SUMMARY OF ALTERNATIVES LOS OSOS WASTEWATER PROJECT

EFFLUENT DISPOSAL / REUSE ALTERNATIVES

The disposal/reuse alternative selected will dictate the level of treatment required and subsequent size of the facility to provide the treatment needed.

The disposal/reuse alternatives that are under consideration are:

- Unrestricted Reuse (Agricultural and Urban)
- Percolation Ponds
- Leachfields
- Spray Fields
- Constructed Terminal Wetlands

Unrestricted Reuse

Unrestricted reuse is the practice of using treated wastewater to irrigate landscape and food crops in areas where public access is not restricted. Unrestricted reuse is often used to offset potable water uses.

Urban Reuse: Urban reuse was considered for irrigation of schools, parks and golf courses, however there are not nearly enough potential sites for water reuse in the community of Los Osos to accept all of the treated effluent. Approximately half of the water use in Los Osos is for outside irrigation, so although running extensive piping to existing development might be expensive, there is significant potential for water reuse.

Urban reuse would provide the general benefit of reducing withdrawals from the lower aquifer for urban use, thus helping with overall groundwater management.

Agricultural Reuse: Agricultural reuse may allow the treatment facility to dispose of higher concentrations of nitrate in its effluent than for other alternatives if it is applied at agronomic rates. However, the use of treated wastewater for crop irrigation requires diligent and ongoing management to ensure the protection of public health from *E. coli* and other waterborne pathogens.

Percolation Ponds and Leachfields

Percolation ponds and leachfields are both methods for disposing of wastewater to the ground through percolation. For either percolation ponds or leachfields, secondary treatment would be required..

Percolation Ponds: Percolation ponds are open ponds where water is stored and percolated into the ground. The pond bottoms are managed to maintain percolation rates by drying, ripping and conditioning the soils. A percolation pond could be as large as several acres and could be accommodated on several of the potential treatment plant sites.

Due to aesthetic issues, percolation ponds would have to be located downwind, and therefore east, of residential areas.

Construction of a percolation pond involves the excavation of the pond itself and trenches for supply pipes. The area converted to a percolation pond would be permanently lost to agricultural production.

Leachfields: Leachfields are operated by subsurface spreading and percolation, so there is no open water. There are limited areas within the groundwater basin that would be appropriate for subsurface leachfields.

Construction of a leachfield involves the excavation of trenches and the installation of percolation and supply pipe. The vegetation overlying a disposal leachfield must be chosen to ensure that the root systems do not interfere with the percolation capacity of the field. Moreover, leachfields need to be periodically renovated over the life of the fields, which necessitates removing the overlying groundcover.

Spray Field

Spray field disposal is the practice of spraying effluent on lands not to grow a particular crop, but to dispose of the water. Water is disposed through evapotranspiration and percolation. Care must be taken to ensure that runoff is reduced and contained.

The capacity of spray fields to accept treated wastewater would be greatest during the dry season. Spraying of fields during the rainy season would accelerate erosion and sedimentation as well as the volume of runoff conveyed by natural drainage courses.

Constructed Terminal Wetlands

Constructed wetlands can be used for treatment, for mitigation for destruction of wetlands elsewhere or for creation of habitat. For this report, wetlands are considered as a disposal method. A terminal wetland has no discharge to surface waters and is designed to evaporate and percolate wastewater effluent for disposal.

The issues associated with constructed wetlands are similar to those associated with percolation ponds, except that the biological sensitivity of existing wetlands is far greater. In addition, once the wetlands are established, they could have considerable regulatory protections of Federal and State laws.

This alternative would provide a general benefit to the community by providing wildlife habitat and a recreation area. This is essentially a variant of the percolation pond strategy in which the pond (or ponds) consists of newly constructed wetlands or the expansion/augmentation of existing wetlands. Wetlands have both aesthetic and biological value, in addition to possessing certain water purifying qualities.

Issues for Disposal/Reuse Alternatives
Los Osos Wastewater Project Development
San Luis Obispo County

Disposal/Reuse Alternative	Sufficient Local Capacity for all flow?	Winter Storage Required	Affect on Sea Water Intrusion	Treatment Level	Other Issues
Unrestricted Reuse - Urban	No, 132 ac-ft/yr identified	This alternative can only accommodate small fraction of flow year round	Helps mitigate	Disinfected Tertiary	• Can fit future development with purple pipe • Can be used for nitrogen removal
Unrestricted Reuse - Agriculture	Possibly - depends on local farmers' cooperation and using land outside basin Need 500 - 800 acres	Yes, 500 to 650 ac-ft	Helps mitigate if applied within basin, to a lesser degree than urban reuse	Disinfected Tertiary	• Farmers' response to idea has been mixed • Possibility of in-lieu exchange of reuse water for Agricultural well water • Can be used for nitrogen removal
Percolation Pond	Yes	No	Helps mitigate if located within basin	Disinfected Secondary 23 or 2.2	• Must be downwind of residential areas • Area lost to agriculture • Possible loss of biological resources
Leachfield	Not at Broderson Site (limited to 800,000 gpd with harvest wells, 400,000 without harves wells). Would require many sites (more than identified in past reports)	No, if sized for all flow	Helps mitigate if located within basin	Disinfected Secondary 23 or 2.2	• Harvest wells increase capacity, but harvest water disposal is additional issue • Additional cost to transport effluent to west of town (Broderson site) • Area lost to agriculture • Possible loss of biological/archeological resources
Sprayfield	Possibly - depends on using land outside basin Need approximately 600 acres	Yes	Does not address intrusion - most sites outside basin	Disinfected Secondary 23	• Can be used for nitrogen removal • Changes natural wet/dry seasonal cycle, affecting local species
Constructed Terminal Wetlands	Yes	No, if sized for all flow	Helps mitigate if located within basin	Disinfected Secondary 23	• Could be protected by federal and state laws once established • Provides habitat and recreation area

TREATMENT TECHNOLOGY ALTERNATIVES

The alternatives were assessed relative to the ability of the process to meet permit requirements and include an evaluation of the following wastewater treatment processes:

- Suspended-Growth Activated Sludge
  - Extended Aeration Modified Ludzak-Ettinger (MLE)
  - BIOLAC® Wastewater Treatment Process
  - Sequencing Batch Reactor (SBR)
  - Oxidation Ditch
- Attached-Growth Fixed Media
  - Trickling Filters
- Advanced Wastewater Treatment Ponds
  - Partially Mixed Facultative Ponds (e.g., Nelson Air Diffusion System (ADS)®, Advanced Integrated Pond System (AIPS)®)

A central treatment facility is assumed to be the most cost effective, expedient approach. Siting and permitting a central treatment facility, centralized solids treatment and handling operations, and economy-of-scale are significant advantages for the Los Osos community wastewater project.

Suspended-Growth Activated Sludge

Suspended growth activated sludge is a two-step process. Removal of organic materials from the raw sewage in the first step results in growth of microorganisms, which must be regularly wasted from the system. Since these micro-organisms are held in suspension by aeration or mechanical mixing in the first stage of the process, the activated sludge process is called a suspended growth process. In the second step, the treatment organisms are separated from the main process flow.

Extended Aeration Modified Ludzak-Ettinger (MLE) Processes: Extended aeration is an activated sludge system for removal of carbonaceous pollutants and conversion of ammonia in the raw wastewater to nitrate. The extended aeration process typically operates without primary sedimentation, using raw wastewater as its source. To meet nitrogen removal objectives, the extended aeration process must be modified by addition of anoxic tanks and internal recycle pumping. When modified in this way, this process is called the modified Ludzack-Ettinger (MLE) process, after its inventor.

Extended aeration MLE has a proven history in wastewater treatment and is capable of meeting BOD, suspended solids, and nitrogen water quality objectives.

The extended aeration MLE process requires approximately 4 to 6 acres. The compact size of the system facilitates siting and minimizes land acquisition costs.

BIOLAC® Wastewater Treatment System: The BIOLAC® process is a proprietary activated sludge process developed by Parkson Corporation. The BIOLAC® system is similar to the extended aeration MLE process with multiple “cells” in a large, lined earthen basin to facilitate biological treatment of the wastewater.

Parkson Corporation claims over 500 BIOLAC® installations throughout North America treating municipal and industrial wastewater and is likely capable of meeting BOD, suspended solids and nitrogen water quality objectives.

The BIOLAC® treatment process requires approximately 10 acres. The area required and open earthen basins may limit the potential treatment plant sites.

Sequencing Batch Reactor (SBR): A sequencing batch reactor (SBR) is an activated sludge system that relies on a series of tanks. Each tank sequentially fills, aerates, settles and decants the wastewater to achieve the desired water quality objectives.

SBRs have a proven history in wastewater treatment and are capable of meeting BOD, suspended solids and nitrogen water quality objectives. The SBR treatment process requires approximately 6 acres. The compact size of the system facilitates siting and minimizes land acquisition costs.

Oxidation Ditch: An oxidation ditch system is an activated sludge system that consists of a ring or oval-shaped channel equipped with mechanical aeration devices. Oxidation ditches typically operate with long detention and solids retention times.

The oxidation ditch system has a proven history in wastewater treatment and is capable of meeting BOD, suspended solids, and nitrogen water quality objectives.

The oxidation ditch treatment process requires approximately 8 acres. The land requirement is greater than MLE, MBR, or SBR processes because surface aeration in the oxidation ditch process typically limits tank depth to approximately 12 feet.

Attached-Growth Fixed Media

Attached-growth fixed media processes use media such as plastic or rock to support microbial growth. Wastewater is spread over the media, where the soluble organic matter is metabolized by the microorganisms and the colloidal organic matter is adsorbed on the film. Rough screening evaluations are provided for several types of attached-growth fixed media processes for potential use in treatment of wastewater.

Trickling Filters: Trickling filters are an aerobic attached-growth biological treatment process that may include nitrification (the conversion of ammonia to nitrate) but are not typically employed to obtain low levels of nitrogen

The trickling filter process has a proven history in wastewater treatment and is capable of meeting BOD and suspended solids, but has generally not been used to meet low levels of nitrogen.

The trickling filter process requires approximately five acres. The compact size of the system facilitates siting and minimizes land acquisition costs. The tricking filter process usually includes towers 20 to 30 feet high, which can be a visual obstruction.

Advanced Wastewater Treatment Ponds

Advanced wastewater treatment ponds is a broad term to classify large earthen or concrete basins used to stabilized domestic wastewater by natural biological processes that occur in shallow ponds. Numerous variations of treatment ponds exist to optimize suspended solids, BOD, fecal microorganisms and ammonia removal. Rough screening evaluations are provided for several types of relatively common pond systems.

Partially Mixed Facultative Ponds: Partially mixed facultative ponds include proprietary designs such as Nelson Air Diffusion System (ADS)® and Advanced Integrated Pond System (AIPS)®.

Partially mixed facultative ponds can be viewed as a combined biological process that oxidizes organic oxygen demanding material and a physical operation that allows settling of organic and inorganic solids. Mechanical aeration provides dissolved oxygen needed for aerobic organisms in the pond to convert and oxidize the organic material in the wastewater. It also provides the physical mixing necessary to distribute dissolved oxygen, suspend the organic material and bring the organisms into contact with the organic material.

Partially mixed facultative ponds provided with adequate aeration can be deeper and smaller than facultative ponds. Typical partial mix ponds are 10 to 16 feet deep and have a detention time of 30 to 60 days.

This system has been used at many facilities to meet BOD and suspended solids requirements for all disposal/reuse alternatives.

The partially mixed facultative pond treatment process requires approximately 20 acres. A dual power aerated lagoon would require slightly less area. The area may limit the potential treatment plant sites.

Summary of Wastewater Treatment Process Alternatives
Los Osos Wastewater Project Development
San Luis Obispo County

Treatment Alternative	Relative Construction Cost	Relative O & M Cost	Estimated Acreage Required [1,2] (Acres)	Approximate Nitrogen Removal Capabilities (mg/L)[(4)]	Relative Energy Usage	"Good Neighbor" Features
Suspended Growth Activated Sludge						
Extended Aeration MLE	Moderate	Moderate	6	Probably less than10	Moderate	• Odor treatment as necessary • Low noise/enclosable equipment • Covered facility not cost-effective
BIOLAC®	Low	Low	10	Probably less than10	Low	• Basin size prohibits odor control • Low noise/enclosable equipment • Covered facility not feasible
Sequencing Batch Reactor (SBR)	Moderate	Moderate	6	Probably less than10	Moderate	• Odor treatment as necessary • Low noise/enclosable equipment • Covered facility not cost-effective
Oxidation Ditch	Moderate	Moderate	8	Probably less than10	Moderate	• Odor control as necessary but costly for oxidation ditch • Low noise/enclosable equipment • Covered facility not feasible
Attached-Growth Fixed Media						
Trickling Filters	Moderate	Moderate	5	Probably greater than 10	Low	• Odor control as necessary • Low noise • Covered facility not feasible
Advanced Wastewater Treatment Ponds						
Partially Mixed Facultative Ponds	Low	Low	20[(6)]	Questionable /Limited Control (Probably greater than 10)	Low	• Pond size prohibits odor control • Low noise/enclosable equipment • Covered facility not feasible

Notes:

1) Based on Los Osos Wastewater Management Plan Update (Ripley Pacific Team, 2006).
2) Based on Final Project Report (Montgomery Watson Americas, 2001).
3) TRI-W site was 8 acres. However, a significant portion of the space is necessary for community amenities. Acreage estimated is for general MBR facility to be consistent with extended aeration MLE and other alternatives.
4) Processes evaluated are not acceptable for extremely low nitrogen levels required for creek discharge and groundwater injection. A process such as Bardenpho Aeration would be required to achieve sufficient nutrient removal.
5) Costs are relative to an Extended Aeration MLE facility. Conceptual level costs will be developed as part of the detailed evaluation process.
6) Estimated acreage not presented in previous studies. Estimate is based on information from the Wallace Group.

SOLIDS TREATMENT AND DISPOSAL ALTERNATIVES

Recycling of Digested/Composted Class A Biosolids

Since 2002, Morro Bay has produced EQ Class A composted biosolids through a combination of digestion and composting. Digestion may be utilized to provide stabilization to Class B standards. Composting Class B biosolids greatly reduces the required retention time and space for the process. Conversely, this alternative has an increased operations complexity, requiring separate thickening, digestion, dewatering or solar drying, and composting.

Hauling of Digested Class B Biosolids

Digestion is one of the most common technologies for producing a Class B biosolids product on-site. This alternative would consist of gravity belt thickeners, aerobic digesters, and belt filter presses (mechanical dewatering) to produce a Class B biosolids. Depending on the site selected, solar drying beds may be considered as an alternative route to mechanical dewatering. Solar drying beds require less energy but significantly more space.

Recycling of Composted Class A Biosolids

Presently, composting is the acceptable method for onsite production of Class A biosolids. The production of a Class A biosolids product on-site would include two, 1-meter gravity belt thickeners and mechanical dewatering processes for redundancy purposes. Solar beds can be substituted in lieu of mechanical dewatering. The biosolids would then be treated to Class A pathogen elimination standards through composting.

Hauling of Composted Class B Biosolids

Composting represents the current locally accepted method for biosolids processing to be utilized for recycling within the County. This alternative would be composed of providing two 1-meter gravity belt thickeners and mechanical dewatering (belt filter presses) for redundancy purposes. Solar beds can be substituted in lieu of mechanical dewatering. The biosolids would then be sent to an on-site composting location to undergo pathogen and vector reduction to achieve Class B status prior to hauling.

Hauling of sub-Class B Dewatered Biosolids

One of the benefits of this type of secondary process is that additional solids stabilization is not a necessary component of treatment prior to disposal. However, the production of biosolids not meeting the requirements for Class B results in an increased tipping fee charged by off-site facilities. Since the product is sub-Class B, it cannot be directly land applied and must first be processed further at an off-site facility.

This alternative results in minimal construction of on-site biosolids facilities but increases disposal costs. The biosolids facility may include two 1-meter gravity belt thickeners and mechanical dewatering or heat drying. Depending on the site selected, solar drying beds may be considered as an alternative route to mechanical dewatering.

Hauling of Heat Dried Class B Biosolids

Heat dryers can stabilize raw sludge from secondary processes within a relatively small amount of time. This alternative would consist of providing thickened or unthickened biosolids to two heat dryers (for redundancy purposes). Heat drying can serve to meet the Class B biosolids criteria prior to hauling off-site while containing odors within an enclosed structure.

TREATMENT FACILITY SITING ALTERNATIVES

Property	Acre-age	Description/ Topography	Access to Infrastructure	Visual Resources	Advantages	Disadvantages
Cemetery Property	48.1	Rectangular parcel that slopes gently downward to the north; westerly boundary slopes downward to the west to a dirt road that provides access to surrounding farming operations; southerly third of the site is used for a cemetery, about 7 acres in the northwest corner is cultivated with row crops, with the remainder fallow; no trees, or other natural features; useable portion of site is about 22 acres.	• Close to LOVR, with level, unimproved road bordering on the east that intersects LOVR opposite Clark Valley Road • No public water supply • Electricity at LOVR?	• Site is close to LOVR and visible to passing motorists • Gently sloping terrain may help reduce apparent height /prominence of buildings	• Effective size of the site (about 22 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal • Accessible from LOVR via intersection with Clark Valley Road • No apparent habitat value • No known private easement constraints • Topography may allow for screening from LOVR • Close to service area • Less prime farm land, no LCA contract • No potential for flooding.	• Archaeological resources on property • Close to cemetery and closer to residences to the west • Expansion plans of cemetery are unknown and may affect availability • Los Osos fault may be present • Expansion plans for cemetery unknown
Giacomazzi	37.1	Rectangular parcel that slopes gently downward to the north and east toward an ephemeral drainage that extends along the easterly portion of the site to Warden Lake (offsite); collection of farm-related buildings along the western border; level areas have been cultivated with row crops (irrigation?); numerous tall trees around the buildings and in the drainage channel; useable portion of site is about 20 acres.	• Close to LOVR, with level, unimproved road bordering on the east that intersects LOVR opposite Clark Valley Road • No public water supply • Electricity at LOVR?	• Site is about one third mile from LOVR and partially visible to passing motorists • Gently sloping terrain may help reduce apparent height /prominence of buildings	• Effective size of the site (about 20 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal • Accessible from LOVR via intersection with Clark Valley Road • No known private easement constraints • Topography may allow for screening from LOVR • Close to service area • Less prime farm land, no LCA contract • More removed from receptors and visibility from LOVR.	• Ephemeral drainages may pose drainage issues with design and may support sensitive biological resources • Archaeological resources may extend onto property from the south • Los Osos fault may be present • Requires access over intervening properties.
Andre 2	9.87	Narrow, triangular shaped parcel bordering LOVR; site slopes gently downward to the north; one small building; access provided from adjacent parcel in common ownership; one group of large trees that follows an ephemeral drainage that crosses the northerly portion of the site; useable area of site is about 9 acres, but narrow triangular shape limits development flexibility.	• Borders LOVR, with level, unimproved road providing access from adjacent property to the west that intersects LOVR east of Clark Valley Road • No public water supply • Electricity at LOVR?	• Site is adjacent to LOVR where the largest developable area is also located • Would be highly visible to passing motorists • Gently sloping terrain may help reduce apparent height /prominence of buildings, but site boundaries narrow to the north	• Directly accessible from LOVR • No known private easement constraints • Topography may allow for screening from LOVR • Slightly farther from service area but abuts LOVR • Less prime farm land, no LCA contract • More removed from receptors • No known archaeological resources	• Effective size (about 9 acres) and triangular shape may limit the types of treatment and/or disposal technologies. • Useable portion of site is fairly visible from LOVR. • Ephemeral drainage may support some habitat value. • Vehicle speeds on LOVR are high in this area, which would likely require channelization (east-bound left turn lane, west-bound deceleration lane) for vehicle access.

Property	Acre-age	Description/ Topography	Access to Infrastructure	Visual Resources	Advantages	Disadvantages
Morosin /FEA	81.2	Irregularly shaped parcel located south of LOVR on the east side of Clark Valley Road at the base of the Irish Hills; southerly half of the site slopes upward into the foothills and is composed of native vegetation; northerly half of site is relatively flat and has been cultivated with row crops; site contains a church with parking and access road on a small knoll at the northerly border of the site; cluster of ag-related buildings located at the base of the foothills; water tank is located about 100 meters upslope from the ag buildings; useable area of site is about 35 acres.	• Close to LOVR, with level, borders Clark Valley Road, which is a paved, two-lane county road • No public water supply • Electricity?	• Site borders Clark Valley Road which provides access to a small number of ranches and farms in the Clark Valley to the south • Site is about one-half mile from LOVR and would be at least partially visible to passing motorists • Intervening properties are mostly level and cultivated periodically with row crops	• Effective size of the site (about 35 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal • Accessible from LOVR via intersection with Clark Valley Road • Less visible from LOVR which may reduce need for screening • Less prime farm land, no LCA contract • More removed from receptors • No known archaeological resources • No flooding issues	• Los Osos fault may be present • Somewhat farther to service area than other sites • Church and housing located on property • Sensitive biological resources upslope to the south • PG&E electrical transmission line easement affects the westerly 420 feet of site where buildings would not be allowed.
Branin	42.2	Irregularly shaped lot north of LOVR and adjacent to Warden Lake which consists of native wetland and riparian vegetation; site slopes to the north toward Warden lake and contains two ephemeral drainages; useable portion of the site appears to be periodically cultivated and consists of 15 - 25 acres.	• Close to LOVR, but no apparent improved access • No public water supply • Electricity at LOVR?	• Site is about two- thirds mile from LOVR and marginally visible to passing motorists • Sloping terrain may help reduce apparent height /prominence of buildings	• Effective size of the site (about 15 - 25 acres) is sufficient to accommodate a wide range of treatment technologies and some on-site disposal • Topography may allow for screening from LOVR • Less prime farm land, no LCA contract • More removed from receptors and visibility from LOVR	• Ephemeral drainages may pose drainage issues with design and may support sensitive biological resources • Site drains toward Warden lake, a tributary of Los Osos Creek • Los Osos fault may be present • Northerly portion of site (Warden Lake area) is subject to flooding • Subject to agricultural preserve • Requires access over intervening properties
Gorby	51.7	Irregularly-shaped lot located south of LOVR adjacent to the east side of Los Osos Creek; southerly half of the site slopes upward into the foothills of the Irish Hills and contains native vegetation; the north-westerly portion is level and contains a dwelling and equestrian facilities that include horse paddocks and riding areas. Several ornamental trees occupy the northwesterly portion of the site; level buildable portion of the site is triangular and consists of about 20 – 25 acres.	• Two lane dirt road provides access to LOVR opposite Lariat Drive • No public water supply • Electricity?	• Site is about two- thirds mile from LOVR and marginally visible to passing motorists • Shape of lot and intervening vegetation may help reduce prominence of buildings	• Buildable area of the site (about 6 - 8 acres) is sufficient to accommodate some of the treatment technologies • May be accessible from LOVR • Less visible from LOVR	• Los Osos fault may be present • Los Osos creek is subject to flooding • Buildable area is Class I agricultural land and subject to agricultural preserve unless currently developed area used (6 - 8 acres) • Sensitive receptors to the west of creek • Vehicle speeds on LOVR are high in this area, which would likely require channelization (west-bound left turn lane, east-bound deceleration lane) for vehicle access; Creek and upland area support sensitive biological resources • Known unwilling seller

Property	Acre-age	Description/ Topography	Access to Infrastructure	Visual Resources	Advantages	Disadvantages
Robbins 1	41.1	Mostly rectangular-shaped lot abutting the north side of LOVR east of Clark Valley Road; site contains at least one dwelling and slopes to the north toward Warden Lake; large mature trees surround the farm buildings; site may be used for grazing; buildable portion of the site is about 30 acres.	• Site abuts LOVR • No public water supply • Electricity?	• Site is adjacent to LOVR, and would be fairly visible to passing motorists • Gently sloping terrain may help reduce apparent height /prominence of buildings	• Effective size of the site (about 30 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal • Directly accessible from LOVR • No known private easement constraints or archaeological resources • Topography may allow for screening from LOVR • Less prime farm land, no LCA contract • More removed from receptors and visibility from LOVR	• Site drains toward Warden lake, a tributary of Los Osos Creek • Los Osos fault may be present • Northerly portion of site (Warden lake area) is subject to flooding • Vehicle speeds on LOVR are high in this area, which would likely require channelization (east-bound left turn lane, west-bound deceleration lane) for vehicle access • Furthest property east of service area
Robbins 2	43.5	Mostly rectangular-shaped lot abutting the north side of LOVR east of Clark Valley Road; site slopes to the north toward Warden Lake; site may be used for grazing; buildable portion of the site is about 35 acres.	• Site abuts LOVR • No public water supply • Electricity?	• Site is adjacent to LOVR, and would be fairly visible to passing motorists • Gently sloping terrain may help reduce apparent height /prominence of buildings	• Effective size of the site (about 35 acres) is sufficient to accommodate a wide range of treatment technologies and on-site disposal • Directly accessible from LOVR • No known private easement constraints or archaeological resources • Topography may allow for screening from LOVR • Less prime farm land, no LCA contract • More removed from receptors and visibility from LOVR	• Less level than other sites; undulating topography. Site drains toward Warden lake, a tributary of Los Osos Creek • Los Osos fault may be present • Northerly portion of site (Warden lake area) is subject to flooding • Vehicle speeds on LOVR are high in this area, which would likely require channelization (east-bound left turn lane, west-bound deceleration lane) for vehicle access • Second furthest property east of service area

COLLECTION SYSTEM ALTERNATIVES

Septic Tank Effluent Pumping/Septic Tank Effluent Gravity (STEP/STEG) Collection System

A STEP/STEG collection system retains the use of septic tanks. The septic tanks serve to settle solids and provide a primary level of treatment. The effluent from the tanks is conveyed to an in-street collection system via pumping (STEP system) or gravity (STEG system) through small diameter pipes. The in-street collection system also has relatively small diameter pipes because the waste stream is relatively free of solids. STEP/STEG wastewater lacks any dissolved oxygen (anaerobic).

Combined Gravity, Vacuum, and Low Pressure Collection System

The combined system consists of;

gravity - (system uses gravity to move waste to the treatment facility)

vacuum - (relies on gravity only to move wastewater from homes to a vacuum valve pit package and then use a pressure differential, instead of gravity, to move wastewater to a vacuum station and on to the treatment plant)

low pressure – (individual sumps that collect waste and contain a grinder pump at each customer location)

collection systems depending on the localized topography throughout the system. The combined system allows for optimization of construction and operation and maintenance costs as compared to a dedicated system. The previous designed gravity system would serve as the starting point for this option. Vacuum and low pressure would be incorporated in locations where topography, groundwater, or other site-specific conditions dictate.

Collection System Alternatives
Los Osos Wastewater Project Development
San Luis Obispo County

Collection System	Advantages	Disadvantages	Operations & Maintenance Issues
STEP/STEG	• May utilizes existing septic systems if in acceptable condition (no off-site pump stations required) • Shallow excavation for pipe installation • Small pipes and no manholes • Minimal I/I	• Significant infrastructure and construction disturbance to individual properties (septic tanks are typically replaced because of I&I and previous studies have estimated 85 to 100% of tanks to be replaced) • Dedicated power supply required at individual properties • Limited hydraulic capacity	• Recurring disturbance to inspect and maintain septic tanks and pumps on individual properties (Blanket easement likely required) • Increased septage handling • Privatization option may reduce costs • RWQCB may impose monitoring system and additional maintenance requirements not accounted for in previous studies/estimates
Combined (Gravity/Vacuum/Low Pressure)	• Can optimize technology for localized conditions • Previously designed gravity system serves as design basis	• Similar to individual collection systems • Non-uniformity of design and construction	• Multiple techniques required to operate and maintain system

SUMMARY AND RECOMMENDATIONS

MATRIX OF POTENTIALLY VIABLE PROJECT COMPONENTS

<table>
<tr><th colspan="5">Matrix of Potentially Viable Project Components
Los Osos Wastewater Project Development
San Luis Obispo County</th></tr>
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• Percolation
• Spray Fields
• Agricultural Reuse
• Urban Reuse
• Constructed Wetlands</td><td>• Cemetery
• Giacomazzi
• Andre 2
• Morosin/FEA
• Branin
• Gorby (LOVE Farm)
• Robbins 1
• Robbins 2</td><td rowspan="4">• Recycling of Digested/ Composted Class A Biosolids
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• Hauling of Digested Class B Biosolids
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• Hauling of Sub-Class B Dewatered Biosolids</td><td rowspan="4">• STEP/STEG
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• Robbins 1
• Robbins 2</td><td>• Recycling of Digested /Composted Class A Biosolids
• Hauling of Digested Class B Biosolids</td><td>• STEP/STEG
• Gravity/ Vacuum/ Low Pressure Combination</td></tr>
</table>

Matrix of Potentially Viable Project Components
Los Osos Wastewater Project Development
San Luis Obispo County

Potential Treatment Process	Potential Reuse/Disposal Alternatives	Potential Siting Alternatives	Potential Solids Disposal Alternatives	Potential Collection System Alternatives
Partially Mixed Facultative Ponds	• ~~Leach Fields~~ • ~~Percolation~~ • Spray Fields (?) • Agricultural Reuse(?) • Urban Reuse (?) • ~~Constructed Wetlands~~	• Cemetery • Giacomazzi • ~~Andre 2~~ • Morosin/FEA • Branin • ~~Gorby (LOVE Farm)~~ • Robbins 1 • Robbins 2	• Mobile/ Temporary Facilities (as required)	• STEP/STEG Gravity/ Vacuum/ Low Pressure Combination