops such as grapes and vegetables. Alfalfa requires undisinfected secondary effluent for irrigation. However, crops intended for human consumption that come in contact with irrigation water, must be irrigated with disinfected tertiary recycled water. An in-depth discussion of CDPH Title 22 recycled water regulations is provided in Section 4.5.2 of this PER. A discussion of both of these effluent disposal methods is presented below.

7.3.1 Regulatory Requirements

7.3.1.1 Nitrogen

Nitrogen in wastewater effluent is a nutrient that supports plant growth and therefore is beneficial. However, nitrogen must be applied at agronomic rates, meaning the application of nitrogen on reclamation areas cannot exceed the amounts that the crop uptakes. With surface irrigation applications, typically higher levels of nitrogen are required than would be applied at the hydraulic application rate and supplemental nitrogen is usually required. In addition, all the treatment alternatives evaluated will reliably produce an effluent with an effluent TN concentration of 10 mg/L.

7.3.1.2 Salinity

Data obtained from the 2009 Water Quality Report for the District indicates anticipated source water quality for Los Olivos will have a TDS concentration of approximately 555 mg/L assuming none of the supply is received from the Cachuma Project entitlement. Residential water use typically adds between 200 and 300 mg/L TDS to the source water. Assuming a salt pick-up of approximately 250 mg/L, the expected effluent quality would have a TDS concentration of 805 mg/L.

While feed and fodder crops such as alfalfa have a high salt tolerance, a high TDS concentrations can affect the yields of certain vegetables and row crops. Table 7.7 summarizes the effects of TDS on many of the most common crops grown in the area immediately surrounding the special problem area.

Table 7.7 – Effects of Salinity on Crop Yield

	Effect of TDS (mg/L) on Crop Yield				
Crop	**100 % Yield**	**90 % Yield**	**75 % Yield**	**50 % Yield**	**Sensitivity Rating**
Beans	450	640	960	1,535	Sensitive
Lettuce	575	895	1,345	2,175	Moderately Sensitive
Almond	640	895	1,215	1,790	Sensitive
Grapes	640	1,090	1,730	2,880	Moderately Sensitive
Pepper	640	960	1,410	2,175	Moderately Sensitive
Corn	705	1,090	1,600	2,495	Moderately Sensitive
Spinach	830	1,410	2,240	5,015	Moderately Sensitive
Tomato	1,090	1,470	2,175	3,200	Moderately Sensitive
Beets	1,730	2,175	2,880	5,630	Moderately Tolerant

Notes:
1. Values for electroconductivity effects obtained from Grattan, 2002.
2. Electroconductivity (dS/m) converted to TDS (mg/L) with a factor of 640 mg/L for <5 dS/m and 880 mg/L for >5 dS/m.

7.3.1.3 Turbidity

The two recycled water options discussed in this PER, undisinfected secondary and disinfected tertiary, differ in the levels of turbidity and total coliform allowed for irrigation. While undisinfected secondary effluent has no filtration requirements, disinfected tertiary must be filtered. The specific requirements are discussed in detail in the following sections.

7.3.1.3.1 Disinfected Tertiary

Disinfected tertiary effluent must be oxidized, filtered, and disinfected for irrigation. The effluent must be coagulated and filtered to not exceed the following criteria for turbidity:

- Average of 2 NTU within a 24-hour period;
- 5 NTU more than 5 percent of the time within a 24-hour period;
- 10 NTU at any time.

If the effluent is passed through microfiltration, ultrafiltration, nanofiltration or reverse osmosis, as is the case with the MBR treatment alternative, the following turbidity levels must not be exceeded:

- 0.2 NTU more than 5 percent of the within a 24-hour period; and
- 0.5 NTU at any time.

For the purposes of this PER, both treatment Alternative No. 1 – MLE and Alternative No. 2 – SBR have been presented with coagulation and cloth media disk filtration to meet the Title 22 requirements. Alternative No. 3 – MBR inherently includes filtration in the form of ultrafiltration membranes.

7.3.1.4 Coliform

In addition to filtration, disinfected tertiary must be disinfected to lower the level of coliform in the effluent before it can be applied for irrigation. The specific requirements are discussed below.

7.3.1.4.1 Disinfected Tertiary

The median level of coliform in tertiary disinfected effluent must not exceed 2.2 MPN/100 mL. Disinfection must occur by either chlorination or a process that inactivates and/or removes 99.999 percent of F-specific bacteriophage MS-2, or polio viruses.

For the purposes of this PER, AECOM has assumed UV disinfection will be used with each alternative to bring total coliform levels in line with the Title 22 requirements.

7.3.1.4.2 Federal Leafy Greens Criteria

In 2009, the United States Food and Drug Administration (FDA) published a draft guidance document[13]aimed at reducing the risks of microbial hazards on leafy greens. Leafy greens (iceberg lettuce, romaine lettuce, leaf lettuce, butter lettuce, baby leaf lettuce) are minimally processed and once contaminated, removing or killing pathogens is difficult. The draft guidance provides growers with recommendations in limiting the sources of contamination at all stages of processing from production and harvest to retail and foodservice handling.

Immediately following discharge from the WWTP, the effluent would be disinfected in accordance with disinfected tertiary requirements per Title 22. However, the effluent would be stored in uncovered and unlined ponds until being conveyed to individual growers. These ponds could provide the opportunity for contamination or re-growth of pathogens in the recycled water. Effluent supplied for production of leafy greens would most likely require additional disinfection after being delivered to the irrigation site.

[13] U.S. Food and Drug Administration- Guidance for Industry: Guide to Minimize Microbial Food Safety Hazards of Leafy Greens; Draft Guidance (July 2009)

7.3.1.5 Reliability

Article 9 of the Regulations Related to Recycled Water[14] describes the reliability requirements for various portions of a wastewater treatment plant producing reclaimed water for irrigation. These requirements apply to both undisinfected secondary and disinfected tertiary recycled water production, and pertain to biological treatment, coagulation and filtration, and disinfection facilities. In order to meet the reliability requirements for these facilities, either redundant treatment units or long-term storage is required. Long-term storage is defined as facilities with sufficient capacity for the storage or disposal of wastewater for at least 20 days.

In order to minimize the construction cost of the facility, AECOM has assumed the Title 22 reliability requirements will be met with long-term storage rather than installation of redundant treatment units. For both the undisinfected secondary and disinfected tertiary alternatives, an additional emergency storage basin has been included that provides a minimum of 20 days of storage for each phase of the WWTP.

7.3.2 Design Criteria

In order to develop design criteria for the agricultural reuse alternatives, water balances were developed for both undisinfected secondary and disinfected tertiary options. To construct these water balances, irrigation estimates were determined for two representative crops in the Los Olivos area. The water balances are included in Appendix C. For the undisinfected secondary option, irrigation of alfalfa was assumed since it is prevalent in the area surrounding the SPA. For the disinfected tertiary option, vineyards were selected. Also, the recycled water may be used to irrigate another crop such as beans that requires tertiary disinfected effluent for unrestricted reuse.

[14] California Department of Public Health – Regulations Related to Recycled Water (January 2009)

The irrigation requirements for both alfalfa and vineyards are included in Table 7.8.

Table 7.8 – Los Olivos Area Irrigation Demands

Month	Standard Monthly Average ETo[1] (inches)	Monthly Average Precipitation[2] (inches)	Crop Coefficients (Kc)[3]		Crop Water Demands (inches)[4]	
			Alfalfa	Vineyard	Alfalfa	Vineyard
January	1.68	3.10	1.17	0.00	0.00	0.00
February	2.21	3.14	1.11	0.00	0.00	0.00
March	3.52	2.55	1.05	0.00	1.35	0.00
April	5.01	1.12	1.02	0.68	4.72	2.71
May	5.78	0.27	1.02	0.78	6.60	5.00
June	6.18	0.03	1.00	0.80	7.24	5.76
July	6.40	0.02	1.00	0.80	7.51	5.98
August	6.01	0.03	1.00	0.80	7.04	5.60
September	4.46	0.18	1.00	0.73	5.04	3.60
October	3.57	0.52	1.01	0.53	3.65	1.63
November	2.19	1.53	1.07	1.20	0.97	1.28
December	1.67	2.27	1.11	0.00	0.00	0.00
Total	**48.68**	**14.76**	-	-	**44.10**	**31.55**

Notes:
1. California Irrigation Management Information System (CIMIS) Station 64 – Santa Ynez (1986).
2. Western Regional Climate Center – Lompoc (1917 – 2010).
3. State of California – Department of Water Resources Consumptive Use Program + (2008).
4. Includes 85 percent irrigation efficiency.

7.3.2.1 Undisinfected Secondary

Detailed design criteria for the undisinfected secondary option are provided in Table 7.9.

Table 7.9 – Agricultural Reuse (Undisinfected Secondary) Design Criteria

Parameter	Phase I	Phase II	Phase III
Influent Characteristics			
Average Annual Daily Flow (gpd)	19,000	63,000	143,000
Average Day Maximum Month Flow (gpd)	20,000	69,000	158,000
Maximum Daily Flow (gpd)	59,000	200,000	458,000
Peak Hour Flow (gpd)	82,000	281,000	644,000
Effluent Characteristics			
BOD (mg/L)[1]	20	20	20
TSS (mg/L)[1]	20	20	20
Total Nitrogen (mg/L)	10	10	10
Irrigation Area			
Type	Undisinfected Secondary	Undisinfected Secondary	Undisinfected Secondary
Crop	Feed and Fodder (Alfalfa)	Feed and Fodder (Alfalfa)	Feed and Fodder (Alfalfa)
Total Area (acres)	5	15	30
Application Rate (inches/acre-year)	45	45	45
Nitrogen Loading (lb/acre-year)	101	101	100
Emergency Storage[2]			
Total Volume Required (AF)	1.2	3.9	8.8
Type	Lined	Lined	Lined
Total Volume (AF)	6.0	6.0	12.0
Number of Basins	1	1	2
Effluent Storage			
Type	Unlined	Unlined	Unlined
Total Volume (AF)	6.0	24.0	47.9
Number of Basins	1	4	9
Basin Dimensions			
Length (ft)	335	335	335
Width (ft)	165	165	165
Side Water Depth (ft)	8	8	8
Freeboard (ft)	2	2	2
Side Slope (H:V)	4	4	4

Notes:
1. Typical effluent limits for BOD and TSS of 30 mg/L are anticipated. Treatment facilities will be designed for 20 mg/L to ensure a limit of 30 mg/L can be reliably achieved.
2. Emergency long-term storage of 20 days is required meet Title 22 reliability criteria for biological treatment, coagulation and filtration, and disinfection facilities.

7.3.2.2 Disinfected Tertiary

Detailed design criteria for the disinfected tertiary option are provided in Table 7.10.

Table 7.10 – Agricultural Reuse (Disinfected Tertiary) Design Criteria

Parameter	Phase I	Phase II	Phase III
Influent Characteristics			
Average Annual Daily Flow (gpd)	19,000	63,000	143,000
Average Day Maximum Month Flow (gpd)	20,000	69,000	158,000
Maximum Daily Flow (gpd)	59,000	200,000	458,000
Peak Hour Flow (gpd)	82,000	281,000	644,000
Effluent Characteristics			
BOD (mg/L)	10	10	10
TSS (mg/L)	10	10	10
Total Nitrogen (mg/L)	10	10	10
Coliform (MPN/100 mL)	2.2	2.2	2.2
Turbidity (NTU)	2	2	2
Irrigation Area			
Type	Disinfected Tertiary	Disinfected Tertiary	Disinfected Tertiary
Crop	Vineyard	Vineyard	Vineyard
Total Area (acres)	10	30	70
Application Rate (inches/acre)	32	32	32
Nitrogen Loading (lb/acre-year)	73	72	72
Emergency Storage[1]			
Total Volume Required (AF)	1.2	3.9	8.8
Type	Lined	Lined	Lined
Total Volume (AF)	5.5	5.5	10.9
Number of Basins	1	1	2
Effluent Storage			
Type	Unlined	Unlined	Unlined
Total Volume (AF)	5.5	21.7	48.7
Number of Basins	1	4	9
Basin Dimensions			
Length (ft)	320	320	320
Width (ft)	160	160	160
Side Water Depth (ft)	8	8	8
Freeboard (ft)	2	2	2
Side Slope (H:V)	4	4	4

Notes:
1. Emergency long-term storage of 20 days is required meet Title 22 reliability criteria for biological treatment, coagulation and filtration, and disinfection facilities.

7.3.3 Opinion of Probable Costs

Cost estimates for the two agricultural reuse options discussed previously have been developed. It is important to note that several components of these effluent disposal options are not included in the cost estimates. Like the percolation and leachfield alternatives, the cost presented for agricultural reuse does not include the cost for purchase of land to accommodate the disposal or irrigation facilities. Also, unlike the percolation and the leachfield alternatives, the agricultural reuse options will require the addition of an effluent pump station and other infrastructure including pipelines to deliver recycled water to a County-owned reclamation area or farmers who have been contracted to use the water produced by the WWTP. Once potential reuse sites and customers have been identified in a subsequent PER, the cost for the associated facilities will be determined. The cost for effluent pumping will also be incorporated into the overall O&M cost for the WWTP.

7.3.3.1 Undisinfected Secondary

A cost estimate for the undisinfected secondary reuse option is presented in Table 7.11.

Table 7.11 – Agricultural Reuse (Undisinfected Secondary) Alternative Project Cost Summary

Component	Value			
	Phase I	**Phase II**	**Phase III**	**Total**
Irrigation/Emergency Storage	$41,000	$61,000	$101,000	$203,000
Subtotal	**$41,000**	**$61,000**	**$101,000**	**$203,000**
Tax	$4,000	$3,000	$6,000	$13,000
Contractor Overhead & Profit	$8,000	$7,000	$14,000	$29,000
Contingency (20 Percent)	$17,000	$14,000	$ 31,000	$62,000
Total Construction Cost	**$70,000**	**$85,000**	**$152,000**	**$307,000**
Engineering, Administration, Legal (35 Percent)	$36,000	$29,000	$65,000	$130,000
Total Project Cost	**$106,000**	**$114,000**	**$217,000**	**$437,000**

7.3.3.2 Disinfected Tertiary

A cost estimate for the disinfected tertiary reuse option is presented in Table 7.12.

Table 7.12 – Agricultural Reuse (Disinfected Tertiary) Alternative Project Cost Summary

	Value			
Component	**Phase I**	**Phase II**	**Phase III**	**Total**
Irrigation/Emergency Storage	$37,000	$55,000	$109,000	$201,000
Subtotal	**$37,000**	**$55,000**	**$109,000**	**$201,000**
Tax	$3,000	$3,000	$7,000	$13,000
Contractor Overhead & Profit	$7,000	$6,000	$15,000	$28,000
Contingency (20 Percent)	$16,000	$13,000	$32,000	$61,000
Total Construction Cost	**$63,000**	**$77,000**	**$163,000**	**$303,000**
Engineering, Administration, Legal (35 Percent)	$32,000	$27,000	$67,000	$126,000
Total Project Cost	**$95,000**	**$104,000**	**$230,000**	**$429,000**

7.4 Summary

A summary of the construction costs for each of the disposal alternatives is presented in Table 7.13. It should be noted that the cost and area requirements for the percolation and subsurface disposal alternatives are based on the lowest expected infiltration rates near the SPA. Percolation testing could significantly decrease the cost and footprint of these disposal alternatives.

Table 7.13 – Effluent Disposal Alternatives Cost Summary

	Total Project Cost			
Component	**Phase I**	**Phase II**	**Phase III**	**Total**
Percolation	$122,000	$244,000	$405,000	$771,000
Subsurface Disposal (Leachfield)	$390,000	$855,000	$1,578,000	$2,823,000
Agricultural Reuse				
Undisinfected Secondary[1]	$106,000	$114,000	$217,000	$437,000
Disinfected Tertiary[1]	$95,000	$104,000	$230,000	$429,000

Notes:
1. Costs for the agricultural reuse options do not include components such as pump stations or pipelines.

A summary of the estimated land requirements for each of the disposal alternatives is presented in Table 7.14. The estimated land requirements are based on the information in the previous design criteria tables and include accommodations for necessary areas not used for disposal including applicable setbacks, pond embankments, access roads, etc. These area estimates are for the disposal area only, and do not include the area required for the WWTP.

Table 7.14 – Summary of Disposal Alternative Land Requirements

Alternative	Component	Area (acres)			
		Phase I	Phase II	Phase III	Total
Percolation	Basins	10	15	15	40
	Total	**10**	**15**	**15**	**40**
Subsurface Disposal (Leach field)	Disposal Field	10	15	25	50
	Total	**10**	**15**	**25**	**50**
Agricultural Reuse (Undisinfected Secondary)	Storage	10	15	25	50
	Cultivated Land	5	10	15	30
	Total	**15**	**25**	**40**	**80**
Agricultural Reuse (Disinfected Tertiary)	Storage	10	15	25	50
	Cultivated Land	10	20	40	70
	Total	**20**	**35**	**65**	**120**

A summary of the advantages and disadvantages for each of the effluent disposal alternatives evaluated in this PER is presented in Table 7.15.

Table 7.15 – Viable Treatment Alternatives Advantages and Disadvantages

Criteria	Alternative			
	Percolation	Leachfields	Agricultural Reuse Undisinfected Secondary	Agricultural Reuse Disinfected Tertiary
Construction Cost	+	-	+	+
O&M Cost	+	0	-	-
Level of Treatment	+	-	+	-
Land Requirements	+	+	-	-
Visual Impacts	-	+	-	-
Beneficial Reuse	-	-	+	+

Legend:
(+) Advantage
(0) Neutral
(-) Disadvantage

8 Preliminary Site Evaluation

Specific sites for new wastewater facilities were not identified and evaluated as part of this PER. However, general evaluation criteria such as acreage requirements, zoning, and adjacent uses are discussed to allow the County to conduct an initial siting study in the future.

8.1 Selection Parameters

It is important to consider a number of parameters when evaluating potential WWTP sites. These parameters include regulatory restrictions, land use, available area, site access, available utilities and potential impacts associated with noise and odors. These issues are briefly discussed below and should be considered during preliminary siting evaluations.

8.1.1 Regulatory Restrictions

Regulatory requirements for the WWTP will ultimately be determined by the selected effluent disposal method, and will be influenced by the type of treatment processes implemented. The Central Coast Regional Water Quality Control Board (RWQCB) is the agency responsible for issuing waste discharge requirements (WDRs). Where treated wastewater is to be recycled (reuse) additional regulations are required by the California Department of Public Health (CDPH) under California Code of Regulations (CCR) Title 22, Division 4, Chapter 3, Water Recycling Requirements (Title 22). Typical requirements in WDRs include constituent effluent limits for pollutants, monitoring, and reporting as well as separation distances from groundwater, and setback distances from surrounding wells (private, drinking, agricultural, etc.) and fence lines for each discharge method.

8.1.2 Land Use

The surrounding land use may be a factor in the public acceptance of the treatment and disposal area. In general, the area required for the proposed treatment technologies discussed in Section 6 of this report is relatively small, and mitigation measures could be implemented to reduce noise and odor impacts. Control of these issues may permit placement of the treatment system in sensitive areas such as residential neighborhoods. Disposal sites require larger amounts of land, and are typically surrounded by agricultural type properties.

Existing site usage is a factor in evaluating treatment and disposal sites. Sites that have not been previously developed are considered more desirable since they are likely less costly to develop and may decrease the number and complexity of mitigation measures required to address site-related issues.

8.1.3 Area Requirements

The ideal site would have sufficient room to accommodate facilities through the planned system build-out. Depending on the treatment process selected and disposal method used, total size requirements will vary.

For the purposes of this PER, sizing of the treatment facility includes area required for major process components including auxiliary facilities such as a lift station, headworks, maintenance and control building. These items combined with setbacks and providing adequate space between structures could add significant area to each treatment alternative.

A variety of effluent disposal methods are currently being considered by the County. For the purposes of this PER, area requirements are provided for each disposal alternative. These area requirements include disposal facilities such as percolation and storage ponds and irrigation areas. In addition to these facilities, AECOM has also added accommodations for potential setbacks or area required for site access. Actual site conditions such as soil permeability or availability of agricultural reuse areas may have significant impacts on area requirements and may result in decreased area needs.

8.1.4 Site Access

It is important the WWTP site provide sufficient access for operations and maintenance (O&M) staff, biosolids tanker trucks, waste disposal, and material deliveries.

8.1.5 Utility Service

The proposed WWTP could require potable water, electrical, telephone, and possibly natural gas service. The availability of each utility should be taken into consideration during site selection.

8.1.6 Noise Control

The WWTP will include mechanical equipment such as pumps, blowers and generators that generate noise that could impact the surrounding area. While efforts will be made to implement sound attenuation at individual pieces of equipment, the level of additional noise mitigation will depend on the facility location. For sites located near sensitive areas such as residential neighborhoods or the downtown core, additional mitigation measures will most likely be required.

8.1.7 Odor Control

Odor control can be an important consideration when siting a WWTP. Processes that utilize uncovered basins containing raw wastewater or uncovered sludge storage tanks can produce foul odors. Mitigation measures to control these odors would vary depending on the treatment process selected and location of the facility.

8.1.8 Additional Studies/Reports

The information presented in this PER is intended to provide the County with a general overview of potential treatment and disposal site criteria. A detailed evaluation of possible treatment and disposal sites will be required to fully address any potential issues that would affect project components, costs, permitting, and environmental mitigation. Site specific studies such as a geotechnical assessment, percolation testing (for disposal sites) and an environmental site assessment will be required prior to final site selection.

8.2 Treatment Sites

8.2.1 Overview

Treatment sites available near the downtown core are considered more favorable compared to more remote sites since they minimize the distance between service area and treatment site. However, the majority of town is located to the south of the downtown core. Due to the elevation differences across the community, the use of lift stations will likely be required to convey wastewater flows to a treatment facility located near the downtown core. Treatment sites located on the south side of the community could result in a gravity collection system. However, pumping could still be required depending on the location of the disposal site. Sites near downtown would also likely require additional mitigation measures to control odors and excessive noise as compared to a treatment site located outside of town. The following table (Table 8.1) displays these items and other suggested siting requirements for the treatment site.

Table 8.1 – Treatment Siting Issues

Siting Parameters	Issues
Location, Land Use	• Plant should be located close to the collection system to reduce construction costs and O&M costs • Plant must be constructed above the 100 year flood level • Buildable site (constructability, no shallow groundwater, etc.) • Site should be readily available
Area Requirements	• Sufficient space for all treatment alternatives through Phase 3 and associated structures/facilities
Site Access	• Adjacent to a public roadway. • Roadway is able to handle increased traffic
Utility Service	• All utilities are available at the site
Noise and Odor Control	• Mitigation measures will be required and will be defined based on proximity of surrounding properties.
Visual Screening	• Plant should be located out of site from businesses and residences. Screening will also be required at the entrance and exit of the community.

8.2.2 Treatment Alternatives

Four treatment alternatives are being considered for the Los Olivos WWTP project. These alternatives include Extended Aeration Activated Sludge Modified Ludzak-Ettinger (MLE), Sequencing Batch Reactor (SBR), Membrane Bioreactor (MBR), and AdvanTex. For this report, it is assumed that an influent lift station and headworks structure will be required. In addition, a control and maintenance building, and other ancillary facilities such as staff parking will also be required.

A brief description of each process is provided below and includes the estimated size required for each project phase. Detailed descriptions of these alternatives are discussed below, and in Section 6 of this report. Also included in this PER is a detailed discussion of the phasing scheme developed for the Los Olivos WWTP.

8.2.2.1 Extended Aeration Activated Sludge Modified Ludzak-Ettinger (MLE)

The activated sludge process configuration applicable for the Los Olivos WWTP is known as a packaged activated sludge system where the different components of the treatment process are housed in an aboveground bolted, or welded steel tank configured with two concentric rings. The secondary clarifier is housed in the inner tank, while the equalization, aerobic, anoxic, and aerobic digester zones are housed in the outer tank.

Preliminary sizing of a MLE treatment system was performed as in section 6 of this report. For Phase 1 (Existing Commercial) of the project a single tank approximately 12 feet by 54 feet would be required with a 12-foot diameter circular clarifier. At Phase 2 (Commercial Build-Out), an additional 50-foot diameter tank would be required. For Phase 3 (Build-Out) a second 50-foot diameter tank would be needed.

8.2.2.2 Sequencing Batch Reactor (SBR)

The SBR treatment process is a true batch system where equalization, treatment, and clarification are achieved within the confines of a single reactor. The typical treatment cycle of a SBR includes separate fill, react, settle, and decant treatment phases. Since all of these processes occur in a single basin, footprint requirements are reduced and mixed liquor recycle (MLR) pumping needed to achieve denitrification is eliminated.

Preliminary sizing of a SBR treatment system was performed as part of section 6 of this report. For Phase 1 of the project, a tank approximately 22 feet wide by 36 feet long would be required. At Phase 2, a tank approximately 36 feet wide by 90 feet long would be required. For Phase 3 a tank approximately 36 feet wide by 124 feet long would be required.

8.2.2.3 Membrane Bioreactor (MBR)

The MBR process consists of activated sludge reactors or aeration basins that use membrane filtration for solids separation. Membrane filtration is a solids separation process which utilizes polymeric filtration media with extremely small pore sizes ranging from 0.04 (hollow fiber) to 0.4 microns (flat sheet) to sieve and separate solids from the treated effluent. These systems are used to replace the secondary clarification and filtration steps normally associated with the activated sludge process. Without the limitations set by solids flux in conventional secondary clarification, the mixed liquor suspended solids (MLSS) concentration can be as high as 10,000 mg/L, which is much higher than conventional suspended growth processes. The higher MLSS concentration and the elimination of secondary clarifiers reduce the footprint of the overall MBR process.

Preliminary sizing of an MBR treatment system was performed as part of section 6 of this report. For Phase 1 of the project a tank approximately 50 feet long by 7 ½ feet wide would be required. At Phase 2, two tanks approximately 79 feet long by 7 ½ feet wide would be required. For Phase 3 a total of three tanks approximately 79 feet long by 7 ½ feet wide would be required.

8.2.2.4 AdvanTex

The AdvanTex system is a packed bed aerobic system. The system consists of a reactor with media and an effluent recirculation chamber to keep the media wet continuously. The bed is composed of textile-covered, plastic media that promote attached growth of microorganisms, similar to a trickling filter process. Ventilation fans are utilized to aerate the reactor and provide sufficient oxygen to the attached-growth communities to convert the incoming organics to biomass. The recirculation chamber includes pumps for both recirculation and discharge of treated effluent.

Preliminary sizing of an Advantex treatment system was performed as part of section 6 of this report. For Phase 1 and 2 of the project concrete channels covered by the AdvanTex filter media measuring 120 feet long by 80 feet wide would be required. At Phase 3, a similarly sized facility would be installed.

8.2.3 Total Land Requirements

Treatment sites will contain one of the outlined treatment alternatives along with other supporting structures and setbacks. The following table (Table 8.2) provides a summary of the estimated size requirement for the four treatment alternatives.

Table 8.2 – Estimated Required Land per Alternative				
Phase	Alternative Land Requirements (Acres)			
	Modified Ludzak-Ettinger (MLE)	Sequencing Batch Reactor (SBR)	Membrane Bioreactor (MBR)	AdvanTex
1	0.2	0.2	0.2	0.8
2	0.4	0.4	0.2	0.8
3	0.6	0.4	0.3	1.50

8.3 Treatment and/or Disposal Sites

8.3.1 Overview

Large agricultural sites located north of town could be considered the most favorable due to the large parcel sizes and primarily agricultural use. Since it is intended for the disposal method to incorporate some form of agricultural reuse it is recommend the disposal site be located near potential users. The following table (Table 8.3) displays suggested siting requirements for the disposal site.

Table 8.3 – Disposal Siting Issues	
Siting Parameters	Issues
Regulatory Restrictions	• Location of wells
Location, Land Use	• Near agricultural land for increased reuse potential • Disposal must be out of or constructed above the 100-year flood level • Permeability of soils • Topography of site does not prohibit large pond construction • Site should be readily available
Area Requirements	• Large enough for all or a combination of treatment alternatives through Phase 3 • Adequate area for WWTP facilities
Site Access	• Located near a major roadway. • Roadway is able to handle increased traffic
Utility Service	• All utilities are available at the site
Noise and Odor Control	• Mitigation measures will be required and will be defined by proximity of surrounding properties.
Visual Screening	• Plant should be located out of site from businesses and residences. Screening will also be required at the entrance and exit of the community.

8.3.2 Disposal Alternatives

Four effluent disposal methods are being considered for the Los Olivos WWTP. These methods include percolation ponds, subsurface disposal (leachfields), and agricultural reuse with either undisinfected secondary or disinfected tertiary effluent. In addition, disinfected tertiary recycled water is also being considered for supplemental irrigation water at community parks and other community landscaping areas if feasible. The final disposal site, or combination of sites, will likely include a combination of these disposal methods. A brief description of each method is presented below and includes the estimated size required for each project phase. Detailed descriptions of these alternatives are discussed in Section 7 of this report.

8.3.2.1 Percolation Ponds

Percolation ponds are reservoirs where water is stored and allowed to either percolate into the ground or evaporate. The pond bottoms are managed to maintain percolation rates by periodically drying, ripping, and conditioning the soils.

Potential for groundwater degradation is a major consideration for this type of disposal practice without the appropriate level of treatment. Regulations are continually changing and becoming more restrictive to protect groundwater quality. Considerations such as distance to the nearest well, depth to groundwater, and mounding potential must all be considered in addition to water quality. Mounding of treated effluent is typically a result of underlying impermeable layers slowing the rate of downward percolation and forcing treated effluent laterally. Mounding can attribute to increased flows to surrounding water bodies and destabilization of the percolation ponds. Sizing and siting requirements for the percolation ponds depend on these groundwater issues, the types of soils (near surface and underlying layers), and percolation capacity.

8.3.2.2 Subsurface Disposal (Leachfields)

Conventional leachfields consist of shallow trenches approximately two feet in depth. Small diameter perforated piping is installed in the trenches, and gravel backfill is placed several inches above and below the pipe. A layer of geotextile fabric is placed over the gravel to prevent the intrusion of fines and fouling of the leachfield and the remaining trench depth is backfilled with native or imported fill. Treated wastewater flows by gravity to a simple distribution structure that evenly distributes effluent to individual trenches several hundred feet in length. The effluent leaves the perforated pipe and percolates through the gravel to the infiltration surface, which is the bottom of the narrow trenches. Conventional leachfields are a proven wastewater disposal technology for both small decentralized systems as well as larger community treatment facilities.

8.3.2.3 Agricultural Reuse (Undisinfected Secondary or Disinfected Tertiary)

Los Olivos is surrounded by agriculture land. Crops grown in the area vary widely and include alfalfa, barley, beets, beans, vineyards, olives, walnuts, miscellaneous row crops, and organically grown vegetables. In order to encompass this diversity, two reuse options for agricultural were identified in section 7 of this PER. For feed and fodder crops such as alfalfa, undisinfected secondary can be used. However, disinfected tertiary must be used for crops grown for human consumption crops such as grapes and vegetables. As previously mentioned, disinfected tertiary recycled water could be used for irrigation of community parks and other landscaped areas.

8.3.3 Total Land Requirements

Disposal sites could contain one or several of the outlined disposal alternatives. For larger areas of land (greater than 20 aces) it has been assumed that the WWTP could also be placed at the disposal site. The table below (Table 8.4) provides a summary of required acreage for each of the disposal methods under consideration. These values do not include the comparatively small amount of space required for the WWTP. Area requirements for agricultural reuse were calculated using irrigation demand estimates for alfalfa (undisinfected effluent) and grapes (disinfected tertiary).

Table 8.4 – Disposal Area Requirements (acres)				
Phase	Percolation Ponds	Subsurface Disposal (Leachfield)	Agricultural Reuse	
			Undisinfected	Disinfected
1	10	10	15	20
2	15	15	25	35
3	15	25	40	65
Total	40	50	80	120

9 Engineer's Opinion of Cost

This section presents a preliminary planning-level Engineer's Opinion of Cost for a new wastewater treatment plant (WWTP), effluent disposal facilities, and collection system for the community of Los Olivos. The treatment and disposal processes selected for this cost are based on alternatives provided in Sections 6 and 7 of this report. For cost estimating purposes a treatment and disposal site has been assumed to be north of town. Due to the elevation of the service area in relation to the assumed WWTP location, it is assumed a gravity collection system will be used with several lift stations to convey wastewater flows to the WWTP site. It is important to note that the WWTP site is conceptual and is only used as a basis to evaluate the overall project cost.

9.1 Cost Basis

9.1.1 Phasing

As discussed in Section 2 of this report, the construction of the collection system and WWTP for the Los Olivos community may be implemented in one, two, or three distinct phases. The county and community may decide to phase the development of this system, or to initially build either a Phase 2 or Phase 3 system and skip "Phase 1".

- Phase 1- Downtown Core
- Phase 2- Downtown Core including full commercial build-out
- Phase 3- Entire community

This report provides project cost opinions for Phase 1 and at project build-out, which represents service to the entire community. This methodology provides the County with a projected range and sequence of project costs. Flows estimated in Section 3 were used in sizing the collection system, WWTP, and disposal facilities.

9.1.2 Recommended Treatment Alternatives

Four treatment alternatives are discussed in Section 6, including extended aeration activated sludge modified Ludzak-Ettinger (MLE), sequencing batch reactor (SBR), membrane bioreactor (MBR), and AdvanTex. These treatment alternatives were evaluated based on their ability to produce a treated effluent with a total nitrogen concentration below future, anticipated discharge limits.

9.1.2.1 Sequencing Batch Reactor

The sequencing batch reactor (SBR) treatment process is a true batch system where equalization, treatment, and clarification are achieved within the confines of a single reactor. The typical treatment cycle of a SBR includes separate fill, react, settle, and decant phases. Since all of these processes occur in a single basin, footprint requirements are reduced and mixed liquor recycle (MLR) pumping needed to achieve denitrification is eliminated.

This treatment alternative is recommended for the Los Olivos WWTP due to its ability to handle a large range of flow and loading conditions. Since this project represents the first centralized treatment facility for Los Olivos, flows and loadings could be different than those estimated in Section 3. As previously discussed, wastewater flow estimates were developed to roughly size the new wastewater facilities. Actual flows experienced could vary significantly depending on the Phase 1 service area. Although the other treatment alternatives discussed can produce an effluent with a similar quality, they can be more difficult to operate with variable loading conditions. Another benefit of the SBR is its relatively compact footprint compared to other suspended growth technologies.

9.1.2.2 Size Requirements

For Phase I of the WWTP project, a single SBR basin and pre-equalization basin will be provided to attenuate diurnal flow variations and store influent wastewater while the SBR is in operation. Once the SBR cycle is completed, and the effluent has been decanted, the influent in the pre-equalization basin will be pumped into the SBR and the cycle will be repeated.

At full build-out, the existing SBR would be expanded and a new SBR would also be constructed. The existing pre-equalization basin would be eliminated and a post-equalization basin would be constructed to equalize the decant flow.

9.1.3 Support Facilities

In addition to the recommended treatment process, additional facilities will be required. These ancillary facilities will be included, but not necessarily be limited to, a new headworks, control and electrical building, and sludge treatment and disposal facilities.

9.1.3.1 Headworks

The headworks consists of mechanical screening equipment that is used to remove inorganic solids and trash from the influent wastewater stream. Large inorganic solids remaining in the influent can cause issues with downstream mechanical equipment, resulting in decreased efficiency and the need for increased maintenance. In addition, removal of these types of solids increases the stability of the treatment process operation.

9.1.3.2 Control and Electrical Building

A relatively small structure will be used to house a control room as well as necessary electrical equipment. For the purpose of this report, a 35 foot by 98 foot structure has been assumed. Sizing of this building would be sufficient through build-out of the project.

9.1.3.3 Sludge Treatment and Disposal

Due to the small size of the proposed WWTP, waste activated sludge (WAS) pumped from the SBR will be sent to an aerated sludge holding tank or aerobic digester for stabilization. These facilities will provide storage and the potential for some volatile solids reduction (VSR) to help minimize the amount of sludge that must be disposed of by the community. Following a period of approximately 15 days, the solids will be hauled offsite by a liquid hauler and disposed of at another wastewater treatment facility in the County, or a neighboring county, that accepts sludge or septage. The cost of this aerated tank has been included in the construction cost estimates.

9.1.4 Recommended Disposal Alternative

Four effluent disposal alternatives have been analyzed for the Los Olivos WWTP. These alternatives include percolation ponds, subsurface disposal (leachfields), and agricultural reuse with either undisinfected secondary or disinfected tertiary recycled water. In addition, disinfected tertiary effluent is also being considered for supplemental irrigation water at community parks and other community landscaping areas if feasible.

For the purpose of estimating project costs it has been assumed that percolation ponds along with agricultural reuse will be used for disposal. However, percolation ponds would be used as the main form of disposal and would be adequately sized to handle all effluent produced by the plant. This would maintain the plant's ability to properly dispose of treated effluent during periods of limited or zero agricultural demand. It should be noted that drip irrigation or other forms of disposal and reuse will be explored during concept design but percolation ponds have been selected for cost planning purposes.

Factors in selecting a final disposal or reuse method will include property costs, site percolation capacity, available land, and adjacent land reuses among other considerations.

9.1.4.1 Percolation Ponds

Percolation ponds are reservoirs where water is stored and allowed to either percolate into the ground or evaporate. The pond bottoms are managed to maintain percolation rates by periodically drying, ripping, and conditioning the soils.

In order to calculate the volume and area of percolation basins necessary water balances were developed as discussed in Section 7 of this report. The water balances take into account percolation, water lost from evaporation and the contribution of rainfall. Based on the water balances, preliminary sizing for this alternative were determined. The selected disposal area may exhibit increased percolation rates, but for the purpose developing cost estimates, the conservative assumptions utilized will be used.

9.1.4.2 Agricultural Reuse (Undisinfected Secondary)

The assumed area for the WWTP and disposal system is surrounded by land designated for agriculture production. Crops grown in the area appear to be generally feed and fodder crops. Undisinfected secondary can be used for irrigation of these crops and would not require additional treatment of the effluent. In addition, undisinfected secondary can be applied to beef cattle pasture.

9.1.4.3 Unrestricted Reuse (Disinfected Tertiary)

In order to achieve the level of treatment necessary for unrestricted reuse, additional processes including tertiary filtration and disinfection would be required. A description of the filtration and disinfection facilities considered for the Los Olivos WWTP as well as detailed design criteria can be found in Section 6. For the Los Olivos WWTP, the use of cloth media disk filters are recommended for tertiary filtration and UV is recommended for disinfection. These processes have a comparatively small foot print and lower capital cost than other alternatives.

9.1.4.4 Proposed WWTP Layout

Figures 9.1 and 9.2 provide sample layouts for the initial phase and build-out of the Los Olivos WWTP. The initial layout would take into consideration requirements for future plant expansion.

9.1.5 Collection System

Based on discussions with the County, a typical gravity collection system has been assumed for the community wastewater system. Since the terrain in and around Los Olivos slopes to the south, and the disposal site is assumed to be to the north, lift stations will be required to convey wastewater collected in gravity lines located throughout the community. Initially, one lift station would be required with additional lift stations becoming necessary during latter subsequent phases. For the purposes of this report, one lift station will be associated with Phase 1 with two additional lift stations required for build-out. An example collection system layout used to develop estimated costs is provided on Figure 9.3.

9.1.6 Operations and Maintenance (O&M)

9.1.6.1 Staffing Requirements

Due to the relatively small size of the WWTP, it has been assumed that one operator would be required at the plant for half of the day, 5 days a week. For one of these days an additional operator would likely be required to assist in performing maintenance functions.

According to Section 3675, Chapter 26, Title 23 of the California Code of Regulations the Los Olivos WWTP would be considered a Class III plant. Section 3680 of the same chapter also states that for a Class III plant the Chief Plant Operator would have to possess at a minimum a valid Grade III license.

Supervisors and shift supervisors would have to possess a Grade II license while operators would be required to have a valid Grade 1 or operator-in-training certificate.

9.1.6.2 Treatment and Disposal

Operations and maintenance of the treatment and disposal systems would include material replacements including cloth filter sections and UV bulbs, maintenance items, and power usage of the facility. The impacts of the aeration and disposal of this material have also been accounted for in the O&M cost estimates.

9.1.6.3 Collection system

It is assumed typical O&M associated with a gravity collection system with lift stations would be required for Los Olivos. This would include periodic cleaning and inspection of the sewer lines and maintenance of the pumps at the lift stations. Collection system cleaning and inspection is typically recommended for 20 percent of the system each year. Periodic inspection and cleaning of lift stations would also be required. Inspection of lift stations identifies potential problems not detected by the control system.

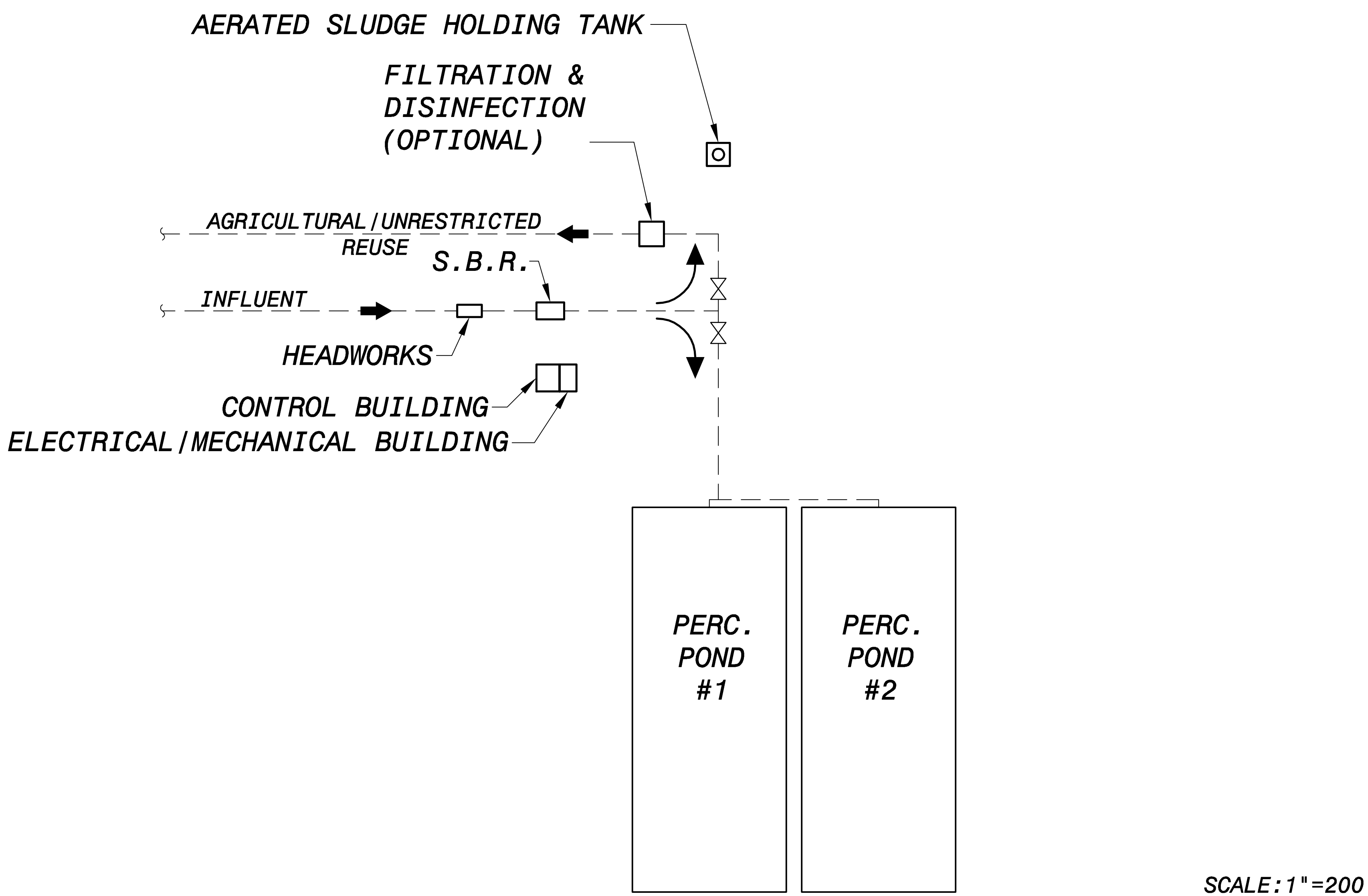

FIGURE		AECOM PROJECT NO.	
9.1	LOS OLIVOS WWTP PER PHASE 1 - SITE LAYOUT	60198379	AECOM AECOM Technical Services, Inc. 1194 Pacific Street, Suite 204 San Luis Obispo, California 93401 T 805.542.9840 F 805.542.9990 www.aecom.com

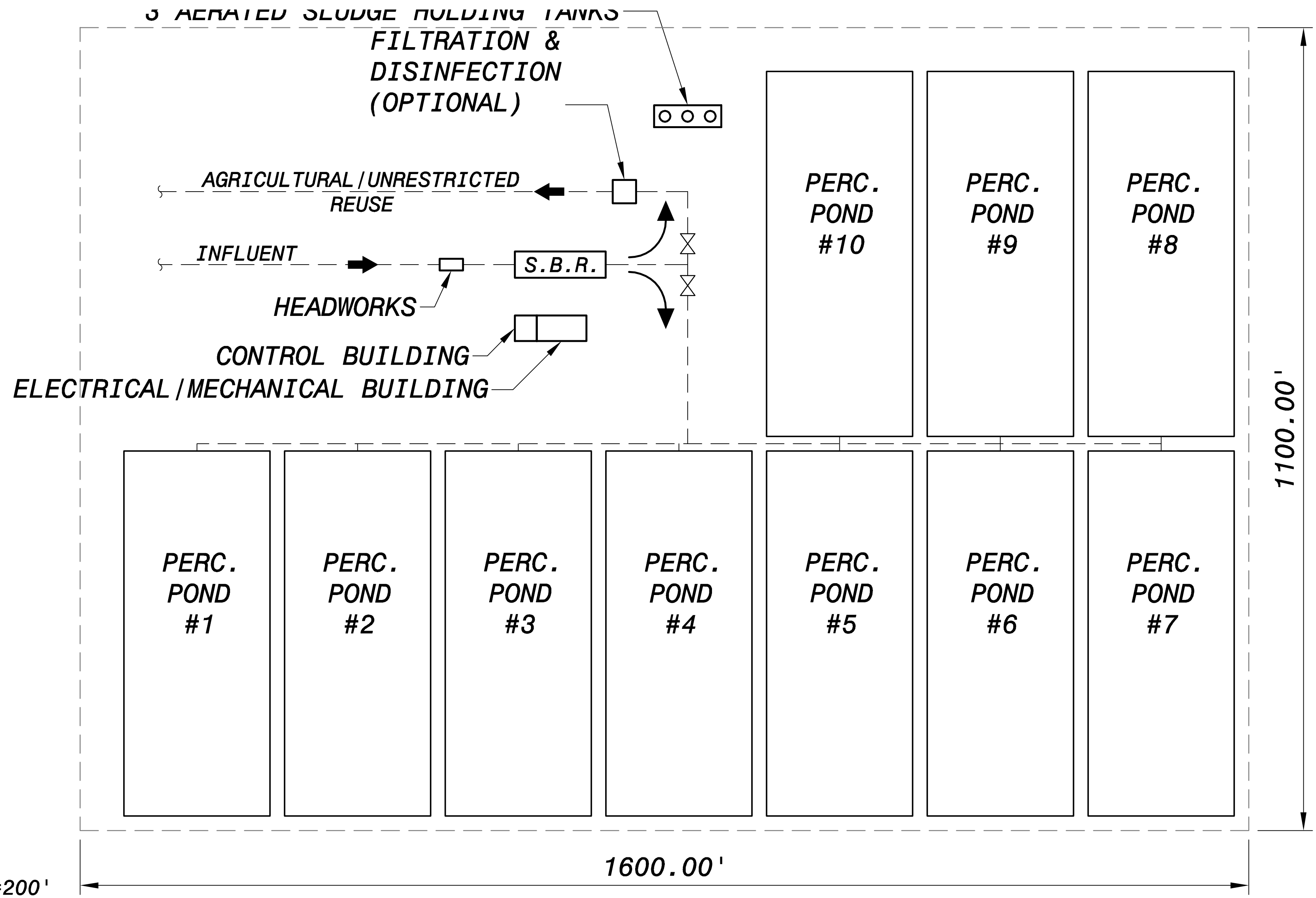

FIGURE	LOS OLIVOS WWTP PER	AECOM PROJECT NO.	AECOM
9.2	BUILD-OUT - SITE LAYOUT	60198379	AECOM Technical Services, Inc. 1194 Pacific Street, Suite 204 San Luis Obispo, California 93401 T 805.542.9840 F 805.542.9990 www.aecom.com

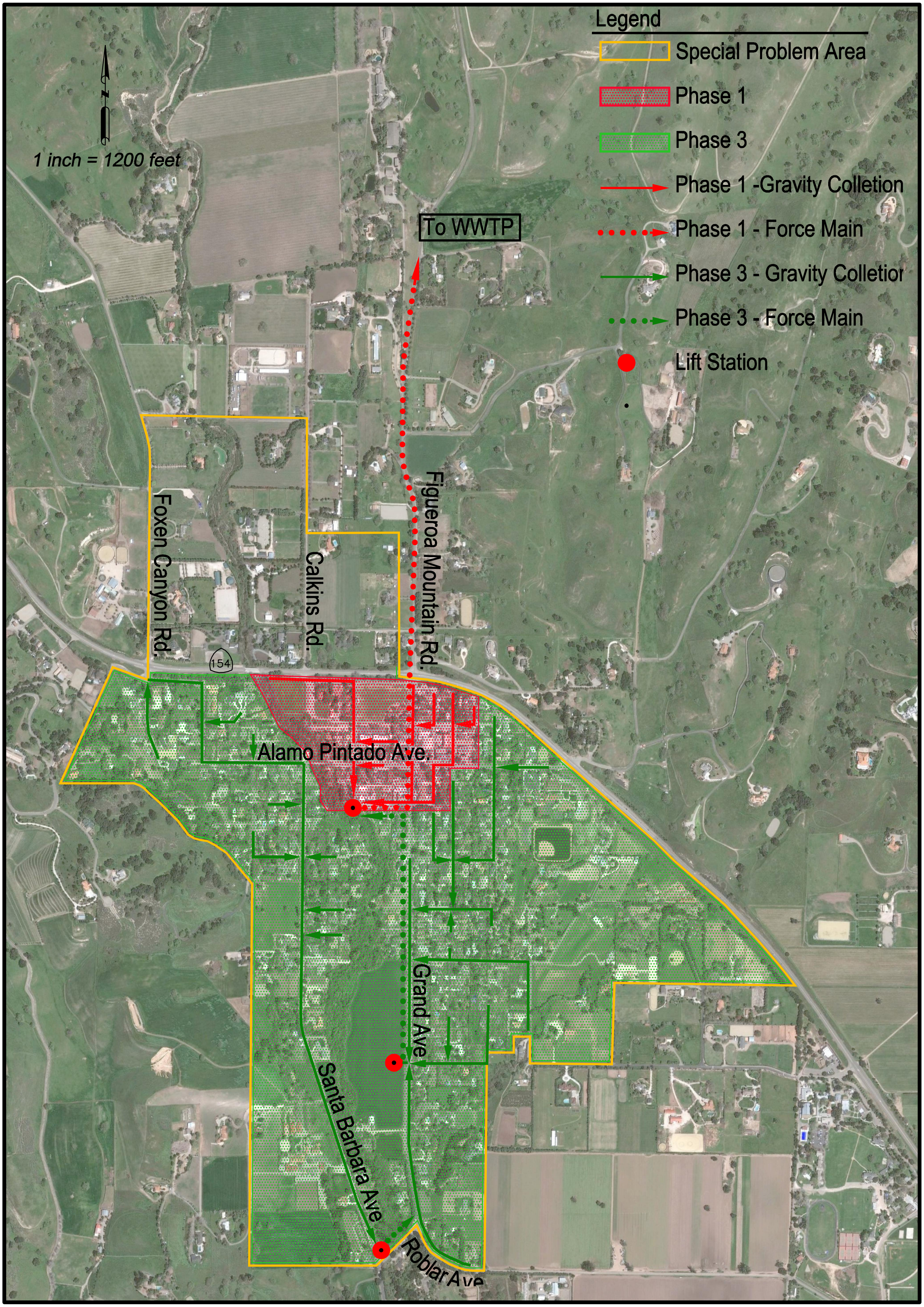

Figure 9.3 Collection Routes

9.2 Project Costs

9.2.1 General Cost Parameters

The objective is to develop project cost opinions with sufficient flexibility for a range of collection, treatment, and disposal system options. These costs will be revised and refined as the project proceeds. The following assumptions were made to develop planning-level cost opinions:

- Except where other data is available, construction cost opinions are generally derived using bid prices from similar wastewater projects, with adjustments for inflation, size, complexity, and location;
- Except where other data is available, operations and maintenance cost opinions are generally derived using information from product venders, utility rates and personnel costs provided by the County, and costs from similar wastewater projects, with adjustments for inflation, size, complexity, and location;
- 20 percent construction contingency;
- Engineering, administration, and legal costs were assumed to be 35 percent of the total construction costs;
- Construction cost opinions are in 2012 dollars;
- Operations and maintenance cost opinions are in 2014 dollars;
- When budgeting for future years, appropriate escalation factors are applied (ENR Construction Cost Index of 9175.94 for January 2012);
- Cost opinions are "budget-level" and may not fully account for site-specific conditions that will affect the actual costs; and
- Cost opinions do not include the cost to purchase or acquire the land needed to accommodate the WWTP and collection system.

The opinions of probable cost prepared by AECOM represent our judgment and are supplied for the general guidance of the County. Since AECOM has no control over the cost of labor and material, or over competitive bidding or market conditions, AECOM does not guarantee the accuracy of such opinions as compared to contractor bids or actual costs.

9.2.2 Collection System

It is assumed that conventional excavation depths of five to six feet can be maintained along the majority of the alignments. Opinions of probable construction cost for the collection system were developed based on conventional excavation and estimated costs of materials, preparation, earthwork, installation, and roadwork. Cost criteria are summarized in Table 9.1.

Table 9.1 – Sewer Improvement Cost Criteria

Item Description	Estimated Construction cost	Including Contingency (20 Percent)	Plus Engineering/Administration (35 Percent)
4-in Force Main	$107/LF	$128/LF	$173/LF
6-in Force Main	$117/LF	$140/LF	$190/LF
8-in Gravity Sewer	$158/LF	$190/LF	$257/LF
10-in Gravity Sewer	$178/LF	$214/LF	$288/LF

Preliminary sizing of the collection system lines were calculated for the "northern route" as described in Section 5. These pipe sizes and the estimated line lengths shown on Figure 9.3 were used in calculating construction costs for the collection system. Lift station cost estimates are based on actual cost of recent lift station projects in the area of similar size. The lift station required for Phase 1 would be larger than the additional two required at project build-out as shown below. The following table provides a cost summary for the collection system.

Table 9.2 – Collection System Project Cost Summary

Component		Phase I		Build-Out		Total	
	Unit	Quantity	Cost	Quantity	Cost	Quantity	Cost
4" force main	LF	0	$ -	2950	$316,000	2950	$316,000
6" force main	LF	5200	$609,000	0	$ -	5200	$609,000
8" Pipeline	LF	5200	$822,000	21670	$3,424,000	26870	$4,246,000
10" Pipeline	LF	1650	$294,000	0	$ -	1650	$294,000
Lift Stations	EA	1	$600,000	2	$900,000	3	$1,500,000
Subtotal			**$2,325,000**		**$4,640,000**		**$6,965,000**
Contingency (20 Percent)			$465,000		$928,000		$1,393,000
Total Construction Cost			**$2,790,000**		**$5,568,000**		**$8,358,000**
Engineering, Administration, Legal (35 Percent)			$977,000		$1,949,000		$2,926,000
Total Project Cost			**$3,767,000**		**$7,517,000**		**$11,284,000**

9.2.3 Treatment

Based on the design criteria presented in Section 6, project cost estimates were developed for the recommended treatment alternative. Since the preferred method of disposal is percolation with some agricultural reuse, filtering and disinfection would not be required. However, filtering and disinfection would be required if unrestricted reuse is desired. In addition, public opinion may dictate the level of filtration and disinfection of the effluent regardless of the disposal method.

In order to develop cost estimates for the recommended treatment alternative, major equipment manufacturers were consulted. These manufacturers are presented in Table 9.3.

Table 9.3 – Basis for Evaluated Equipment Costs

Process	Manufacturer/Model
Spiral Screen	Parkson Hycor® Helisieve Plus®/HLS300P
SBR Equipment	Aqua-Aerobic Systems, Inc. AquaSBR®
Cloth Media Disk Filters	Aqua-Aerobic Systems, Inc. AquaMiniDisk®
UV Disinfection Equipment	TrojanUVFit™ 18AL40 Reactor

Tables 9.4 and 9.5 provide an opinion of cost for the treatment facility. Subtotals are provided for the treatment process and for additional filtration and disinfection equipment. As shown in Table 9.5 below, the filtration and disinfection costs are only in Phase 1 since the initial equipment installed would be adequate to handle the additional flows at build-out.

Table 9.4 – Treatment Cost Summary-Undisinfected Secondary

	Value		
Component	Phase I	Additional for Build-Out	Total
Equipment			
Screening	$212,000	$ -	$212,000
Sequencing Batch Reactor	$411,000	$518,000	$929,000
Civil/Yard Piping	$102,000	$57,000	$159,000
Structural	$730,000	$245,000	$975,000
Process Mechanical	$170,000	$80,000	$250,000
Electrical & Instrumentation	$406,000	$225,000	$631,000
Subtotal	**$2,031,000**	**$1,125,000**	**$3,156,000**
Contingency (20 Percent)	$502,000	$225,000	$727,000
Total Construction Cost	**$2,533,000**	**$1,350,000**	**$3,883,000**
Engineering, Administration, Legal (35 Percent)	$886,550	$472,500	$1,359,050
Total Project Cost	**$3,419,550**	**$1,822,500**	**$5,242,050**

Table 9.5 – Treatment Cost Summary-Disinfected Tertiary			
		Value	
Component	**Phase I**	**Additional for Build-Out**	**Total**
Equipment			
Screening	$212,000	$ -	$212,000
Sequencing Batch Reactor	$411,000	$518,000	$929,000
Civil/Yard Piping	$102,000	$57,000	$159,000
Structural	$730,000	$245,000	$975,000
Process Mechanical	$170,000	$80,000	$250,000
Electrical & Instrumentation	$406,000	$225,000	$631,000
Subtotal	**$2,031,000**	**$1,125,000**	**$3,156,000**
Additional Equipment for Recycled Water			
Filtration	$236,000	$ -	$236,000
Disinfection	$245,000	$ -	$245,000
Subtotal	**$481,000**	**$ -**	**$481,000**
Total	**$2,512,000**	**$1,125,000**	**$3,637,000**
Contingency (20 Percent)	$502,400	$225,000	$727,400
Total Construction Cost	**$3,014,400**	**$1,350,000**	**$4,364,400**
Engineering, Administration, Legal (35 Percent)	$1,055,040	$472,500	$1,527,540
Total Project Cost	**$4,069,440**	**$1,822,500**	**$5,891,940**

9.2.4 Disposal

For the purpose of this report, AECOM has assumed effluent will flow by gravity to the percolation basins. Additional costs for pumping effluent off site including a pump facility and pipelines are also included. Large agricultural fields located north of the community were assumed for calculation of the agricultural reuse pipe quantities. For calculation of the unrestricted reuse pipe length, the center of downtown (Alamo Pintado Avenue and Grand Avenue) was assumed as the end point. For the purposes of this report it is assumed the additional facilities to pump effluent off site will be constructed only in Phase 1 of the project and would remain the same through build-out. Costs for the disposal system are separated for undisinfected secondary and for disinfected tertiary and are provided in Tables 9.6 and 9.7 on the next page.

Table 9.6 – Disposal Cost Summary-Undisinfected Secondary			
		Value	
Component	**Phase I**	**Additional for Build-Out**	**Total**
Percolation Basins	$76,000	$302,000	$378,000
Subtotal	**$76,000**	**$302,000**	**$378,000**
Contingency (20 Percent)	$16,000	$61,000	$77,000
Total Construction Cost	**$92,000**	**$363,000**	**$455,000**
Engineering, Administration, Legal (35 Percent)	$32,200	$127,050	$159,250
Total Project Cost	**$124,200**	**$490,050**	**$614,250**

Table 9.7 – Disposal Cost Summary-Disinfected Tertiary			
		Value	
Component	**Phase I**	**Additional for Build-Out**	**Total**
Percolation Basins	$76,000	$302,000	$378,000
Subtotal	**$76,000**	**$302,000**	**$378,000**
Pump Station	$60,000	$ -	$60,000
Ag Reuse Piping	$321,000	$ -	$321,000
Recycled Piping	$514,000	$ -	$514,000
Subtotal	**$895,000**	**$ -**	**$895,000**
Contingency (20 Percent)	$195,000	$61,000	$256,000
Total Construction Cost	**$1,166,000**	**$363,000**	**$1,529,000**
Engineering, Administration, Legal (35 Percent)	$408,100	$127,050	$535,150
Total Project Cost	**$1,574,100**	**$490,050**	**$2,064,150**

9.3 Operations and Maintenance Costs

9.3.1 Collection system

O&M cost estimates for the collection system are provided in Tables 9.8 and 9.9 for Phases 1 and at build-out, respectively. These estimates provide general items typically required such as line inspection and cleaning and lift station maintenance.

Table 9.8 – Collection System - Phase 1 Annual O&M Cost Estimate1

Component	Unit Cost	Unit	Quantity	Unit	Total
Power	$0.16	$/kWh	2,072	kWh	$332
Line Cleaning	$0.64	$/ft	2,410	ft	$1,542
Line Inspection (CCTV)	$1.07	$/ft	2,410	ft	$2,579
Line Replacement[3]	$15.00	$/ft	121	ft	$1,808
Labor	$58.37	$/hour	1,252	hours	$73,079
Maintenance[2]	2.0	%	$100,000	-	$2,000
Misc. Equipment Replacement[2]	4.0	%	$100,000	-	$4,000
Total					**$85,400**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the total Phase I equipment cost.
3. Percentage of total average pipeline cost.

Table 9.9 – Collection System – Build-Out Annual O&M Cost Estimate1					
Component	**Unit Cost**	**Unit**	**Quantity**	**Unit**	**Total**
Power	$0.16	$/kWh	9,499	kWh	$1,520
Line Cleaning	$0.64	$/ft	7,334	ft	$4,694
Line Inspection (CCTV)	$1.07	$/ft	7,334	ft	$7,847
Line Replacement[3]	$15.00	$/ft	367	ft	$5,501
Labor	$58.37	$/hour	1,252	hours	$73,079
Maintenance[2]	2.0	%	$300,000	-	$6,000
Misc. Equipment Replacement[2]	4.0	%	$300,000	-	$12,000
Total					**$110,700**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the total equipment cost.
3. Percentage of total average pipeline cost.

9.3.2 Treatment and Disposal

The O&M cost estimates for the WWTP are provided in Tables 9.10 and 9.11 for undisinfected secondary at Phase 1 and build-out and Tables 9.12 and 9.13 for disinfected tertiary for Phase 1 and at build-out, respectively. Offsite effluent disposal O&M costs are not included in these tables.

Table 9.10 – Annual Treatment and Disposal O&M Cost Estimate-Phase 1, Undisinfected Secondary[1]					
Component	**Unit Cost**	**Unit**	**Quantity**	**Unit**	**Total**
<u>Treatment</u>					
Sludge Disposal	$0.22	$/gallon	115,440	gallons	$25,397
Labor	$58.37	$/hour	1,252	hours	$73,079
Maintenance[2]	2.0	%	$402,961	-	$8,059
Misc. Equipment Replacement[2]	4.0	%	$402,961	-	$16,118
Power	$0.16	$/kWh	$149,227	kWh	$23,876
Total					**$146,600**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the equipment cost.

Table 9.11 – Annual Treatment and Disposal O&M Cost Estimate-Build-Out, Undisinfected Secondary[1]

Component	Unit Cost	Unit	Quantity	Unit	Total
<u>Treatment</u>					
Sludge Disposal	$0.22	$/gallon	709,320	gallons	$156,050
Labor	$58.37	$/hour	1,252	hours	$73,079
Maintenance[2]	2.0	%	$737,881	-	$14,758
Misc. Equipment Replacement[2]	4.0	%	$737,881	-	$29,515
Power	$0.16	$/kWh	1,123,000	kWh	$179,680
Total					**$453,100**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the equipment cost.

Table 9.12 – Annual Treatment and Disposal O&M Cost Estimate-Phase 1, Disinfected Tertiary[1]

Component	Unit Cost	Unit	Quantity	Unit	Total
<u>Treatment</u>					
Sludge Disposal	$0.22	$/gallon	115,440	gallons	$25,397
Labor	$58.37	$/hour	1,252	hours	$73,079
Maintenance[2]	2.0	%	$402,961	-	$8,059
Misc. Equipment Replacement[2]	4.0	%	$402,961	-	$16,118
Power	$0.16	$/kWh	149,227	kWh	$23,876
Subtotal					**$146,600**
<u>Filtration and Disinfection</u>					
Filter Replacement	$991.17	$/filter	7.2	filters	$7,136
UV Bulb Replacement	$297.14	$/bulb	18	bulbs	$5,349
Power	$0.16	$/kWh	26,380	kWh	$4,221
Maintenance[2]	2.0	%	$289,968	-	$5,799
Subtotal					**$22,600**
Total					**$169,200**

Notes:
1. Costs based on the first year of operation in 2014.
2. Percentage of the equipment cost.

Table 9.13 – Annual Treatment and Disposal O&M Cost Estimate-Build-Out, Disinfected Tertiary[1]					
Component	**Unit Cost**	**Unit**	**Quantity**	**Unit**	**Total**
Treatment					
Sludge Disposal	$0.22	$/gallon	709,320	gallons	$156,050
Labor	$58.37	$/hour	1,252	hours	$73,079
Maintenance[2]	2.0	%	$737,881	-	$14,758
Misc. Equipment Replacement[2]	4.0	%	$737,881	-	$29,515
Power	$0.16	$/kWh	1,123,000	kWh	$179,680
Subtotal					**$453,100**
Filtration and Disinfection					
Filter Replacement	$991.17	$/filter	7.2	filters	$7,136
UV Bulb Replacement	$297.14	$/bulb	18	bulbs	$5,349
Power	$0.16	$/kWh	26,380	kWh	$4,221
Maintenance[2]	2.0	%	$289,968	-	$5,799
Subtotal					**$22,600**
Total					**$475,700**

Notes:
3. Costs based on the first year of operation in 2014.
4. Percentage of the equipment cost.

9.4 Summary

The following tables provide a summary of project costs for Phase 1 and at build-out for both undisinfected secondary and disinfected tertiary.

Table 9.14 – Total Project Cost Summary-Undisinfected Secondary

	Phase 1	Additional for Build-Out	Total
Land Purchase Cost	$1,500,000	-	$1,500,000
Construction Cost	$5,320,000	$7,281,000	$12,601,000
Project Cost	$1,862,000	$2,549,000	$4,411,000
Total Cost	**$8,682,000**	**$9,830,000**	**$18,512,000**
Land Purchase Cost	$1,500,000	$-	$1,500,000
Construction Cost	$6,971,000	$7,281,000	$14,252,000
Project Cost	$2,440,000	$2,549,000	$4,989,000
Total Cost	**$10,911,000**	**$9,830,000**	**$20,741,000**

Note:
Land Purchase Cost based on market price of available parcels around Los Olivos
Construction Cost includes 20% contingency
Project Cost includes engineering, administration and legal cost (35% of Construction Costs)

As shown in the tables above, inclusion of the filtration and disinfection process results in a project cost increase of approximately two million dollars. A majority of this cost comes from installation of a distribution system to convey the treated effluent to the use locations. This additional cost only occurs during phase 1 of the project since the equipment and distribution system installed during Phase 1 is adequately sized for the total expected flows for the community.

An estimated land value has been included in the total project cost summary. This figure has been calculated based on listing prices per acre of agricultural parcels currently on the market and the total acreage required for the assumed treatment and disposal methods. Depending on the actual treatment and disposal method, final WWTP site location, and market conditions at the time of land acquisition this price may be significantly different.

10 Preliminary Benefit Assessment Analysis

A preliminary benefit assessment analysis for a new wastewater treatment plant (WWTP), effluent disposal facilities and collection system for the community of Los Olivos has been prepared as part of this PER. A preliminary method of assessment spread has also been developed based on the Engineer's Opinion of Construction Cost presented in Section 9 of this report. The assessment spread was developed based on estimated benefit units for residential and commercial development at Phases 1 and 3 as defined Section 2 of this report.

10.1 Benefit Assessment Districts Overview

One option that is typically used for funding of capital improvement projects such as the proposed Los Olivos community WWTP and collection system is through the formation of an assessment district. Benefit assessments are involuntary charges to properties to fund public improvements or services that provide benefits specifically to that property. These charges are different than those of taxes or fees. Taxes are not based on actual benefit and fees are voluntary charges to cover the expense of the service provided.

Benefit assessment usage is limited by the California Constitution. Over 30 types of benefit assessment types are listed in the Constitution. The benefit assessment types vary by agencies allowed to use them, determination of who benefits, what the assessment can fund, and limits on the duration and renewal of the assessment.

10.1.1 Benefit Assessment District Formation

The formation of a benefit assessment district varies depending on the type. However, there are basic steps they all follow including:

- Creation of the district begins with a petition or a resolution. Petitions are generated by property owners, whereas resolutions are created by the governing body.
- Following the petition or resolution, an engineering report is prepared to study the proposed improvements, costs, and district boundaries and to calculate the benefit assessment per parcel.
- As required by Proposition 218, agencies use the engineer's report to determine the level of benefit to property owners as well as the overall benefit to the community. In some cases the benefits to the property owner are only a percentage of the overall project benefits. In this case the agency can only set the assessment charges to cover the same percentage of project costs.
- A public meeting is held to hear comments from property owners located in the proposed assessment district.
- Ballots are mailed to the affected property owners and are counted at another public hearing. Ballots are weighted depending on the amount each owner will have to pay based on the benefit. Assessments are approved based a simple majority of the weighted ballots.
- After adoption, the assessment is placed on the property owners' annual property tax bill.

10.2 Preliminary Benefit Assessment for Los Olivos

Within this report, a preliminary method of assessment spread was developed. In addition, a range of possible assessment amounts is calculated to be used in discussions of the possible project options. These calculations are based on the cost opinions presented in Section 9. The project phasing and wastewater flow factors used as basis of the assessment spread are as defined in Sections 2 and 3.

10.2.1 Cost Allocation Factors

By law, the assessment of the total cost of the improvements to the various properties within an assessment district is to be in proportion to the estimated benefit to be received by the property from the improvements. To that end, the residential and commercial wastewater flow factors from Section 3 for annual average daily flow (AADF) were was used to calculate the percent of total AADF per residential connection and per 1,000 square feet (SF) of commercial development. Commercial flows were converted into the number of residential unit equivalents by dividing the total amount of expected commercial flow by the estimated flow per residence. Residential unit equivalents (RUE) are commonly used in benefit assessments to account for the differing wastewater flow amounts between various types of residences and commercial business and to determine the amount of actual benefit the commercial property would receive from the proposed service. For instance, a restaurant will have much higher wastewater flows than those expected for a retail type store and in turn would have a larger cost allocation. Commercial duty factors would be established by the governing agency and used to determine the connection and service costs per residence and commercial property.

Table 10.1 displays the calculated values to be used as a basis for the allocation of costs. These Cost Allocation Factors were developed for Phase I of the project and for project build-out.

Table 10.1 – Calculation of Unit Cost Percentages

Residential					
Project Phase	**No. of Connections**	**Factor (gpd/conn)[1]**	**AADF (gpd)**	**% of Total AADF**	**% Cost per Connection**
I	25	215	5,400	29.67%	1.19%
Build-out	400	215	86,000	60.14%	0.15%
Commercial					
Project Phase	**Area (SF)**	**Factor (gpd/SF)[1]**	**AADF (gpd)**	**No. of Equivalent Residential Connections[2]**	
I	228,990	0.056	12,800	60	
Build-out	1,018,071	0.056	57,000	265	

Notes:
1. Residential and commercial flow factors are from Section 3 of this report.
2. Equivalent Residential Connections for commercial development are equal to the commercial AADF divided by the residential flow factor of 215 gpd/residential connection.

10.2.2 Preliminary Assessment Spread

The estimated costs developed in Section 9 for the recommended alternative for collection, treatment and disposal system improvements have been summarized as shown in Table 10.2 for both Phase I and build-out of the project. Costs have also been developed for both undisinfected secondary and disinfected tertiary treatment. Incidental costs (legal, administration and engineering) have been estimated at 35 percent of the improvement costs. A land purchase price was also included based on the current retail prices of agricultural type properties in the general area of Los Olivos. It should be noted that costs in Table 10.2 do not include costs for right-of-way acquisition or bond issuance.

The total estimated costs were then multiplied by the percent cost per connection developed in Table 10.1 to provide an estimated assessment cost for per RUE for the various phases and treatment alternatives.

Table 10.2 – Preliminary Cost Estimate and Assessment Spread

	Phase I Undisinfected Secondary	Build-out Undisinfected Secondary	Phase I Disinfected Tertiary	Build-out Disinfected Tertiary
Improvement Costs[1]				
Land Purchase Cost	$1,500,000	$1,500,000	$1,500,000	$1,500,000
Collection System	$2,790,000	$8,358,000	$2,790,000	$8,358,000
Treatment Improvements	$2,533,000	$3,883,000	$3,014,000	$4,364,000
Disposal System	$92,000	$454,000	$1,166,000	$1,529,000
Total	**$6,915,000**	**$14,195,000**	**$8,470,000**	**$15,751,000**
Incidental Costs[2]				
Engineering, Admin. & Legal	$2,420,000	$4,968,000	$2,965,000	$5,513,000
Total Estimated Cost	$9,335,000	$19,163,000	$11,435,000	$21,264,000
Preliminary Assessment[3]				
Cost/RUE	$110,800	$28,800	$135,700	$32,000

Notes:
1. Improvement costs do not include costs for right-of-way acquisition. Collection, treatment and disposal costs include 20% contingency
2. Incidental costs are estimated at 35% of improvement costs and do not include costs associated with bond issuance.
3. Preliminary Assessment is the Total Estimated Cost multiplied by the percent cost per connection(including equivalent residential connections) from Table 10.1.

Based on this analysis, the preliminary assessment spread is estimated to be in the range of $110,800 to $135,700 per RUE for Phase I of the project and in the range of $28,800 to $32,000 per RUE for build-out when the costs are spread among the entire community. As stated in previously, these costs are based on preliminary information and are intended to provide the basis for discussion relative comparison of project options.

Actual costs per RUE could be significantly lower by incorporating several cost lowering strategies. These strategies could include:

1. Reduced land purchase price

   As previously discussed the estimated land purchase price is calculated based on the average current market price and acreage required for the WWTP and effluent disposal. This amount could be reduced if the selected location has better soil characteristics for effluent disposal resulting in a reduced land requirement. In addition, agreements with land owner(s) may be possible for agricultural reuse further reducing the amount of disposal area needed.

2. Acquire grant funding

   Several grants are available for projects designed to improve water quality. Because grant funds do not have to be repaid the impact on the total cost per RUE could be significant.

3. Reduce administrative costs

   As previously indicated administrative costs have been assumed to be 35% of the project construction costs. The costs include design, legal and miscellaneous administrative fees that occur through the life of the project. Careful project planning and management could result in administration fees as low as 20% of the construction costs.

   A design-build type project could also be considered to reduce administrative costs. A design-build project would proceed more expeditiously than a traditional design-bid-build project since multiple procurement processes would be avoided and design and construction could be integrated to make the project execution both more efficient and less expensive.

Table 10.3 incorporates the strategies discussed above and presents target cost estimates for the project.

Table 10.3 – Target Preliminary Cost Estimate and Assessment Spread

	Phase I Undisinfected Secondary	Build-out Undisinfected Secondary	Phase I Disinfected Tertiary	Build-out Disinfected Tertiary
Improvement Costs[1]				
Land Purchase Cost	$1,500,000	$1,500,000	$1,500,000	$1,500,000
Collection System	$2,790,000	$8,358,000	$2,790,000	$8,358,000
Treatment Improvements	$2,533,000	$3,883,000	$3,014,000	$4,364,000
Disposal System	$92,000	$454,000	$1,166,000	$1,529,000
Cost Reduction[4]	$ (1,500,000)	$ (1,500,000)	$ (1,500,000)	$ (1,500,000)
Total	**$5,415,000**	**$12,695,000**	**$6,970,000**	**$14,251,000**
Incidental Costs[2]				
Engineering, Admin. & Legal	$1,083,000	$2,539,000	$1,394,000	$2,850,000
Total Estimated Cost	$6,498,000	$15,234,000	$8,364,000	$17,101,000
Preliminary Assessment[3]				
Cost/RUE	$77,100	$22,900	$99,300	$25,700

Notes:
1. Improvement costs do not include costs for right-of-way acquisition. Collection, treatment and disposal costs include 20% contingency
2. Incidental costs are estimated at 20% of improvement costs and do not include costs associated with bond issuance.
3. Preliminary Assessment is the Total Estimated Cost multiplied by the percent cost per connection from Table 10.1.
4. Land costs, grant funding, or other target strategies

The table above assumes $1,500,000 in grants or cost reduction and incidental costs of 20% of the total construction costs. With these assumptions cost reductions are in the range of $33,700 to $36,400 per RUE for Phase 1 and $5,900 to $6,300 at build-out.

10.2.3 Annual Payments

Estimated annual payments based on a 20-year payback period are provided in Table 10.4. Typically, this repayment schedule is offered to provide a more affordable payback option for the user.

Table 10.4 – Estimated Annual Assessments

	Phase I Undisinfected Secondary	Build-out Undisinfected Secondary	Phase I Disinfected Tertiary	Build-out Disinfected Tertiary
Total Estimated Cost	$9,335,000	$19,163,000	$11,435,000	$21,264,000
Total Estimated Cost- Targeted ($1.5 mil. credit and 20% Admin)	$6,498,000	$15,234,000	$8,364,000	$17,101,000
Total Annual Cost (6% interest, 20 years)	$813,900	$1,670,700	$997,000	$1,853,900
Total Annual Cost- Targeted (2.1% interest, 20 years)	$401,200	$940,700	$516,500	$1,056,000
Estimated Annual Assessments				
Cost/RUE	$9,700	$2,500	$11,800	$2,800
Estimated Annual Assessments- Target				
Cost/RUE	$4,800	$1,400	$6,100	$1,600

The above table provides estimated annual costs based on the estimated project costs presented in Tables 10.2 and 10.3. Annual payments are estimated based on a 20 year loan with an assumed six percent interest rate.

Target annual payments are calculated using an interest rate of only 2.1 percent. This rate is based on the current interest rate for a loan provided through the Clean Water State Revolving Fund Program (CWSRF). The Federal Water Pollution Control Act established the CWSRF program in 1987 and offers low interest financing for water quality projects. This financing is available to any city, town, or district for construction of publicly-owned facilities such as wastewater treatment plants and local sewers. The interest rate for these loans is calculated by taking one half the most recent General Obligation Bond Rate at the time of Preliminary Funding Commitment. Over the past five years the interest rate has varied between two to three percent. Securing this type of loan is another strategy that should be pursued to lower the assessed costs. Another strategy could be to extend the financing payback period beyond 20 years. Although a larger amount would be paid in interest over the life of the loan, it would further reduce the annual assessment costs.

10.2.4 Annual Service Charge

Annual operating and maintenance (O&M) costs are typically funded through annual service charges for each connection. Using percent cost per connection developed in Table 10.1, estimated service charges were calculated for RUE's. Table 10.5 presents these charges and is provided for both Phase 1 of the project and build-out based on the O&M costs developed in Section 9. Again, values are provided for both undisinfected secondary and disinfected tertiary treatment.

Table 10.5 – Estimated Annual O&M Unit Costs

	Phase I Undisinfected Secondary	Build-out Undisinfected Secondary	Phase I Disinfected Tertiary	Build-out Disinfected Tertiary
Total Annual O&M Costs				
Collection System	$85,400	$110,700	$85,400	$110,700
Treatment & Disposal	$146,600	$453,100	$169,200	$475,700
Total	**$232,000**	**$563,800**	**$254,600**	**$586,400**
Annual O&M Unit Costs				
Cost/RUE	$2,800	$800	$3,000	$900

These O&M costs are approximate and actual costs could be half of the values presented depending on the final project. Cost saving strategies such as sharing personnel and equipment with surrounding districts to perform O&M duties should be fully explored to lower annual costs.

10.3 Conclusion

The following table provides a summary of the estimated total annual cost per RUE. Annual costs include the total assessment for project construction and O&M. It is assumed target O&M costs would be 50% of those calculated for the project. The summary below provides a range of costs that include both estimated costs and targeted costs as discussed throughout this section.

Table 10.6 – Estimated Annual Unit Costs per RUE

	Phase I Undisinfected Secondary	Build-out Undisinfected Secondary	Phase I Disinfected Tertiary	Build-out Disinfected Tertiary
Estimated Annual Assessments	$4,800-$9,700	$1,400-$2,500	$6,100-$11,800	$1,600-$2,800
Annual O&M Unit Costs	$1,400-$2,800	$400-$800	$1,500-$3,000	$450-$900
Total	**$6,200-$12,500**	**$1,800-$3,300**	**$7,600-$14,800**	**$2,050-$3,700**
Monthly Payment	$517-$1,042	$150-$275	$633-$1,233	$171-$308

As shown in the above table there is a financial benefit to all potential users to fully explore the cost saving strategies presented throughout this section since the costs per RUE could be significantly lower. These strategies include:

- Reducing the required land purchasing costs
- Obtaining grant funding
- Reducing administrative costs through alternative delivery or other techniques
- Securing low interest rate loans
- Increasing the loan payback period to greater than 20 years
- Serving the largest area possible to distribute the costs among more users

11 District Formation

The proposed WWTP and collection system project will require a new governing agency such as a special district. The agency would be responsible for funding, operating and maintaining sewer service in the Los Olivos Community. Provided is a brief discussion of the types of service districts available and a general description of the associated formation process.

11.1 Background

As previously discussed in the beginning of this report the LOWWMP provided recommendations to mitigate the current issues with OWTSs. The LOWWMP concluded that a community treatment system would be the most efficient way to reduce the impacts of the high density of OWTSs on groundwater quality. The nearest existing treatment plant is to the south in Solvang. However, a new WWTP will be required since the option of connecting to Solvang's WWTP with a new trunk line would not be allowed as discussed in the Santa Ynez Valley 2009 Community Plan (SYVCP)[15]. This is due to the potential for development to occur along the trunk line between Los Olivos and the plant.

The proposed new WWTP will require funding for construction, operations and maintenance. Formation of a new special district may be undertaken as a mechanism to provide this funding. Alternatively, Los Olivos could be annexed into the Santa Ynez Community Services District (SYCSD), an existing special district located to the south. This would be considered a non-contiguous annexation since Los Olivos is not adjacent to the existing district boundary. With approval, the SYCSD would expand their services to the annexed area and would be responsible for the new WWTP and collection system. A brief discussion of special districts and the formation process is provided in this section.

11.2 Special Districts

11.2.1 Overview

In California, special districts are formed by land owners and residents to provide a mechanism for funding desired services not provided through the local county or municipality. According to the Senate Local Government Committee, the first several districts were created by rural land owners to deliver irrigation water, and to fund their activities through water rates and bond sales[16]. Since then, special districts have been formed to provide a wide array of services to areas consisting of only a handful of members to those serving millions of members.

Special districts provide a focused service or services for a defined boundary. In areas where services either do not exist or where residents want a higher level of service, special districts can be formed to meet these demands and to provide a mechanism to pay for these services. Special districts have corporate powers similar to counties and cities, including but not limited to abilities associated with issuing bonds, levying special taxes, signing contracts, and hiring employees. The main difference between special districts and counties or cities is that districts do not have the ability to make and enforce rules (i.e. police power).

11.2.2 Types of Special Districts

Two types of special districts can be formed; independent or dependent districts. Independent districts are governed by a board elected by residents located within the district's boundary. An example of this

[15] Santa Ynez Valley Community Plan (County of Santa Barbara, October 2009)
[16] *What's So Special About Special Districts?*, (Fourth Edition), Senate Local Government Committee, October 2010

type of district is the Santa Ynez Community Services District (SYCSD). The SYCSD was formed in 1971 to provide sewer services for the Santa Ynez Township and locally elects its Board of Directors.

Dependent districts are governed by existing governments such as a county board of supervisors. County Service Areas (CSAs), such as Santa Barbara County's Mission Canyon (CSA 12), are dependent districts since they are governed by the county board of supervisors. Although a CSA is governed by a county, a Local Advisory Group could be formed to advise the board of supervisors on district issues. This group would be composed of residents and landowners located within the CSA. The formation of a CSA is particularly useful for districts serving a smaller number of residents, since the county is responsible for the administrative costs.

Special districts can also be single or multi-function. According to CALAFCO[17] only 15% of special districts offer more than one service. This includes all service districts and not just CSAs and Community Service Districts (CSD). However, multi-function districts such as CSAs can perform an array of services that are typically provided by the County. CSDs can also provide up to 32 types of services under the Community Service District Law (Government Code §61100).

11.2.3 Special District Funding

Spending by districts is broken into two separate categories:

- Capital projects; and
- Operations and maintenance (O&M).

Funding for each of these types of spending comes from different sources. The following sections describe the funding for these categories.

11.2.3.1 Capital Projects

Special districts can issue bonds or receive loans from the state or federal government to fund capital projects such as construction of new infrastructure to expand existing services. Typical bonds used include general obligation bonds and benefit assessment bonds. According to the California Debt Issuance Primer prepared by the California Debt and Investment Advisory Commission, "*general obligation bonds are secured either by a pledge of the full faith and credit of the issuer or by a promise to levy property taxes in an unlimited amount necessary to pay debt service*." General obligation bonds are typically payable from ad valorem property taxes. Issuance of general obligation bonds requires a supermajority (2/3) voter approval. Benefit assessment bonds also require property owner approval but only require a simple majority through a weighted-ballot election. If approved, assessment amounts are based on the proportion of services the property receives and are typically added to the property tax bills. A more detailed discussion of benefit assessments is provided in Section 10 of this report.

11.2.3.2 Operations and Maintenance

Three different types of revenue sources can be used to fund O&M services of the district. These include taxes, service charges, and benefit assessments. Proposition 218 (1996) prohibits service districts from levying separate general taxes. Special taxes can be levied with a two thirds voter approval and are typically a flat amount per lot. Service charges such as water or electricity rates charge residents within the district based on the usage of the service. Benefit assessments similar to those for capital improvements can also be used for funding of operations and maintenance.

[17] *Special District Fact Sheet*, Senate Local Government Committee, August 2009.

11.3 Formation and Annexation Process

The process of forming a new district or annexation of an area into an existing district involves several steps that are briefly described below.

11.3.1 LAFCO

In 1963 the California legislature created the Local Agency Formation Commissions (LAFCo). The goal of the formation was to improve coordination and planning for and between local government agencies since at the time several agencies overlapped geographically and had inefficient service boundaries. The result of this lack of coordination and planning was the premature loss of agricultural and open space lands.

LAFCo's purpose is to encourage orderly formation of local agencies, preserve agricultural resources and to discourage urban sprawl. To accomplish these goals, LAFCo reviews proposals for formation of new agencies, as well as proposed changes to existing agencies. LAFCo has the power to either approve or deny the proposal based on their review.

Each county has its own LAFCo that is typically comprised of members from the Board of Supervisors and members of city councils. Some LAFCos also include members of independent special districts located in the county. The Santa Barbara LAFCo includes two City members, two County members, two Special District members, and one public member.

11.3.2 Process

The formation of a new district or annexation of an area into an existing district requires five general steps:

1. Registered voters within the proposed district/annexation area apply to LAFCo on specified application forms. Alternatively the County could adopt a resolution and submit an application for formation of a dependent district such as a CSA.

2. LAFCo reviews the application and provides the public with recommendations after an initial public hearing. LAFCo can either approve or reject the submitted application.
3. If LAFCo approves the application a second public hearing is held to measure formal protests. If a majority of the voters protest the proposal, the process stops.
4. If there is not a majority of protests then an election is held within the proposed district boundaries.
5. If the voters approve, LAFCo files the formal documents to create the new district or annex the proposed area.

A flow chart representing this process is provided the Appendix D of this report. The time required to complete all of the steps listed above to form a new special district or to be annexed into an existing district can vary from several months to several years.

11.3.3 Required Application Information

The application to LAFCo to initiate the formation process would include a general description of the area, type of district to be formed, reasoning for the creation, legal description of the district boundary, and support of the residents and land owners. In addition, the application would include the appropriate environmental documentation under CEQA. A detailed application package including the associated fees would be obtained from LAFCo prior to the initiation of the process. The current schedule of processing fees is provided in Appendix C.

11.4 Summary

As previously discussed, the community of Los Olivos has several alternatives available to fund and manage a new WWTP and collection system. Either annexation to an existing special district such as the SYCSD or formation of a new district are viable options. It is assumed that all options would be explored and a final option selected with input from the community, County staff, the Board of Supervisors, nearby special districts, and LAFCo.

APPENDIX A
Central Coast Regional Water Quality Control Board- Preliminary Engineering Report Response to Surface Water Discharge Alternative

June 18, 2012

J.J. Reichmuth, PE
Email (Joseph.Reichmuth@aecom.com)
AECOM, Project Manager
1194 Pacific Street, Suite 204
San Luis Obispo, CA 93401

Dear Mr. Reichmuth:

SANTA BARBARA COUNTY'S LOS OLIVOS WASTEWATER TREATMENT FACILITY - PRELIMINARY ENGINEERING REPORT RESPONSE TO SURFACE WATER DISCHARGE ALTERNATIVE

Central Coast Water Board staff received your June 7, 2012 letter regarding the Los Olivos Wastewater Facility Preliminary Engineering report. We understand that you and the County are seeking to better understand issues surrounding discharges of treated effluent to surface water.

We understand that the project will be conducted in three phases. Phase I will serve the existing downtown core, which will include the entire commercial district as well as some residential homes. Phase II will expand wastewater treatment capacity to serve the build-out of the commercial and residential downtown core. Phase III will expand wastewater treatment capacity to serve the remaining properties identified within the Special Problems Area (as delineated by the County). Total average annual daily flow from the wastewater treatment facility is anticipated to be 143,000 gallons per day at the completion of Phase III. If the project is designed to discharge to surface water, then the likely location for discharge would be Alamo Pintado Creek. We offer the following responses to your questions related to surface water discharges:

Given the possible discharge locations (i.e., Alamo Pintado Creek or a tributary to the creek), what additional effluent limitations (other than BOD, TSS, and TN) are anticipated?

Surface water discharges are regulated by the National Pollutant Discharge Elimination System (NPDES) permitting program, as required by the federal Clean

Water Act. Discharges to surface water bodies are subject to review and permitting through the Central Coast Water Board. Discharges to surface water require effluent limitations that are protective of aquatic life and habitat. Title 40 of the Code of Federal Regulations, Section 133.102 requires compliance with secondary standards for biochemical oxygen demand (BOD), total suspended solids (TSS) and pH, at a minimum. In addition to these secondary standards, surface water discharges are subject to water quality objectives identified in the Central Coast Water Quality Control Plan (Basin Plan) and the California Toxics Rule. The Basin Plan includes water quality objectives that are protective of beneficial uses. Basin Plan water quality objectives include, but are not limited to organic chemicals, radioactivity, bacteria, dissolved oxygen, temperature, and salts. The California Toxics rule includes a list of volatile organics, semi-volatile organics, pesticides, inorganics, and other pollutants (approximately 130)[1].

If the future Los Olivos Wastewater Treatment Facility would treat the wastewater to meet tertiary standards for recycled water reuse and have a surface water discharge, then the facility would have to satisfy Title 22, California Code of Regulations (Title 22) as well as the aforementioned effluent requirements.

What studies would be required to evaluate impacts on aquatic life and other beneficial uses during the CEQA/EIR and permitting process for the NPDES/WDRs?

In order to allow Central Coast Water Board staff to fully understand the project, its anticipated discharge, and its potential downstream impacts, staff would request, at a minimum, the following studies:

- <u>Flow Studies</u> – This study should calculate flows through each phase of the project. This would include peak seasonal flows and community growth projections.

- <u>Hydrological Study</u> – This study should include an evaluation of downstream impacts associated with the additional daily flows. This would include a discussion of baseline riparian and stream conditions; potential downstream erosion and sediment transport; and water quality changes (i.e., increasing nutrients, salts, sediment, temperature, organics) that might alter aquatic life habitat.

- <u>Groundwater Studies</u> – This study should include an evaluation of groundwater impacts related to the additional discharges to the creek. This would include a evaluation of groundwater connectivity via in-stream recharge, potential impacts

[1] The discharger may conduct a Reasonable Potential Analysis to identify pollutants with reasonable potential to impact water quality. Pollutants may not have effluent limitations only if they are identified not to have reasonable potential to impact water quality.

to downstream drinking water sources, and groundwater quality changes as a result of the discharge.

- Endangered Species Study – This study would include an evaluation/survey of endangered species that would be impacted by the additional surface water discharge. This study would need to include both federal and state species of concern and would also be reviewed by California Department of Fish and Game and the US Fish and Wildlife Service.

- Reasonable Potential Analysis – This study would analyze the priority pollutants identified in the California Toxic Rule and evaluate whether the pollutants would be present in the discharge and have reasonable potential to cause an exceedance of water quality standards.

Other federal and state resources agencies may have additional requirements.

What monitoring requirements would be imposed? In particular, what are the current toxicity testing requirements for water bodies with similar beneficial uses?

As discussed in the first question above, surface water discharges are required to meet secondary standards, water quality objectives identified in the Basin Plan, and California Toxics Rule. Therefore, monitoring for influent wastewater, effluent wastewater, and receiving water (creek) would be required in order to establish compliance and protection of the receiving water. At a minimum, the following monitoring requirements would be established.

- Influent Monitoring – The Discharger would be required to monitoring influent wastewater (Flow, BOD, TSS, pH, etc.) to determine removal efficiency and loading rates.

- Effluent Monitoring - Effluent monitoring would include all of the pollutants identified to meet federal secondary standards, water quality objectives in the Basin Plan, and water quality objectives in the California Toxics Rule. If recycled water is proposed, then the Discharger would be required to monitor for Title 22 standards and constituents of emerging concern[2].

- Receiving Water Monitoring - The discharger would be required to establish receiving water monitoring points upstream and downstream of the effluent discharge location. Typical receiving water monitoring includes evaluating the chemical contribution from the discharge, compliance with the permit, and identifying any downstream impacts as a result of the discharge.

[2] Constituents of Emerging Concern are established by the Department of Public Health and are associated with recycled water reuse and irrigation.

- Groundwater Monitoring – The discharger would be required to monitor groundwater. This study would evaluate potential impacts to groundwater as a result of the surface water discharges. Typical groundwater monitoring parameters include, but are not limited to, salts, nitrogen, and some drinking water parameters.

If the County proposed this option as a seasonal solution or short-term solution (coupled with direct reuse for irrigation and/or percolation elsewhere), would the environmental studies, monitoring requirements, or effluent limitations be different?

Any discharge of waste to surface water would be subject to NPDES regulation. In other words, regardless of the discharge duration to surface water, the discharger would be subject to federal secondary standards and compliance with Basin Plan and California Toxics Rule water quality objectives. Monitoring frequency of the receiving water may change due to the temporary nature of discharge.

Would state funding and/or grant opportunities be limited with surface water discharges?

More recently, the state has placed emphasis on projects related to recycled water and reuse. As a result, grand funding opportunities are available for recycled water projects. Projects that do not have a recycled water element are limited from receiving recycled water grant funds.

Additional Comments:

Mandatory Minimum Penalties - Surface water discharges are subject to mandatory minimum penalties, pursuant to California Water Code, Section 13385. This section of the water code requires a mandatory penalty of $3,000 per effluent violation. The total amount of mandatory penalties is dependent on the number of violations assessed by Water Board staff.

Habitat Maintenance - Wastewater treatment facilities that discharge to surface water have also been required to support aquatic habitat. For example, the City of San Luis Obispo currently discharges to San Luis Obispo Creek. As a result, the additional water in the creek has created and maintained a habitat for aquatic life, more specifically steelhead trout. Subsequently, the City of San Luis Obispo is required by the US Fish and Wildlife Service to provide a certain flow to the creek in order to maintain the aquatic habitat in perpetuity.

Conclusion:

In general, the federal Clean Water Act discourages waste discharges to surface water. The NPDES program exists to make sure that where these discharges exist, there are requirements in place to protect water quality. California laws encourage recycling of wastewater to the greatest extent possible. Recycled wastewater can be a valuable source of water, especially in chronically water-short areas such as the central coast.

The Central Coast Water Board appreciates the County's efforts to provide wastewater management to the community of Los Olivos. The Basin Plan identifies Los Olivos and Ballard Canyon as urbanizing areas that are in need of wastewater management[3]. We encourage the County to continue its environmental analysis, design, and construction of a community wastewater treatment facility in an expeditious manner. Central Coast Water Board staff encourages the County to seek alternatives that are beneficial for the surface water and groundwater protection. As such, staff would likely recommend approval for a wastewater treatment facility that involves sustainable methods for discharge. We recognize that wastewater treatment/recycled water projects are most sustainable and provide opportunities for urban and agricultural reuse.

If you have any further questions, please contact **David LaCaro at (805) 549-3892 or via email at dlacaro@waterboards.ca.gov.**

Sincerely,

for Roger W. Briggs
Executive Officer

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[3] Section VIII.D.3.g. of the Basin Plan.

APPENDIX B
Cost Estimation – Treatment Comparison

Table B.1 – Cost Summary by Treatment Alternative-Phase 1				
	Treatment Alternative			
Component	**MLE**	**SBR**	**MBR**	**AdvanTex**
Equipment				
Screening	$177,000	$177,000	NA	$177,000
Treatment Alternative	$425,000	$344,000	$894,000	$553,000
Retention Tank	NA	NA	NA	$173,000
Filtration	$197,000	$197,000	NA	NA
Disinfection[1]	$103,000	$205,000	$103,000	$401,000
Civil/Yard Piping	$81,000	$83,000	$87,000	$50,000
Structural	$145,000	$175,000	$147,000	$119,000
Process Mechanical[2]	$159,000	$142,000	$154,000	$ -
Electrical & Instrumentation	$322,000	$330,000	$346,000	$100,000
Subtotal	**$1,609,000**	**$1,653,000**	**$1,731,000**	**$1,573,000**
Overhead (Contractor Profit & Tax)	$239,000	$246,000	$257,000	$216,000
Contingency (20 Percent)	$369,000	$379,000	$397,000	$334,000
Total Construction Cost	**$2,217,000**	**$2,278,000**	**$2,385,000**	**$2,123,000**
Engineering, Administration, Legal (35 Percent)	$775,000	$796,000	$834,000	$701,000
Total Project Cost	**$2,992,000**	**$3,074,000**	**$3,219,000**	**$2,824,000**

1. Includes dentrification (Blue NITE) for the AdvanTex Alternative
2. Included in equipment pricing for the AdvanTex Alternative

Table B.2 – Cost Summary by Treatment Alternative-Phase 2				
	Treatment Alternative			
Component	**MLE**	**SBR**	**MBR**	**AdvanTex**
Equipment				
Screening	$ -	$ -	NA	$ -
Treatment Alternative	$625,000	$295,000	$900,000	$750,000
Retention Tank	NA	NA	NA	$586,000
Filtration	$ -	$ -	NA	NA
Disinfection[1]	$ -	$ -	$ -	$ -
Civil/Yard Piping	$65,000	$37,000	$81,000	$10,000
Structural	$166,000	$213,000	$163,000	$ -
Process Mechanical[2]	$100,000	$46,000	$139,000	$ -
Electrical & Instrumentation	$258,000	$148,000	$321,000	$25,000
Subtotal	**$1,214,000**	**$739,000**	**$1,604,000**	**$1,371,000**
Overhead (Contractor Profit & Tax)	$192,000	$110,000	$239,000	$203,000
Contingency (20 Percent)	$296,000	$170,000	$368,000	$315,000
Total Construction Cost	**$1,702,000**	**$1,019,000**	**$2,211,000**	**$1,889,000**
Engineering, Administration, Legal (35 Percent)	$621,000	$356,000	$773,000	$661,000
Total Project Cost	**$2,323,000**	**$1,375,000**	**$2,984,000**	**$2,550,000**

1. Includes dentrification (Blue NITE) for the AdvanTex Alternative
2. Included in equipment pricing for the AdvanTex Alternative

Table B.3 – Cost Summary by Treatment Alternative-Phase 3				
	Treatment Alternative			
Component	**MLE**	**SBR**	**MBR**	**AdvanTex**
Equipment				
Screening	$ -	$ -	NA	$ -
Treatment Alternative	$625,000	$223,000	$993,000	$1,572,000
Retention Tank	NA	NA	NA	$1,213,000
Filtration	$ -	$ -	NA	NA
Disinfection[1]	$103,000	$ -	$103,000	$711,000
Civil/Yard Piping	$73,000	$29,000	$95,000	$10,000
Structural	$166,000	$172,000	$147,000	$ -
Process Mechanical[2]	$116,000	$35,000	$169,000	$ -
Electrical & Instrumentation	$289,000	$115,000	$377,000	$25,000
Subtotal	**$1,372,000**	**$574,000**	**$1,884,000**	**$3,531,000**
Overhead (Contractor Profit & Tax)	$215,000	$85,000	$280,000	$524,000
Contingency (20 Percent)	$332,000	$132,000	$432,000	$811,000
Total Construction Cost	**$1,919,000**	**$791,000**	**$2,596,000**	**$4,866,000**
Engineering, Administration, Legal (35 Percent)	$697,000	$276,000	$907,000	$1,703,000
Total Project Cost	**$2,616,000**	**$1,067,000**	**$3,503,000**	**$6,569,000**

1. Includes dentrification (Blue NITE) for the AdvanTex Alternative
2. Included in equipment pricing for the AdvanTex Alternative

Table B.4 – Project Cost Summary by Treatment Alternative-Buildout				
	Treatment Alternative			
Component	**MLE**	**SBR**	**MBR**	**AdvanTex**
Equipment				
Screening	$177,000	$177,000	NA	$177,000
Treatment Alternative	$1,675,000	$862,000	$2,787,000	$2,875,000
Retention Tank	NA	NA	NA	$1,972,000
Filtration	$197,000	$197,000	NA	NA
Disinfection[1]	$206,000	$205,000	$206,000	$1,112,000
Civil/Yard Piping	$219,000	$149,000	$263,000	$70,000
Structural	$477,000	$560,000	$457,000	$119,000
Process Mechanical[2]	$375,000	$223,000	$462,000	$ -
Electrical & Instrumentation	$869,000	$593,000	$1,044,000	$150,000
Subtotal	**$4,195,000**	**$2,966,000**	**$5,219,000**	**$6,475,000**
Overhead (Contractor Profit & Tax)	$646,000	$441,000	$776,000	$943,000
Contingency (20 Percent)	$997,000	$681,000	$1,197,000	$1,460,000
Total Construction Cost	**$5,838,000**	**$4,088,000**	**$7,192,000**	**$8,878,000**
Engineering, Administration, Legal (35 Percent)	$2,093,000	$1,428,000	$2,514,000	$3,065,000
Total Project Cost	**$7,931,000**	**$5,516,000**	**$9,706,000**	**$11,943,000**

1. Includes dentrification (Blue NITE) for the AdvanTex Alternative
2. Included in equipment pricing for the AdvanTex Alternative

APPENDIX C
Effluent Disposal Alternatives – Water Balances

Effluent Disposal - Percolation

	Flow		Percolation Basins								
			Area	Percolation Rate		Evaporation		Precipitation		Monthly	Cumulative
Month	(gpd)	(AF/mo)	(acres)	(in/day)	(AF/mo)	(in/mo)	(AF/mo)	(in/mo)	(AF/mo)	Storage	Storage
November	19,000	1.7	2.3	0.20	1.2	2.62	0.5	1.53	0.3	0.3	0.3
December	19,000	1.8	2.3	0.20	1.2	2.09	0.4	2.27	0.4	0.6	0.9
January	19,000	1.8	2.3	0.20	1.2	1.83	0.4	3.10	0.6	0.8	1.7
February	19,000	1.6	2.3	0.20	1.1	2.65	0.5	3.14	0.6	0.6	2.3
March	19,000	1.8	2.3	0.20	1.2	3.31	0.6	2.55	0.5	0.5	2.8
April	19,000	1.7	2.3	0.20	1.2	4.51	0.9	1.12	0.2	0.0	2.6
May	19,000	1.8	2.3	0.20	1.2	5.66	1.1	0.27	0.1	0.0	2.2
June	19,000	1.7	2.3	0.20	1.2	6.42	1.2	0.03	0.0	0.0	1.5
July	20,000	1.9	2.3	0.20	1.2	7.13	1.4	0.02	0.0	0.0	0.8
August	19,000	1.8	2.3	0.20	1.2	6.74	1.3	0.03	0.0	0.0	0.1
September	19,000	1.7	2.3	0.20	1.2	5.25	1.0	0.18	0.0	0.0	0.0
October	19,000	1.8	2.3	0.20	1.2	4.07	0.8	0.52	0.1	0.0	0.0
Total		21.1	2.3	0.20	14.3	52.26	10.1	14.76	2.8		
											-0.5

ADF 19,000 gpd
MMF 20,000 gpd

	Flow		Percolation Basins								
			Area	Percolation Rate		Evaporation		Precipitation		Monthly	Cumulative
Month	(gpd)	(AF/mo)	(acres)	(in/day)	(AF/mo)	(in/mo)	(AF/mo)	(in/mo)	(AF/mo)	Storage	Storage
November	63,000	5.8	7.7	0.20	3.9	2.62	1.7	1.53	1.0	1.2	1.2
December	63,000	6.0	7.7	0.20	4.0	2.09	1.3	2.27	1.5	2.2	3.4
January	63,000	6.0	7.7	0.20	4.0	1.83	1.2	3.10	2.0	2.8	6.2
February	63,000	5.4	7.7	0.20	3.6	2.65	1.7	3.14	2.0	2.1	8.3
March	63,000	6.0	7.7	0.20	4.0	3.31	2.1	2.55	1.6	1.5	9.8
April	63,000	5.8	7.7	0.20	3.9	4.51	2.9	1.12	0.7	0.0	9.5
May	63,000	6.0	7.7	0.20	4.0	5.66	3.6	0.27	0.2	0.0	8.1
June	63,000	5.8	7.7	0.20	3.9	6.42	4.1	0.03	0.0	0.0	5.9
July	69,000	6.6	7.7	0.20	4.0	7.13	4.6	0.02	0.0	0.0	3.9
August	63,000	6.0	7.7	0.20	4.0	6.74	4.3	0.03	0.0	0.0	1.6
September	63,000	5.8	7.7	0.20	3.9	5.25	3.4	0.18	0.1	0.0	0.2
October	63,000	6.0	7.7	0.20	4.0	4.07	2.6	0.52	0.3	0.0	0.0
Total		71.2	7.7	0.20	47.2	52.26	33.5	14.76	9.4		
											-0.1

ADF 63,000 gpd
MMF 69,000 gpd

	Flow		Percolation Basins								
			Area	Percolation Rate		Evaporation		Precipitation		Monthly	Cumulative
Month	(gpd)	(AF/mo)	(acres)	(in/day)	(AF/mo)	(in/mo)	(AF/mo)	(in/mo)	(AF/mo)	Storage	Storage
November	143,000	13.2	17.6	0.20	8.8	2.62	3.8	1.53	2.2	2.8	2.8
December	143,000	13.6	17.6	0.20	9.1	2.09	3.1	2.27	3.3	4.7	7.5
January	143,000	13.6	17.6	0.20	9.1	1.83	2.7	3.10	4.5	6.3	13.8
February	143,000	12.3	17.6	0.20	8.2	2.65	3.9	3.14	4.6	4.8	18.6
March	143,000	13.6	17.6	0.20	9.1	3.31	4.9	2.55	3.7	3.3	21.9
April	143,000	13.2	17.6	0.20	8.8	4.51	6.6	1.12	1.6	0.0	21.3
May	143,000	13.6	17.6	0.20	9.1	5.66	8.3	0.27	0.4	0.0	17.9
June	143,000	13.2	17.6	0.20	8.8	6.42	9.4	0.03	0.0	0.0	12.9
July	158,000	15.0	17.6	0.20	9.1	7.13	10.5	0.02	0.0	0.0	8.3
August	143,000	13.6	17.6	0.20	9.1	6.74	9.9	0.03	0.0	0.0	2.9
September	143,000	13.2	17.6	0.20	8.8	5.25	7.7	0.18	0.3	0.0	0.0
October	143,000	13.6	17.6	0.20	9.1	4.07	6.0	0.52	0.8	0.0	0.0
Total		161.7	17.6	0.20	107.1	52.26	76.8	14.76	21.4		
											-0.8

ADF 143,000 gpd
MMF 158,000 gpd

Effluent Disposal - Feed & Fodder Crop Irrigation with Unlined Storage (Undisinfected Secondary)

	Flow		Cropping and Applied Effluent					Storage Basins									
									Percolation Rate		Evaporation		Precipitation		Monthly Storage	Cumulative Storage	Imported Water
Month	(gpd)	(AF/mo)	Crop	Application (in/acre)	Area (acres)	Total (AF/mo)	Excess Effluent (AF/mo)	Area (acres)	(in/day)	(AF/mo)	(in/mo)	(AF/mo)	(in/mo)	(AF/mo)	(AF)	(AF)	(AF)
November	19,000	1.7	Feed/Fodder	0.97	5	0.4	1.3	0.8	0.20	0.4	2.62	0.2	1.53	0.1	0.8	0.8	0.0
December	19,000	1.8	Feed/Fodder	0.00	5	0.0	1.8	0.8	0.20	0.4	2.09	0.1	2.27	0.1	1.4	2.2	0.0
January	19,000	1.8	Feed/Fodder	0.00	5	0.0	1.8	0.8	0.20	0.4	1.83	0.1	3.10	0.2	1.5	3.7	0.0
February	19,000	1.6	Feed/Fodder	0.00	5	0.0	1.6	0.8	0.20	0.4	2.65	0.2	3.14	0.2	1.2	4.9	0.0
March	19,000	1.8	Feed/Fodder	1.35	5	0.6	1.2	0.8	0.20	0.4	3.31	0.2	2.55	0.2	0.8	5.7	0.0
April	19,000	1.7	Feed/Fodder	4.72	5	2.0	0	0.8	0.20	0.4	4.51	0.3	1.12	0.1	0.0	4.8	0.0
May	19,000	1.8	Feed/Fodder	6.60	5	2.8	0	0.8	0.20	0.4	5.66	0.4	0.27	0.0	0.0	3.0	0.0
June	19,000	1.7	Feed/Fodder	7.24	5	3.0	0	0.8	0.20	0.4	6.42	0.4	0.03	0.0	0.0	0.9	0.0
July	20,000	1.9	Feed/Fodder	7.51	5	3.1	0	0.8	0.20	0.4	7.13	0.5	0.02	0.0	0.0	0.0	1.2
August	19,000	1.8	Feed/Fodder	7.04	5	2.9	0	0.8	0.20	0.4	6.74	0.4	0.03	0.0	0.0	0.0	1.9
September	19,000	1.7	Feed/Fodder	5.04	5	2.1	0	0.8	0.20	0.4	5.25	0.3	0.18	0.0	0.0	0.0	1.1
October	19,000	1.8	Feed/Fodder	3.65	5	1.5	0.3	0.8	0.20	0.4	4.07	0.3	0.52	0.0	0.0	0.0	0.4
Total		21.1		44.10	5	18.4		0.8	0.20	4.8	52.26	3.4	14.76	0.9			4.6
																	-4.6

ADF 19,000 gpd
MMF 20,000 gpd

	Flow		Cropping and Applied Effluent					Storage Basins									
									Percolation Rate		Evaporation		Precipitation		Monthly Storage	Cumulative Storage	Imported Water
Month	(gpd)	(AF/mo)	Crop	Application (in/acre)	Area (acres)	Total (AF/mo)	Excess Effluent (AF/mo)	Area (acres)	(in/day)	(AF/mo)	(in/mo)	(AF/mo)	(in/mo)	(AF/mo)	(AF)	(AF)	(AF)
November	63,000	5.8	Feed/Fodder	0.97	15	1.2	4.6	3.1	0.20	1.5	2.62	0.7	1.53	0.4	2.8	2.8	0.0
December	63,000	6	Feed/Fodder	0.00	15	0.0	6	3.1	0.20	1.6	2.09	0.5	2.27	0.6	4.5	7.3	0.0
January	63,000	6	Feed/Fodder	0.00	15	0.0	6	3.1	0.20	1.6	1.83	0.5	3.10	0.8	4.7	12.0	0.0
February	63,000	5.4	Feed/Fodder	0.00	15	0.0	5.4	3.1	0.20	1.4	2.65	0.7	3.14	0.8	4.1	16.1	0.0
March	63,000	6	Feed/Fodder	1.35	15	1.7	4.3	3.1	0.20	1.6	3.31	0.8	2.55	0.7	2.6	18.7	0.0
April	63,000	5.8	Feed/Fodder	4.72	15	5.9	0	3.1	0.20	1.5	4.51	1.2	1.12	0.3	0.0	16.2	0.0
May	63,000	6	Feed/Fodder	6.60	15	8.3	0	3.1	0.20	1.6	5.66	1.5	0.27	0.1	0.0	10.9	0.0
June	63,000	5.8	Feed/Fodder	7.24	15	9.0	0	3.1	0.20	1.5	6.42	1.6	0.03	0.0	0.0	4.6	0.0
July	69,000	6.6	Feed/Fodder	7.51	15	9.4	0	3.1	0.20	1.6	7.13	1.8	0.02	0.0	0.0	0.0	1.6
August	63,000	6	Feed/Fodder	7.04	15	8.8	0	3.1	0.20	1.6	6.74	1.7	0.03	0.0	0.0	0.0	6.1
September	63,000	5.8	Feed/Fodder	5.04	15	6.3	0	3.1	0.20	1.5	5.25	1.3	0.18	0.0	0.0	0.0	3.3
October	63,000	6	Feed/Fodder	3.65	15	4.6	1.4	3.1	0.20	1.6	4.07	1.0	0.52	0.1	0.0	0.0	1.1
Total		71.2		44.10	15	55.2		3.1	0.20	18.6	52.26	13.3	14.76	3.8			12.1
																	-12.1

ADF 63,000 gpd
MMF 69,000 gpd

	Flow		Cropping and Applied Effluent					Storage Basins									
									Percolation Rate		Evaporation		Precipitation		Monthly Storage	Cumulative Storage	Imported Water
Month	(gpd)	(AF/mo)	Crop	Application (in/acre)	Area (acres)	Total (AF/mo)	Excess Effluent (AF/mo)	Area (acres)	(in/day)	(AF/mo)	(in/mo)	(AF/mo)	(in/mo)	(AF/mo)	(AF)	(AF)	(AF)
November	143,000	13.2	Feed/Fodder	0.97	30	2.4	10.8	6.2	0.20	3.1	2.62	1.3	1.53	0.8	7.2	7.2	0.0
December	143,000	13.6	Feed/Fodder	0.00	30	0.0	13.6	6.2	0.20	3.2	2.09	1.1	2.27	1.2	10.5	17.7	0.0
January	143,000	13.6	Feed/Fodder	0.00	30	0.0	13.6	6.2	0.20	3.2	1.83	0.9	3.10	1.6	11.1	28.8	0.0
February	143,000	12.3	Feed/Fodder	0.00	30	0.0	12.3	6.2	0.20	2.9	2.65	1.4	3.14	1.6	9.6	38.4	0.0
March	143,000	13.6	Feed/Fodder	1.35	30	3.4	10.2	6.2	0.20	3.2	3.31	1.7	2.55	1.3	6.6	45.0	0.0
April	143,000	13.2	Feed/Fodder	4.72	30	11.8	1.4	6.2	0.20	3.1	4.51	2.3	1.12	0.6	0.0	41.6	0.0
May	143,000	13.6	Feed/Fodder	6.60	30	16.5	0	6.2	0.20	3.2	5.66	2.9	0.27	0.1	0.0	32.7	8.9
June	143,000	13.2	Feed/Fodder	7.24	30	18.1	0	6.2	0.20	3.1	6.42	3.3	0.03	0.0	0.0	21.4	11.3
July	158,000	15.0	Feed/Fodder	7.51	30	18.8	0	6.2	0.20	3.2	7.13	3.7	0.02	0.0	0.0	10.7	10.7
August	143,000	13.6	Feed/Fodder	7.04	30	17.6	0	6.2	0.20	3.2	6.74	3.5	0.03	0.0	0.0	0.0	10.7
September	143,000	13.2	Feed/Fodder	5.04	30	12.6	0.6	6.2	0.20	3.1	5.25	2.7	0.18	0.1	0.0	0.0	5.1
October	143,000	13.6	Feed/Fodder	3.65	30	9.1	4.5	6.2	0.20	3.2	4.07	2.1	0.52	0.3	0.0	0.0	0.5
Total		161.7		44.10	30	110.3		6.2	0.20	37.7	52.26	26.9	14.76	7.6			47.2
																	-5.6

ADF 143,000 gpd
MMF 158,000 gpd

Effluent Disposal - Food Crop Irrigation with Unlined Storage (Disinfected Tertiary)

	Flow		Cropping and Applied Effluent					Storage Basins									
									Percolation Rate		Evaporation		Precipitation		Monthly	Cumulative	Imported
				Application	Area	Total	Excess Effluent	Area							Storage	Storage	Water
Month	(gpd)	(AF/mo)	Crop	(in/acre)	(acres)	(AF/mo)	(AF/mo)	(acres)	(in/day)	(AF/mo)	(in/mo)	(AF/mo)	(in/mo)	(AF/mo)	(AF)	(AF)	(AF)
November	18,200	1.7	Vineyard	1.28	10	1.1	0.6	0.7	0.20	0.3	2.62	0.2	1.53	0.1	0.2	0.2	0.0
December	18,200	1.7	Vineyard	0.00	10	0.0	1.7	0.7	0.20	0.4	2.09	0.1	2.27	0.1	1.3	1.5	0.0
January	18,200	1.7	Vineyard	0.00	10	0.0	1.7	0.7	0.20	0.4	1.83	0.1	3.10	0.2	1.4	2.9	0.0
February	18,200	1.6	Vineyard	0.00	10	0.0	1.6	0.7	0.20	0.3	2.65	0.2	3.14	0.2	1.3	4.2	0.0
March	18,200	1.7	Vineyard	0.00	10	0.0	1.7	0.7	0.20	0.4	3.31	0.2	2.55	0.1	1.2	5.4	0.0
April	18,200	1.7	Vineyard	2.71	10	2.3	0	0.7	0.20	0.3	4.51	0.3	1.12	0.1	0.0	4.3	0.0
May	18,200	1.7	Vineyard	5.00	10	4.2	0	0.7	0.20	0.4	5.66	0.3	0.27	0.0	0.0	1.1	0.0
June	18,200	1.7	Vineyard	5.76	10	4.8	0	0.7	0.20	0.3	6.42	0.4	0.03	0.0	0.0	0.0	2.7
July	20,000	1.9	Vineyard	5.98	10	5.0	0	0.7	0.20	0.4	7.13	0.4	0.02	0.0	0.0	0.0	3.9
August	18,200	1.7	Vineyard	5.60	10	4.7	0	0.7	0.20	0.4	6.74	0.4	0.03	0.0	0.0	0.0	3.8
September	18,200	1.7	Vineyard	3.60	10	3.0	0	0.7	0.20	0.3	5.25	0.3	0.18	0.0	0.0	0.0	1.9
October	18,200	1.7	Vineyard	1.63	10	1.4	0.3	0.7	0.20	0.4	4.07	0.2	0.52	0.0	0.0	0.0	0.3
Total		20.5		31.55	10	26.5		0.7	0.20	4.3	52.26	3.1	14.76	0.8			12.6
																	-12.6

ADF 19,000 gpd
MMF 20,000 gpd

	Flow		Cropping and Applied Effluent					Storage Basins									
									Percolation Rate		Evaporation		Precipitation		Monthly	Cumulative	Imported
				Application	Area	Total	Excess Effluent	Area							Storage	Storage	Water
Month	(gpd)	(AF/mo)	Crop	(in/acre)	(acres)	(AF/mo)	(AF/mo)	(acres)	(in/day)	(AF/mo)	(in/mo)	(AF/mo)	(in/mo)	(AF/mo)	(AF)	(AF)	(AF)
November	63,000	5.8	Vineyard	1.28	30	3.2	2.6	2.8	0.20	1.4	2.62	0.6	1.53	0.4	1.0	1.0	0.0
December	63,000	6	Vineyard	0.00	30	0.0	6	2.8	0.20	1.4	2.09	0.5	2.27	0.5	4.6	5.6	0.0
January	63,000	6	Vineyard	0.00	30	0.0	6	2.8	0.20	1.4	1.83	0.4	3.10	0.7	4.9	10.5	0.0
February	63,000	5.4	Vineyard	0.00	30	0.0	5.4	2.8	0.20	1.3	2.65	0.6	3.14	0.7	4.2	14.7	0.0
March	63,000	6	Vineyard	0.00	30	0.0	6	2.8	0.20	1.4	3.31	0.8	2.55	0.6	4.4	19.1	0.0
April	63,000	5.8	Vineyard	2.71	30	6.8	0	2.8	0.20	1.4	4.51	1.1	1.12	0.3	0.0	15.9	0.0
May	63,000	6	Vineyard	5.00	30	12.5	0	2.8	0.20	1.4	5.66	1.3	0.27	0.1	0.0	6.8	0.0
June	63,000	5.8	Vineyard	5.76	30	14.4	0	2.8	0.20	1.4	6.42	1.5	0.03	0.0	0.0	0.0	4.7
July	69,000	6.6	Vineyard	5.98	30	14.9	0	2.8	0.20	1.4	7.13	1.7	0.02	0.0	0.0	0.0	11.4
August	63,000	6	Vineyard	5.60	30	14.0	0	2.8	0.20	1.4	6.74	1.6	0.03	0.0	0.0	0.0	11.0
September	63,000	5.8	Vineyard	3.60	30	9.0	0	2.8	0.20	1.4	5.25	1.2	0.18	0.0	0.0	0.0	5.8
October	63,000	6	Vineyard	1.63	30	4.1	1.9	2.8	0.20	1.4	4.07	0.9	0.52	0.1	0.0	0.0	0.3
Total		71.2		31.55	30	78.9		2.8	0.20	16.7	52.26	12.2	14.76	3.4			33.2
																	-33.2

ADF 63,000 gpd
MMF 69,000 gpd

	Flow		Cropping and Applied Effluent					Storage Basins									
									Percolation Rate		Evaporation		Precipitation		Monthly	Cumulative	Imported
				Application	Area	Total	Excess Effluent	Area							Storage	Storage	Water
Month	(gpd)	(AF/mo)	Crop	(in/acre)	(acres)	(AF/mo)	(AF/mo)	(acres)	(in/day)	(AF/mo)	(in/mo)	(AF/mo)	(in/mo)	(AF/mo)	(AF)	(AF)	(AF)
November	143,000	13.2	Vineyard	1.28	70	7.5	5.7	5.6	0.20	2.8	2.62	1.2	1.53	0.7	2.4	2.4	0.0
December	143,000	13.6	Vineyard	0.00	70	0.0	13.6	5.6	0.20	2.9	2.09	1.0	2.27	1.1	10.8	13.2	0.0
January	143,000	13.6	Vineyard	0.00	70	0.0	13.6	5.6	0.20	2.9	1.83	0.9	3.10	1.4	11.2	24.4	0.0
February	143,000	12.3	Vineyard	0.00	70	0.0	12.3	5.6	0.20	2.6	2.65	1.2	3.14	1.5	10.0	34.4	0.0
March	143,000	13.6	Vineyard	0.00	70	0.0	13.6	5.6	0.20	2.9	3.31	1.5	2.55	1.2	10.4	44.8	0.0
April	143,000	13.2	Vineyard	2.71	70	15.8	0	5.6	0.20	2.8	4.51	2.1	1.12	0.5	0.0	37.8	0.0
May	143,000	13.6	Vineyard	5.00	70	29.1	0	5.6	0.20	2.9	5.66	2.6	0.27	0.1	0.0	16.9	20.9
June	143,000	13.2	Vineyard	5.76	70	33.6	0	5.6	0.20	2.8	6.42	3.0	0.03	0.0	0.0	0.0	26.2
July	158,000	15.0	Vineyard	5.98	70	34.9	0	5.6	0.20	2.9	7.13	3.3	0.02	0.0	0.0	0.0	26.1
August	143,000	13.6	Vineyard	5.60	70	32.7	0	5.6	0.20	2.9	6.74	3.1	0.03	0.0	0.0	0.0	25.1
September	143,000	13.2	Vineyard	3.60	70	21.0	0	5.6	0.20	2.8	5.25	2.4	0.18	0.1	0.0	0.0	12.9
October	143,000	13.6	Vineyard	1.63	70	9.5	4.1	5.6	0.20	2.9	4.07	1.9	0.52	0.2	0.0	0.0	0.5
Total		161.7		31.55	70	184.1		6.3	0.20	34.1	52.26	24.2	14.76	6.8			111.7
																	-73.9

ADF 143,000 gpd
MMF 158,000 gpd

APPENDIX D

Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000 Annexation/Detachment/Reorganization Procedure Diagram from Napa LAFCo.

CORTESE-KNOX-HERTZBERG LOCAL GOVERNMENT REORGANIZATION ACT OF 2000
ANNEXATION/DETACHMENT/REORGANIZATION PROCEDURE DIAGRAM

AGENCY PRE-NOTICE
Mailed notice by proponent to subject and interested agencies at least 20 days before resolution adoption unless 100% consent (optional).

COMMISSION PROCEEDINGS
May be initiated by resolution of application by affected agency, or petition with required signature of landowners or registered voters.

NOTICE OF INTENT TO CIRCULATE PETITION
Must be filed with Executive Officer prior to circulation of the petition.

RESOLUTION
Resolution of application by affected local agency.

PETITION
Petition with required signatures of landowners or registered voters. Check with LAFCO for specific signature requirement.

APPLICATION SUBMITTAL
Application is submitted to LAFCO in form required by Commission to include resolution/petition, map, pre-zoning (for city annexations) and legal description, applicable fees, CEQA compliance documents and comprehensive plan for services.

Environmental Review is performed if LAFCO is the lead agency.

Tax exchange resos are adopted by agencies, if applicable.

APPLICATION REVIEW
Request for information from other agencies or affected counties; Executive Officer prepares report and recommendation on proposal; report mailed at least 5 days prior to hearing.

NOTICE OF HEARING
Notice of Commission hearing is given by Executive Officer; notice given by posting, publication and *mailing to property owners and registered voters within boundaries (within 300 feet) at least 21 days before date of heairng. *(If >1000 notices, 1/8 page display ad in lieu of mailed noticee.)

COMMISSION HEARING
At the hearing the Commission will consider staff report and factors related to proposal, testimony of affected agencies and parties, service plan, CEQA documentation, and make determinations.

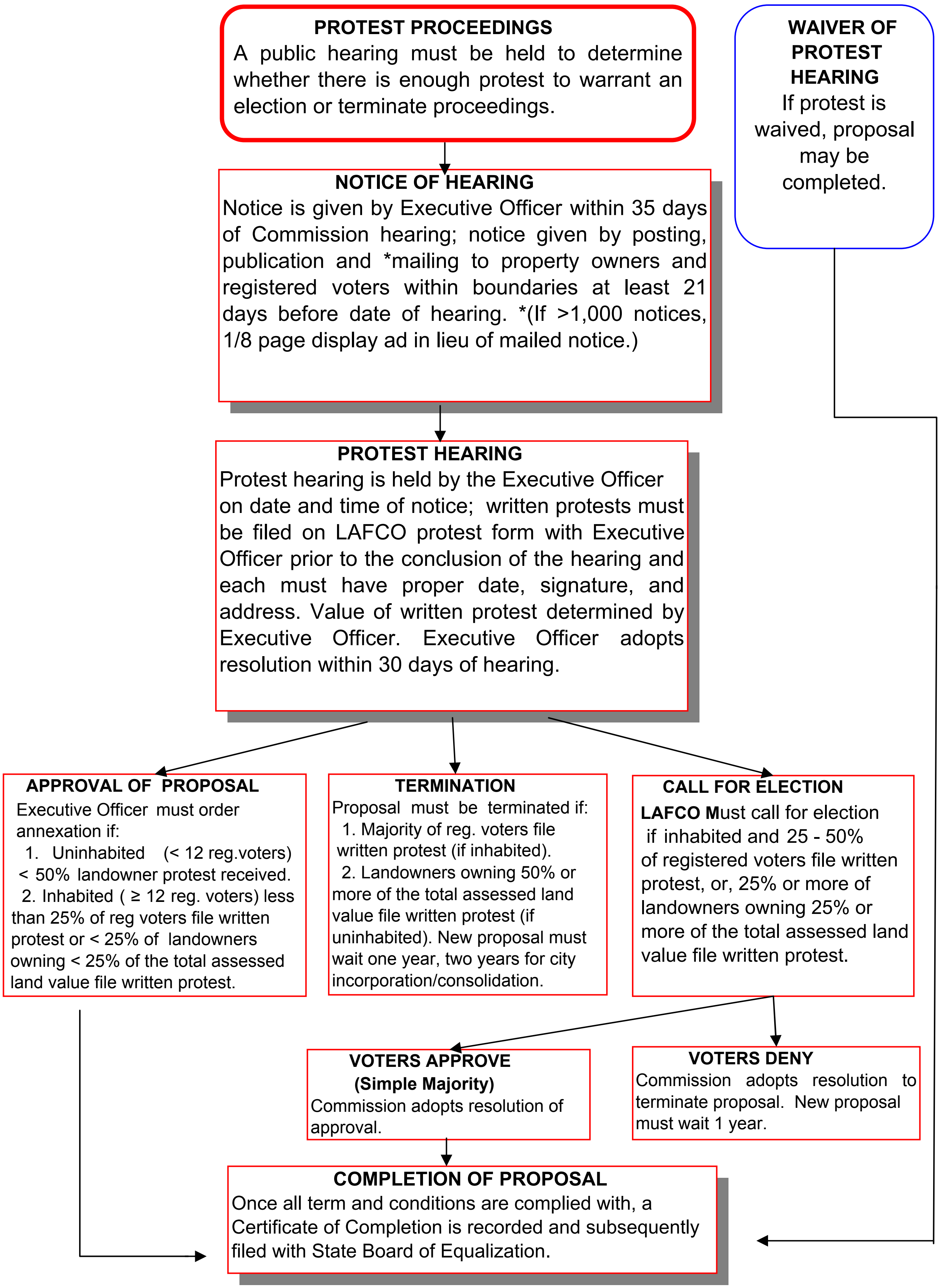
COMMISSION DENIES PROPOSAL
If denied, no similar proposal may be made within one year.

COMMISSION APPROVES PROPOSAL
May be approved with revisions/conditions. Commission directs Executive Officer to conduct protest proceedings. Approval expires within one year if not completed (see next page).

WAIVER OF PROTEST HEARING
Commission may waive hearing if 100% landowner consent and concurrence from affected agencies. (see next page)

*These are generalized procedures. Processing of specific proposals can vary slightly.

CORTESE-KNOX-HERTZBERG LOCAL GOVERNMENT REORGANIZATION ACT OF 2000
ANNEXATION/DETACHMENT/REORGANIZATION PROCEDURE DIAGRAM



*These are generalized procedures. Processing of specific proposals can vary slightly.

REVISED 5/31/11-KU

APPENDIX E

Santa Barbara Local Agency Formation Commision- Schedule of Processing Fees

SANTA BARBARA LOCAL AGENCY FORMATION COMMISSION

SCHEDULE OF PROCESSING FEES

Effective August 8, 2011

Annexations and Detachments

Acreage	Fee
Less than 5	$ 1,430 (10 hours)
5 to 10	2,000 (14 hours)
11 to 25	2,430 (17 hours)
26 +	4,290 (30 hours)

Staff hours in excess of those shown in parentheses shall be charged at an hourly rate of $143. Such fees shall be received prior to the time the staff records the proposed boundary change.

Reorganizations:

Annexation or detachment fee plus a 20% surcharge for each additional change of organization in the application, except for detachments from the County Fire Protection District or CSA 32.

Formations and Incorporations	$ 2,530	$ 8,580 (60 hours)

In addition to the processing fee, the cost of preparing the comprehensive fiscal analysis shall be borne by the applicant, proponents or supporters of the incorporation.

Sphere of Influence Amendment	$970	$ 1,070
Out-of-Agency Service Agreements	The same fee as for an annexation.	

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Documents	1-50 pages is $0.25 a page; 50+ is $0.10 page
DVDs of LAFCO meetings	$20

Fee Policies:

1. Fees may not be charged for proposals that result from LAFCO orders.
2. Fees must be received at the time application materials are submitted.
3. Allowed refunds are based on staff effort that has been expended prior to the withdrawal of the application as follows:

After staff requests reportbacks	80% of the fee
After Certificate of Filing has been issued	50% of the fee
After Executive Officer Report has been issued	20% of the fee

4. If an annexation occurs within one year of the date the affected property receives an out-of-agency service approval the annexation fee shall be reduced by fifty percent.

5. A supplemental fee shall be charged for proposals that require LAFCO to conduct protest hearings. The fee shall include out-of-pocket costs to publish and mail notices of hearing to landowners and registered voters as required by law.

6. A supplemental fee shall be charged when a Commission meeting, that would not otherwise be held, is held at the request of an applicant. The fee includes Commissioner per diem stipends and mileage reimbursement and out-of-pocket costs to copy and mail the notice of hearing and agenda packet for the meeting.

7. A supplemental fee shall be charged to recover actual costs for preparing environmental documents when LAFCO is the lead agency. The fee shall include out-of-pocket costs to prepare, copy and distribute the environmental document.

8. A supplemental fee shall be charged to recover out-of-pocket costs to copy documents that exceed 100 pages for distribution to the members of the Commission.

9. A $1,100 deposit payable to "County of Santa Barbara" for reviewing maps and legal descriptions must be submitted with proposals that include maps and legals. Boundary changes will be completed only when obligations to the County Surveyor are satisfied.

10. The processing fee to file a request for reconsideration is 50% of the original processing fee amount. The fee shall be returned to the applicant if the Commission determines that the reconsideration is required to correct a procedural defect in its earlier action.

11. The cost for the State to review the Comprehensive Fiscal Analysis for an incorporation shall be the responsibility of those requesting the review.

About AECOM

AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With approximately 45,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and collaborative technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. A Fortune 500 company, AECOM serves clients in more than 100 countries and has annual revenue in excess of $6 billion.

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