

Appendix P: Alternatives Information

P-1: Alternative Components

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Los Osos EIR Technical Memorandum 2.1 : Alternative Components

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Section 1: Introduction

The objective of this Technical Memorandum (Tech Memo) is to compile descriptions of alternative project components for potential projects that are to be evaluated in the Draft Environmental Impact Report (DEIR). This Tech Memo includes a summary of the criteria to be used in evaluating the alternative components; the evaluation will be documented in Tech Memo 2.2.

Section 2: Review of Existing Documentation

The development of alternative project components has been based on a review of documentation considered to be relevant and offering valuable technical information on the alternative components identified in the Rough Screening Analysis report (Carollo, March 2007). These alternative components were also identified in Table 1.1 of the Fine Screening Analysis (Carollo, August 2007), which is referenced in this Tech Memo as the FSR.

Research efforts included the following activities:

- Review of the Rough Screening Analysis report and the FSR.
- Site visit in February 2008 with San Luis Obispo (SLO) County representatives to review candidate sites for treatment facilities and to observe site conditions for collection system and conveyance system construction.
- Review of selected documentation identified in the table entitled “Past Project Documents (County pre-1998 efforts and LOCSD efforts)”, accessible via the SLO County Los Osos Wastewater Project (LOWWP) online document library (SLO County, 2008). This table is provided as an attachment to this Tech Memo. Documents reviewed as part of this activity included the following (more complete report titles are listed in the attached table):
 - Ripley Pacific: LO WW Management Plan Update, December 2006
 - Ripley Pacific: LO WW Management Plan Update, August 2006
 - Ripley Pacific: LO WW Management Plan Update, July 2006
 - National Water Research Institute (NWRI): Final Report - Review of LO WW Management Plan Update, December 2006
 - Cleath & Associates: LO Upper Aquifer Water Quality Characterization, June 2006
 - Cleath & Associates: Sea Water Intrusion and Lower Aquifer Source Investigation of the LO Valley GW Basin (Draft Final), July 2005
 - Cleath & Associates: LO Nitrate Monitoring Program, April 2005 Monitoring, June 2005.
 - Crawford, Multari & Clark (CM&C): Los Osos Habitat Conservation Plan (Draft), February 2005
 - Fugro West: Pavement Evaluation Report, January 2005
 - SLO County: Estero Area Plan (Draft Submittal), November 2004
 - California Coastal Commission: Staff Report and Coastal Development Permit, August 2004
 - Cleath & Associates: Nitrate Monitoring Report, June-July 2002, November 2002.
 - Wallace Group: LOCSD Master Plan, August 2002
 - Montgomery Watson Harza (MWH): Report of Waste Discharge for LO WW Project, June 2002
 - LOCSD: Standard Plans and Specs, April 2001
 - MWH: WW Facilities Project Final Report, March 2001
 - CM&C: Final EIR for LOCSD WW Facilities Project, March 2001
 - Wallace Group: LOCSD Urban Water Management Plan, December 2000
 - CM&C: Draft EIR for the LOCSD Los Osos WW Facilities Project”, November, 2000
 - URS: Baseline Report of the LO Valley GW Basin, August 2000

- Oswald Engineering: WW Facilities Project Draft Project Report, January 2000
 - State Water Resources Control Board (SWQCB): Policy for implementing the State Revolving Loan Fund for construction of WW treatment facilities, June 1998
 - Questa Engineering: Draft Comprehensive Comparative Analysis of WW Treatment Plans for LO, May 1998.
 - Metcalf & Eddy (M&E): Evaluation of Effluent Disposal, November 1997
 - Solutions Group: Comprehensive Resources Management Plan, November 1997
 - Fugro West: Final EIR Supplement, February 1997
 - M&E: Final LO WW Project Tech Memos, August 1996
 - Fugro West: LO Sewer, Alternative Treatment Facilities Sites Constraints Study, July 1996
 - M&E: LO WW Study Task G – Report on Detailed Evaluation of Alternatives, July 1995
 - M&E: LO WW Study Task F – Report on Sanitary Survey and Nitrate Source, March 1995
 - USGS: Hydrogeology and Water Resources of the LO Valley GW Basin, 1988
 - Engineering Science: Draft Phase 1 Sewerage Planning Study, May 1986
 - Regional Water Quality Control Board (RWQCB): Resolution 84-13, January 1984
 - RWQCB: Staff Report for Resolution 83-13 – Basin Plan Amendment, January 1984
 - RWQCB: Memo on Resolution 83-13 – Basin Plan Amendment, September 1983
 - RWQCB: Staff Report for Resolution 83-13 – Basin Plan Amendment, September 1983
 - Brown & Caldwell: Phase 1 Water Quality Management Study, April 1983
 - SWQCB: Geohydrology and Water Quality Baywood – LO GW Basin, October 1979
 - California Department of Water Resources (CA DWR): LO- Groundwater Protection Study, October 1973.
- Review of other recently produced documents, including:

Tech Memos prepared by Carollo Engineers (Out of Town Conveyance, Regional Treatment, On Site Systems, Low Pressure Collection System, Greenhouse Gas, Ponds, Imported Water, Reuse Disposal, Septage, Solids Handling, Decentralized Treatment, Flows and Loads))

- Technical Action Committee (TAC) summary memos (April 2007 through August 2007)
- Preliminary Geotechnical Report prepared by Fugro West (July 2007)
- Lombardo Associates Decentralized Scenarios (May 2008)

Section 3: Summary Descriptions

The following are summary descriptions of the alternative project components. Alternative components are grouped as follows, in accordance with Table 1.1 of the FSR:

- Wastewater Treatment Process Alternatives
- Effluent Disposal/Reuse Alternatives
- Candidate Siting Alternatives
- Biosolids Disposal Alternatives
- Collection System Alternatives

3.1 Wastewater Treatment Process Alternatives

Membrane Bio-Reactor (MBR): MBR systems consist of a biological reactor (bioreactor) with suspended biomass and solids separation by microfiltration membranes (with nominal pore sizes ranging from 0.1 to 0.4 μm). MBR systems may be used with aerobic or anaerobic suspended growth bioreactors to separate treated wastewater from the active biomass. The concept of MBR systems consists of utilizing a bioreactor and microfiltration as one unit process for wastewater treatment thereby replacing, and in some cases supplementing, the solids separation function of secondary clarification and effluent filtration.

Extended Aeration: Conventional extended aeration systems typically consist of an aeration tank and secondary clarification. Settled wastewater and return activated sludge (RAS) enter the front end of the aeration tank and are mixed by diffused air or mechanical aeration. The extended aeration process operates in the endogenous respiration phase of the growth curve, which requires a low organic loading and long aeration time; aeration equipment design is controlled by mixing needs and not oxygen demand. This process is used extensively for pre-engineered plants for small communities. Generally, primary clarification is not used, and secondary clarifiers are designed for lower hydraulic loading rates than conventional activated sludge clarifiers to better handle large flow rate variations typical of small communities. Lower hydraulic loading rates are also preferred for the secondary clarifiers for small (less than 2,500 gallons per day dry weather capacity) community systems, which characteristically handle poor-settling activated sludge. Although the biosolids are well stabilized, additional biosolids stabilization is required to allow for beneficial reuse.

Sequencing Batch Reactor (SBR): The SBR is a fill-and-draw type of reactor in which all steps of the activated-sludge process occur. For municipal wastewater treatment with continuous flow, at least 2 basins are used so that one basin is in the fill mode while the other goes through aeration, solids settling, and effluent withdrawal. An SBR goes through a number of cycles per day; a typical cycle may consist of 3-hours fill, 2-hours aeration, 0.5-hours settle, and 0.5-hours for withdrawal of supernatant. An idle step may also be included to provide flexibility at high flows. Mixed liquor remains in the reactor during all cycles, thereby eliminating the need for separate secondary sedimentation tanks. Decanting of supernatant is accomplished by either fixed or floating decanter mechanisms. Aeration may be accomplished by jet aerators or coarse bubble diffusers with submerged mixers; separate mixing provides operating flexibility and is useful during the fill period for anoxic operation. Sludge wasting occurs normally during the aeration period.

Oxidation Ditch: The oxidation ditch consists of a ring or oval shaped channel equipped with mechanical aeration and mixing devices. Screened wastewater enters the channel and is

combined with the RAS. The tank configuration, aeration system, and mixing devices promote unidirectional channel flow, so that the energy used for aeration is sufficient to provide mixing in a system with a relatively long hydraulic retention time. The aeration/mixing method used creates a velocity from 0.25-0.30 m/s in the channel, which is sufficient to keep the activated sludge in suspension. At these channel velocities, the mixed liquor completes a tank circulation in 5-15 min, and the magnitude of the channel flow is such that it can dilute the influent wastewater flow by a factor of 20-30. As a result, the process kinetics approaches that of a complete-mix reactor, but with plug flow along the channels. The long solids retention times (SRTs) and large tank volumes provide for nitrification. As the wastewater leaves the aeration zone, the dissolved oxygen (DO) concentration decreases and denitrification may occur. Brush-type or surface-type mechanical aerators are used for mixing and aeration. Secondary sedimentation tanks are used for most applications, and in some cases intra-channel clarifiers have been used.

Biolac® Extended Aeration: Biolac is a proprietary process that combines long solids retention times with submerged aeration in lined earthen basins. Fine bubble membrane diffusers are attached to floating aeration chains that are moved across the basin by the air released from the diffusers. Aeration basins are typically 2.4 to 4.6 meters deep. The process can be designed for nitrification since the SRT ranges from 40 to 70 days. A variation of the standard process, known as “wave oxidation modification”, allows biological nitrification and denitrification to occur simultaneously by using timers to cycle the air flowrate to each aeration chain. Either an internal or external clarifier can be used.

Trickling Filter Solids Contact (TF/SC): The TF/SC system utilizes a trickling filter (with either rock or plastic media), an aerated sludge contact tank, and a final clarifier designed for a separate flocculation zone and a sedimentation zone. The trickling filter effluent is fed directly to the activated sludge process without clarification and the return activated sludge from the secondary clarifier is fed to the activated sludge aeration basin. There is a return-sludge aeration tank and flocculating center-feed well for the clarifier. A relatively low organic load for the trickling filter is used for the TF/SC process, and the purpose of the aeration tank is to remove remaining soluble biological oxygen demand (BOD) and to develop an activated-sludge flocculent mass that incorporates dispersed solids from trickling filter sloughing.

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. Mixing must not be so great as to prevent the settling of solids for both sedimentation and for facultative and anaerobic degradation.

3.2 Effluent Disposal/Reuse Alternatives

Leach Fields: Leach field disposal is the practice of distributing water through buried perforated piping systems. Effluent disposal through leach fields is not dependent on weather conditions, and does not require uniform discharge rates throughout the year. In this case, more effluent could be disposed in the winter using this method if less is disposed in the summer when agricultural reuse and sprayfields can be used. This asymmetrical disposal approach is possible

as long as the instantaneous application rate does not exceed the leachfield design capacity and the annual total does not exceed the annual hydraulic loading capacity for the site. The leachfield design capacity and annual site hydraulic loading capacity are separate site parameters. A site previously chosen for leachfields is the Broderson site, south of Los Osos Valley Road (LOVR), near Broderson Avenue. The Broderson site is an 80-acre site, of which approximately eight acres has been made available for effluent disposal.

Percolation: Percolation ponds are open reservoirs in which effluent is stored and percolated into the ground. The pond bottoms are managed to maintain percolation rates by drying, ripping, and conditioning the soils. This strategy functions best for sites with permeable soils and sufficient depth to groundwater to maintain sufficient separation between the pond bottoms at the highest historical groundwater surface elevation.

Spray Fields: Spray field disposal is the practice of spraying effluent on the ground surface to dispose of the water through evapotranspiration and percolation. While grasses are grown on sprayfields, no particular crop is grown for harvesting. Sprayfield disposal typically requires secondary treatment with disinfection. The Tonini site has been identified as a candidate location for spray fields.

Agricultural Reuse: Agricultural reuse consists of using treated secondary or tertiary effluent to irrigate agricultural crops. The agricultural land irrigated with recycled water can be managed to maximize disposal of water by increasing the crop density and/or planting crops with high evapotranspiration potential, such as grasses for forage that can be irrigated year-round.

Urban Reuse: Urban reuse consists of using tertiary treated, disinfected effluent to irrigate lawns and ornamental plants.

Constructed Wetlands: Effluent disposal using constructed wetlands would create habitat as well as recreational and aesthetic benefits for the community. Wetlands are considered primarily as a storage device. However, disposal through evapotranspiration could also occur. Constructed wetlands typically operate at depths of 1 to 5 feet, and areas of both vegetation and open water allow for different types of habitat.

Conservation: Conservation of water could be a component of an effluent disposal alternative. As an example, installing low-volume flush toilets would lessen the amount of total effluent that would need to be disposed of via other methods.

3.3 Candidate Siting Alternatives

The following candidate sites can be located and viewed using the provided APN number on the interactive GIS map maintained by SLO County:
<http://www.sloplanning-maps.org/ed.asp?bhcp=1>

Figure 1: Summarizes the locations of the proposed treatment plant sites considered for the LOWWP.

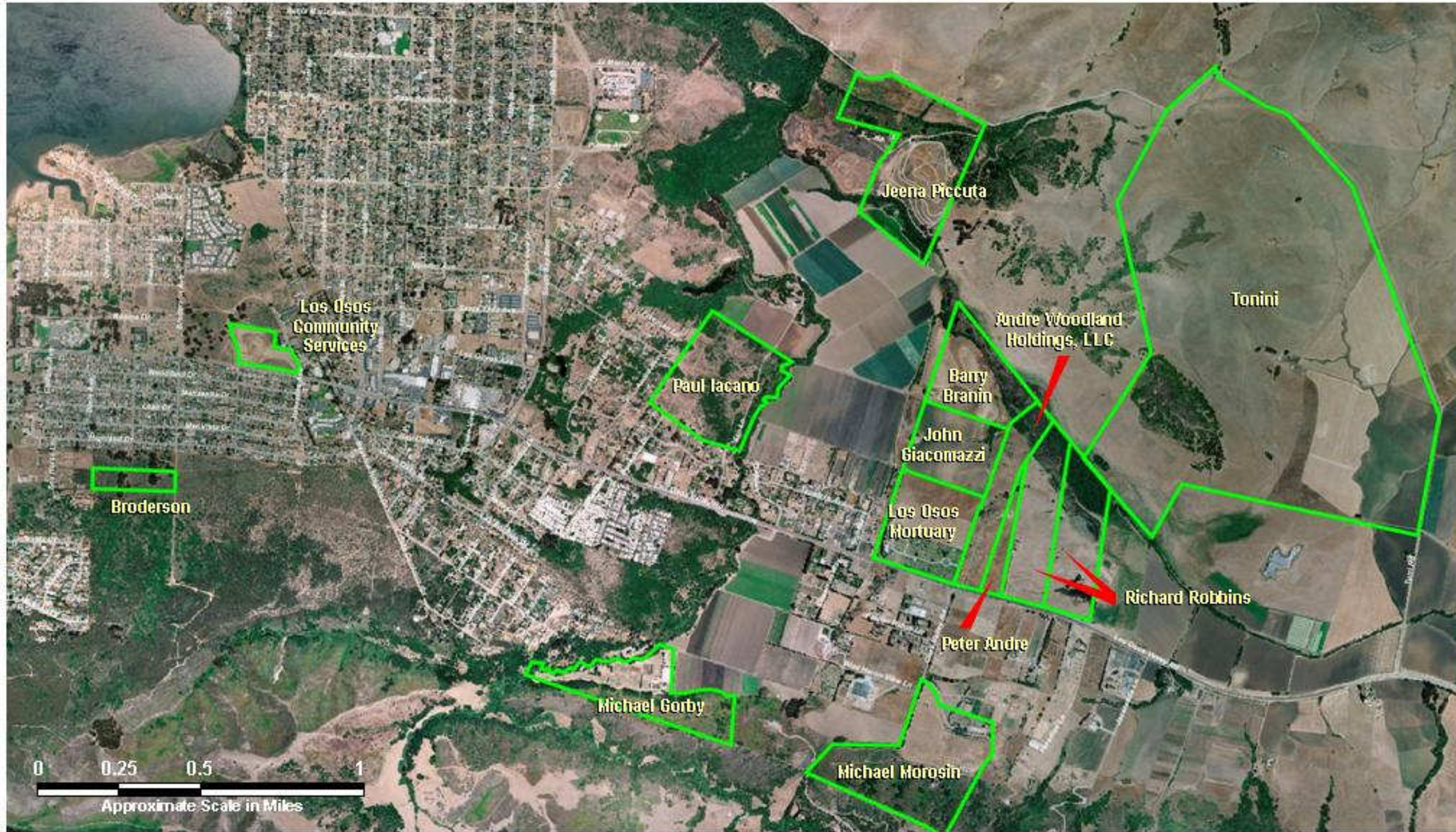


Figure TM 2.1

Project Site Locations

Los Osos Wastewater Project EIR

Mid-Town (APN 074-229-017); approximate acreage 11.7 ac: The Mid-Town site was the location for the previously proposed treatment plant for the 2001 wastewater project. Mid-Town has been identified as the preferred in-town site for locating a wastewater treatment facility. This site is located next the Los Osos Community Services District off LOVR in town. The site is known to be shoulder-banded snail habitat.

Cemetery (APN 074-222-014); approximate acreage 48.1 ac: The Cemetery site is a rectangular parcel, and approximately 22 acres are considered to be buildable. The southerly third of the site is used for a cemetery. Approximately 7 acres in the northwest corner is cultivated with row crops, with the remainder fallow. The site slopes to the north and to the west to a dirt road that provides access to surrounding farming operations. There are no trees or other natural features.

Giacomazzi (APN 067-011-022); approximate acreage 37.1 ac: The Giacomazzi site is a rectangular parcel that slopes to the north and east toward an ephemeral drainage that extends along the easterly portion of the site to Warden Lake (offsite). The level areas on the site have been cultivated with row crops, and the buildable portion of the site is approximately 20 acres.

Andre 2 (APN 067-031-011); approximate acreage 9.87 ac: The Andre 2 site is a narrow, triangular shaped parcel bordering LOVR. The site slopes to the north. There is one small building located on the site, and access is provided from the adjacent parcel in common ownership. There is one group of large trees that follows an ephemeral drainage that crosses the northerly portion of the site. The usable portion of the site is approximately 9 acres, but the narrow triangular shape limits development flexibility.

Iacono (APN 074-222-013); approximate acreage 65.3 ac: The Iacono site is a large polygon-shaped parcel north of LOVR. The site is situated between an established neighborhood and agricultural land. There are multiple biological resources on-site that may constrain development: trees, drainages, wetlands, and habitat for endangered species. The usable portion of the site is limited and would be challenging to access.

Morosin/FEA (APN 067-171-084); approximate acreage 81.2 ac: The Morosin/FEA site is an irregularly shaped parcel located south of LOVR on the east side of Clark Valley Road at the base of the Irish Hills. The southerly half of the site slopes upwards into the foothills and is covered of native vegetation. The northerly half of the site is relatively flat and has been cultivated with row crops. The site contains a church with parking and an access road on a small knoll on the northerly border of the site. There is a cluster of agriculture-related buildings located at the base of the foothills, with a water tank located approximately 100 meters upslope from the agriculture buildings. The useable acreage of the site is approximately 35 acres.

Branin (APN 067-011-020); approximate acreage 42.2 ac: The Branin site is an irregularly shaped lot north of LOVR and adjacent to Warden Lake which consists of native wetland and riparian vegetation. The site slopes to the north toward Warden Lake and contains two ephemeral drainages. The useable portion of the site appears to be periodically cultivated and consists of 15-25 acres.

Gorby (APN 074-225-009); approximate acreage 51.7 ac: The Gorby site is an irregularly shaped lot located south of LOVR adjacent to the east side of Los Osos Creek. The southern 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. The level, buildable portion of the site is triangular and consists of approximately 20-25 acres.

Robbins 1 (APN 067-031-037); approximate acreage 41.1 ac: The Robbins 1 site is a mostly rectangular-shaped lot abutting the north side of LOVR east of Clark Valley Road. The site contains at least one dwelling and slopes to the north toward Warden Lake. Large mature trees surround the farm buildings, and the site is periodically used for grazing. The buildable portion of the site is approximately 30 acres.

Robbins 2 (APN 067-031-038); approximate acreage 43.5: The Robbins 2 site is a mostly rectangular shaped lot abutting the north side of LOVR and east of Clark Valley Road. The site slopes to the north toward Warden Lake, and is periodically used for grazing. The buildable portion of the site is approximately 35 acres.

Turri Road (APN 067-011-047); approximate acreage 87.4 ac: The Turri Road site is located towards the north end of Los Osos on Turri Road. There are steep slopes, trees, and wetlands and drainages located on the site. Approximately 20 acres in the southwest portion of the site, consisting mostly of agricultural land with less than 10% slope, is considered buildable.

Tonini Site (APN 067-031-001); approximate total acreage 400 ac: The Tonini site is located the furthest from Los Osos near the intersection of LOVR and Turri Road. It encompasses mostly agricultural land, some of which is considered prime agricultural land. There are multiple drainages and other natural features located on-site. The Tonini site has been identified as a candidate site effluent disposal. This site has also been identified as potential location for a wastewater treatment facility. Approximately 180 acres of this 400-acre site was identified for use as sprayfields. Within the 180 acres, the possibility for wetlands have been identified, and the need for a wetlands delineation has been defined. The buildable area on this site has yet to be determined.

3.4 Biosolids Disposal Alternatives

3.4.1 Recycling of Digested/Composted Class A Biosolids

US Code of Federal Regulations Title 40, Part 503, (40 CFR Part 503), Subpart D identifies different levels of pathogen concentrations in treated biosolids: Class A and Class B. Biosolids with levels of pathogens (i.e., *Salmonella sp.* bacteria, enteric viruses, and viable helminth ova) that are below detectable levels are referred to as "Class A". (USEPA, 1994) Class A biosolids may be produced through digestion, composting, and/or drying.

Conventional mesophilic anaerobic digestion typically produces biosolids with Class B pathogen levels, which are higher than Class A (see below). Subsequent treatment, such as composting or drying, is used to reduce pathogen levels in the digested solids to Class A levels. Successful digestion requires well-trained staff to maintain a well-operated process, which involves consistent and careful attention to operational parameters. Anaerobic digestion typically makes economic sense for facilities with average dry weather flows starting at 5 MGD.

Class A biosolids are characterized in 40 CFR Part 503 as "Exceptional Quality" (EQ), which indicates biosolids have been treated to levels that "meet low-pollutant and Class A pathogen reduction (virtually absence of pathogens) limits and that have a reduced level of degradable compounds that attract vectors." (USEPA, 1994) With treatment to reduce metals concentrations so requirements for land disposal are satisfied, Class A "biosolids are

considered a product that is virtually unregulated for use, whether used in bulk, or sold or given away in bags or other containers.” (USEPA, 1994). Recycling or reuse of EQ biosolids provides an opportunity to reduce hauling costs and the associated carbon footprint associated with hauling biosolids for land application or disposal.

3.4.2 Recycling of Composted Class A Biosolids

Composting is a recognized method for on-site production of Class A biosolids. In the absence of a digestion process, sludge to be composted must be dewatered through mechanical means or through drying; mechanical systems, such as belt or screw presses, are typically used because of the reduced area requirement for the mechanical system over a pond-based or bed-based drying system. Composting involves four main steps:

- Pre-processing: conditioning dewatered solids with wood chips or similar materials
- Composting: use of vessels or windrows to promote the degradation of organic residues and neutralization of pathogens. This process step involves high heat, up to 160°F; much of the stabilization of the biosolids occurs during this stage (Metcalf & Eddy, 2003)
- Curing: use of piles and/or windrows to allow the temperature of biosolids to decline and results in additional stabilization
- Post-processing: involves removal of residual inorganics (e.g., metal and plastic refuse) and preparation for disposal or reuse, such as transfer of biosolids into bags or other containers for use in the community by municipalities and/or residents.

3.4.3 Hauling of Digested Class B Biosolids

Biosolids are identified in 40 CFR Part 503, Subpart D, as “Class B” if pathogens are detectable but at levels that do not pose a threat to public health and the environment provided measures are taken to prevent exposure to the biosolids after disposal. (USEPA, 1994)

Anaerobic digestion is one of the most common technologies for producing a Class B biosolids on-site. As noted above, digestion requires a high level of operations and maintenance to be effective, and proper conditioning and heating of the incoming sludge is necessary to ensure effective digestion.

Hauling of digested Class B biosolids is one of the most common methods of offsite disposal. This approach to disposal is subject to variable fuel costs and tipping fees at the disposal site. Tipping fees are typically based on wet weight, making the effectiveness of solids dewatering a major focus of the treatment operation. Dewatering is typically accomplished using mechanical dewatering equipment (e.g., belt or screw presses, centrifuges); mechanical systems achieve solids concentrations ranging from 15% to 25%. Mechanical dewatering is occasionally supplemented or replaced by drying systems (ponds, beds, or mechanical drying systems), with the goal of reaching concentrations of at least 50% solids prior to hauling.

3.4.4 Hauling of Composted Class B Biosolids

Under a scenario involving hauling of composted biosolids, the composting process would be managed to achieve Class B pathogen concentrations. As described above, dewatering sludge prior to composting would be necessary, and the method for dewatering would involve either mechanical or drying systems. The dewatered sludge would then be transferred to an onsite composting location to undergo pathogen and vector reduction to achieve Class B status prior to hauling.

Hauling under this scenario is subject to the same issues of variable fuel costs and tipping fees as identified for hauling of digested Class B solids.

3.4.5 Hauling of Sub-Class B Dewatered Biosolids:

Sub-Class B biosolids start as waste sludge taken directly from the final liquid treatment process (e.g., secondary clarifier). The waste sludge is not subjected to further stabilization (i.e., no digestion or composting). Sub-Class B biosolids contain pathogen concentrations greater than Class B levels. A scenario involving hauling sub-Class B biosolids requires fewer onsite biosolids management facilities (e.g., no digestion or composting facilities), but this approach could result in increased disposal costs over a Class B hauling scenario. Sub-Class B biosolids cannot be directly land applied and must first be processed further at an offsite receiving facility. Some of these facilities are implementing drying systems to process the bulk sludge deliveries. Receiving facilities charge a premium for receiving sub-Class B biosolids. As in the case of the Class B biosolids scenarios, the LOWWP onsite facility would include dewatering equipment consisting of mechanical or drying systems to reduce the water content of the sludge to be hauled off for stabilization.

3.5 Collection System Alternatives

Conventional Gravity Collection System (GS): GS systems are the most common wastewater collection systems; this type of system is also referenced as a solids-handling (SH) system. These systems utilize gravity to transport wastewater to final treatment facilities and/or pump stations. They consist of gravity sewer lines with a minimum diameter of 6- or 8-inches and manholes at change of grade or direction, or at intervals of approximately 350 feet. GS systems convey both solids and liquids. A conventional gravity system requires lift stations and pump stations to move sewage to a treatment plant site.

Septic Tank Effluent Pumping System (STEP): STEP systems convey septic tank effluent (STE) only; they do not convey solids. They utilize septic tanks at individual service connections to retain the solids. STEP systems use pumps at each septic tank to pressurize the collection system and convey the STE to a main pump station or treatment facility. The collector lines are small diameter (2- to 4-inch) that feed into larger interceptors.

Septic Tank Effluent Gravity System (STEG): STEG systems are similar to STEP systems, but do not have individual pumps at each septic tank; conveyance is by gravity. However, since solids are not conveyed, pipe diameters are smaller than for GS systems and manholes are not used in the system.

Vacuum System (VS): VS systems rely on vacuum stations to create a collection system that operates under a vacuum. There is a vacuum/interface valve and small retention facility at each service connection that opens when the retention facility is full and allows the solids and liquids to be conveyed to the main vacuum station. VS systems are closed systems where the pipes can follow the natural grade and can be smaller diameter than in GS systems.

Low Pressure Collection System (LPCS): LPCS utilize individual grinder pumps at each connection that grind up solids and convey the resulting slurry to a treatment site or pump station. LPCS are similar in design and operation to STEP systems, except that no individual septic tanks are used and both solids and liquids are conveyed for treatment.

Section 4: Criteria Development

One of the objectives of the current Tech Memo is to identify the criteria that will be used in the subsequent analyses for screening the alternative project components. The resulting subset of components will be used to define the project alternatives that will be analyzed in the DEIR.

The criteria to be used in evaluating alternative components are based on the LOWWP project objectives. These objectives were developed to address the major issues that are driving the LOWWP. The project objectives are as follows:

1. Alleviate groundwater contamination – primarily nitrates;
2. Address the issues of water quality defined by the Regional Water Quality Control Board through its issuance of Waste Discharge Requirements (WDR) for discharge limits;
3. Mitigate impacts of the LOWWP on water supply and saltwater intrusion. Further, the wastewater project will maintain the widest possible options for beneficial reuse of treated effluent;
4. Minimize potential environmental impacts on the Los Osos community and surrounding areas;
5. Meet the project water quality requirements while minimizing life-cycle costs; and
6. Comply with applicable local, state, and federal permits, land uses, and other requirements, including the Local Coastal Plan, Environmentally Sensitive Habitat Areas (ESHA standards), State Marine Reserve, and archeological concerns.

Table 1 provides a summary description of the criteria to be used to conduct the screening evaluation of project components.

Table 1: Summary of Evaluation Criteria

Baseline Criteria	Sub-criteria	Comments
1. Water Balance	A. Salinity Management	Project must contribute to mitigation of saltwater intrusion into lower aquifer
	B. Groundwater Recharge	Project must contribute to recharging groundwater resources in lower aquifer
2. Water Quality	A. Meeting RWQCB requirements for WDR (discharge limits)	Project must be effective in meeting effluent discharge levels for: BOD, total suspended solids (TSS), nitrogen, viruses, and bacteria.
	B. Meeting RWQCB requirements for elimination of pollution to groundwater	Project must involve mitigation of potential effects of effluent discharge on domestic water wells.
	C. Addressing emerging contaminants: pharmaceutical and other constituents	Project is required to be consistent with EPA standards for emerging contaminants
3. Energy	A. Contributing to improvements in air quality	Project must demonstrate: <ul style="list-style-type: none"> • Minimizing particulate emissions • Effectiveness in minimizing release

Baseline Criteria	Sub-criteria	Comments
		of airborne pathogens, and exposure to vectors
	B. Promoting sustainability	Project must increase energy efficiency over conventional designs, reducing overall use of natural resources
	C. Reducing greenhouse gas emissions	Project must result in reduction of carbon footprint from conventional designs
4. Costs	A. Life Cycle Costs	Project must involve: <ul style="list-style-type: none"> • Efficient use of funds for capital improvements • Lowest feasible and practical operations and maintenance costs necessary to meet WDR discharge limits.
	B. Staffing Requirements	Project must minimize number of required management and staff positions.
	C. Community Acceptance	Includes consideration of: <ul style="list-style-type: none"> • Private property value • Aesthetics
5. Permittability	A. Coastal Permit	<ul style="list-style-type: none"> • Required for any work • Must be in compliance with the Local Coastal Plan (LCP)
	B. Endangered Species Habitat Areas (ESHA)	Includes considerations of what is permitted in the ESHA
	C. Environmental	Includes consideration of the following: <ul style="list-style-type: none"> • Endangered Species Protection Act Section 7 consultations with US Fish and Wildlife Service • Archaeology • Sensitive species/habitat • State Marine Reserve
	D. Land Uses	Includes: <ul style="list-style-type: none"> • No other feasible alternative for ESHA • Prime agricultural land • Siting of public utility facilities
	E. Engineering	Includes the following elements: <ul style="list-style-type: none"> • Health and Safety • Drainage • Noise • Odor • Traffic Trips • Operational Dependability

References

Carollo, August 2007; "Viable Project Alternatives: Fine Screening Analysis, Sal Luis Obispo County Los Osos Wastewater Project Development."; in association with Crawford, Multari & Clark, and Cleath & Associates. Final, August 2007.

Carollo, March 2007; "Potential Viable Project Alternatives: Rough Screening Analysis Report, Sal Luis Obispo County Los Osos Wastewater Project Development."; in association with Crawford, Multari & Clark, and Cleath & Associates. Final, March 2007.

Metcalf & Eddy, 2003; Wastewater Engineering, Treatment and Reuse. McGraw-Hill Companies, New York, NY. 2003.

San Luis Obispo County; 2008; Los Osos Wastewater Project online document library: <http://www.slocounty.ca.gov/PW/LOWWP/DOCS.htm>

USEPA, 1994; "A Plain English Guide to the EPA Part 503 Biosolids Rule"; EPA/832/R-93/003; September, 1994.

Appendix A: Past Project Documents

Past Project Documents (County pre-1998 efforts and LOCSD efforts)				
Date	Author	Title	Prepared For	Stored At
Dec. 18, 2006	Ripley Pacific	LO WW Management Plan Update; WW Collection, Treatment, Storage, and Water Recycling; Beneficial Reuse of Water and Nutrients Appendix A through H are Tech Memos # 1-8	LOCSD	Report: *online* App A-H: *online*
Dec. 4, 2006	NWRI	Final Report of the Panel Reviewing the LO WW Management Plan Update	LOCSD	*online*
Aug. 30, 2006	Ripley Pacific	LO WW Management Plan Update: Response to 86 Questions at Town Hall Meeting (draft)	LOCSD	*online*
June 2006	Cleath & Assoc.	Task 3 LO Upper Aquifer Water Quality Characterization	LOCSD	*online*
Dec., 2005	Cleath & Assoc.	LO Nitrate Monitoring Program, Oct 2005 GW Monitoring	LOCSD	LOCSD
October 2005	Cleath & Assoc.	Sea Water Intrusion and Lower Aquifer Source Investigation of the LO Valley GW Basin (Final)	LOCSD	LOCSD
July 2005	Cleath & Assoc.	Water Management Plan for the LO Valley GW Basin (Draft)	LOCSD	LOCSD
July 2005	Cleath & Assoc.	Sea Water Intrusion and Lower Aquifer Source Investigation of the LO Valley GW Basin (Draft Final)	LOCSD	*online*
June 2005	Cleath & Assoc.	LO Nitrate Monitoring Program, April 2005 GW Monitoring	LOCSD	*online*
June 2005	LOCSD	Fiscal Year 2005-2006 Budget	LOCSD	LOCSD
March 2005	LOCSD	Fiscal Year 2004-2005 Budget, Amended	LOCSD	LOCSD
Feb. 2005	CM&C	Los Osos Habitat Conservation Plan (Draft)	LOCSD	*online*
Jan., 2005	MWH	Construction of LO WW Project, Bid Forms (all areas)	LOCSD	LOCSD
Jan., 2005	Fugro West	Pavement Evaluation, LO Wastewater Project	LOCSD	*online*

Past Project Documents (County pre-1998 efforts and LOCSD efforts)				
Date	Author	Title	Prepared For	Stored At
Dec 2004	A.M. Peche & Assoc	2003-04 Summary Financial Information Statement	LOCSD	LOCSD
Nov. 2, 2004	SLO County	Estero Area Plan (Draft Submittal to Coastal Commission)	County, Coastal Comm.	*online* and County Planning
Nov 2004	Tuckfield & Assoc	WW Revenue Program- WW Facilities Project	LOCSD	LOCSD
Aug. 11, 2004	Coastal Comm.	Staff Report and Coastal Development Permit	LOCSD	*online* and County files
Aug 2004	P. Pike	Reporter's Transcript of Proceedings, Coastal Commission, 8/11/2004		LOCSD
July 2004	LOCSD	Fiscal Year 2004-2005 Budget	LOCSD	LOCSD
June 2004	Cleath & Assoc.	Report Addendum and Response to Comments for Simulated Effects of a Proposed Sewer Project on Nitrate Concentrations in the LO GW Basin (Yates and Williams, 2003)	LOCSD	LOCSD
June 2004	MWH	Disposition of Harvest Water	LOCSD	LOCSD
April 2004	P.Pike	Reporter's Transcript of Proceedings, Coastal Commission, 4/15/2004		LOCSD
Mar. 9, 2004	Fugro West	Geotechnical Report, LO WW Project (Vol. 1 & 2)	LOCSD	LOCSD
March 2004	Cleath & Assoc.	Nitrate Monitoring Program December 2003-January 2004	LOCSD	LOCSD
Dec., 2003	Far Western Group	Inventory & Evaluation of Historic Architectural Resources in LO – Draft	LOCSD	LOCSD
Nov. 6, 2003	Yates & Williams	Simulated Effects of a Proposed Sewer Project on Nitrate Concentrations in the LO GW Basin	LOCSD	LOCSD
Nov. 2003	Cleath & Assoc.	LO Nitrate Monitoring Program, Sept. 2003 GW Monitoring	LOCSD	LOCSD
Nov. 2003	Cleath & Assoc.	Geologic Structure of the LO Valley GW Basin	LOCSD	LOCSD
Sept., 2003	CIEDB	Financing Application	LOCSD	LOCSD
Aug., 2003	MWH	Area A/D & B/C 50% Design	LOCSD	LOCSD

Past Project Documents (County pre-1998 efforts and LOCSD efforts)				
Date	Author	Title	Prepared For	Stored At
		LOCSD Collection System		
July 2003	Cleath & Assoc.	Scenic Way Investigation with East Side WW Disposal (Draft)	LOCSD	LOCSD
June 2003	Grand Jury	2002-2003 SLO County Grand Jury Final Report	County	LOCSD
May 2003	Boyle Eng	LOWW Project – Value Engineering Report	LOCSD	LOCSD
April 2003	CM&C	Addendum to Final EIR	LOCSD	LOCSD
March 2003	MWH	LOWW Project, Revised Project Report, Design Documents	LOCSD	LOCSD and County Files
March 2003	Tuckfield & Assoc	Revenue/Rates Review & Evaluation	LOCSD	LOCSD
March 2003	Wallace Group	Storm Water Management Plan/Notice of Intent	LOCSD	LOCSD
Feb. 7, 2003	RWQCB	Waste Discharge/Recycled Water Requirements, Order No. R3-2003-0007	LOCSD	LOCSD and County Files
Feb., 2003	Citygate	Citygate Report – Final Edition	LOCSD	LOCSD
Feb., 2003	MWH	LOWW Project - Energy Evaluation–Standby Power	LOCSD	LOCSD
Feb., 2003	Cleath & Assoc.	Nitrate Monitoring Program Fall 2002	LOCSD	LOCSD
Dec., 2002	MWH	LO WW Project- Design Criteria	LOCSD	LOCSD
Dec., 2002	MWH	LO WW Project- Waste Water Loading	LOCSD	LOCSD
Nov. 2002	Cleath & Assoc.	LO Nitrate Monitoring Program, June-July 2002 GW Monitoring	LOCSD	*online*
Oct., 2002	CM&C	Lateral Study-Biological Resources & Mitigation	LOCSD	LOCSD
Sept. 2002	Cleath & Assoc.	GW Basin Management 2002 Model Update with MT3D	LOCSD	LOCSD
Aug. 2002	Wallace Group	LOCSD Water Master Plan	LOCSD	*online* and LOCSD
June 28, 2002	MWH	Report of Waste Discharge for the LO WW Project	LOCSD	*online*
May 2002	Royden Nakamura	Feasibility Study of a Successful Commercial Fish	LOCSD	LOCSD

Past Project Documents (County pre-1998 efforts and LOCSD efforts)				
Date	Author	Title	Prepared For	Stored At
	PhD	Farm in LO Valley		
Jan., 2002	SLO County	Growth Management Ordinance	County	LOCSD and County Planning
Dec., 2001	Dr. Kitts, et al.	Identifying the Sources of E. coli Contamination in Crassostrea gigas from the Morro Bay Estuary	LOCSD	LOCSD
Nov., 2001	LOCSD	LO Community Pool Grant Request	LOCSD	LOCSD
Nov., 2001	Natural Systems Intl.	LO Drainage Feasibility Report	LOCSD	LOCSD
Oct., 2001	Cleath & Assoc.	WW Disposal Sites Evaluation	LOCSD	?? LOCSD or Cleath & Assoc.
Aug., 2001	Weber Hayes	Site Investigation Report, Bear Valley Chevron		??
June 2001	Wallace Group	Amended Assessment Roll Part I	LOCSD	LOCSD
June 2001	Wallace Group	Amended Assessment Diagram part V	LOCSD	LOCSD
June 2001	Wallace Group	Amended Engineer's Report for the WW Assessment District No. 1	LOCSD	LOCSD
April 2001	LOCSD	LOWW Project, Request for Proposals	LOCSD	LOCSD
April 2001	LOCSD	Standard Plans & Specifications	LOCSD	*online*
Mar. 7, 2001	MWH	WW Facilities Project Final Report	LOCSD	*online* and LOCSD
Mar. 1, 2001	CM&C	Final EIR for LO CSD WW Facilities Project	LOCSD	*online*
March 2001	Wallace Group	Revenue Program Draft	LOCSD	LOCSD
2001	Sports Management Group	Los Osos Community Pool	LOCSD	LOCSD
2001	Sports Management Group	Los Osos Community Pool, Feasibility Study	LOCSD	LOCSD
Dec. 2000	Wallace Group	LOCSD Urban Water Management Plan	LOCSD	*online* and LOCSD
Nov. 2000	Cleath & Assoc.	Hydrogeological Investigation of the Broderson Site, Phase	LOCSD	LOCSD

Past Project Documents (County pre-1998 efforts and LOCSD efforts)				
Date	Author	Title	Prepared For	Stored At
		2—Impacts Assessment		
Nov., 2000	CM&C	Draft Environmental Impact Report	LOCSD	LOCSD
Nov., 2000	CM&C	Draft EIR - Appendix	LOCSD	LOCSD
Aug. 2000	URS	Baseline Report of the LO Valley GW Basin	LOCSD	*online*
Aug. 2000	URS	Management Scenario, LO Valley GW Basin	LOCSD	LOCSD
July 2000	Cleath & Assoc.	Hydrogeological Investigation of the Broderson Site (Reviewed)	LOCSD	Cleath & Assoc.
June 19, 2000	CFS Geotech	Geotechnical Report, LO WW Project	LOCSD	?? LOCSD or Cleath & Assoc.
Jan. 31, 2000	Oswald Eng	WW Facilities Project Draft Project Report	LOCSD	*online*
Jan 19, 2000	RWQCB	Comments on Draft Project Report (Jan. 19, 2000 letter)	LOCSD	RWQCB
Dec. 1998	County	Baywood GW Study, Fourth Quarter 1998	County	LOCSD
June 1998	SWQCB	Policy for Implementing The State Revolving Loan Fund for the Construction of Wastewater Treatment Facilities		*online*
May 21, 1998	Questa Eng.	Draft Comprehensive Comparative Analysis of WW Treatment Plans for LO	California Coastal Comm.	*online*
Dec. 1997	EDA & Morro Group	Preliminary Eng Evaluation, LO/Baywood Park Community Drainage Project		LOCSD
Nov. 21, 1997	Metcalf & Eddy	Evaluation of Effluent Disposal at the Proposed Broderson Recharge Site	County CSA 9	*online*
Nov. 1997	Solutions Group	Comprehensive Resource Management Plan		*online*
July 1997	Metcalf & Eddy	LO WW Project, 75% Collection System Design	County CSA 9	County Files and LOCSD
Feb. 28, 1997	Metcalf & Eddy	LO WW Project, 60% Design Engineer's Opinion of Probable Costs	County CSA 9	County files
Feb. 1997	Fugro West	Final EIR Supplement	County	*online*
Sept. 13,	Metcalf &	Water Discharge Report for	County	County files

Past Project Documents (County pre-1998 efforts and LOCSD efforts)				
Date	Author	Title	Prepared For	Stored At
1996	Eddy	LO WW Project (Draft)	CSA 9	
Sept. 1996	County	Baywood GW Study, Third Quarter 1996	County	County Utilities files
Aug. 30, 1996	Metcalf & Eddy	Final LO WW Project Tech Memos for Alt. Site, Treatment Process, Collection System, Pump Station, and Infiltration Basin Evaluation	County CSA 9	*online*
July 5, 1996	Fugro West	LO Sewer, Alternative Treatment Facilities Sites Constraints Study	County	*online*
Feb. 26, 1996	Metcalf & Eddy	Hydrogeological Evaluation of the Proposed Broderson Recharge Site	County Eng.	County files
July 1995	Metcalf & Eddy	LO WW Study Task G-Report on Detailed Evaluation of Alternatives	County CSA 9	*online* and County files
May 1995	Metcalf & Eddy	LO WW Study Report on Preliminary Screening of Alternative Technologies	County CSA 9	County files
Mar. 1995	Metcalf & Eddy	LO WW Study Task F-Report on Sanitary Survey and Nitrate Source	County CSA 9	*online* and County files
July 1994	CSA 9 TAC	Baywood-LO Soil and GW Nitrogen Study	County CSA 9	County Utilities files
Sept. 1993	Black & Veatch	Baywood-LO Soil and GW Nitrogen Study		County files
June 1992		LO Valley GW Basin Resource Capacity Study	County Planning	County Utilities files
June 1990	Morro Group	Freshwater Influences of Morro Bay		County files
Jan. 1990	Wallace Group	Engineer's Report for SLO County-LO/Baywood Assessment District	County CSA 9	County files
Dec. 5, 1989	County	Notice of Certification of Final EIR, NOD	County	County files
Sept. 1989	Morro Group	Final Supplemental EIR, CSA 9 WW Treatment Facilities	County CSA 9	County files
Sept., 1989	Boyle Eng	GW Treatment vs. Import Water Economics: Nitrate Removal		LOCSD
July 1989	CA DWR	Geohydrology and Management of LO Valley	County	County files

Past Project Documents (County pre-1998 efforts and LOCSD efforts)				
Date	Author	Title	Prepared For	Stored At
		GW Basin		
July, 1989	Metcalf & Eddy	Estimated Cost Update	County CSA 9	County files
1988	USGS	Hydrogeology and Water Resources of LO Valley GW Basin, Report 88-4081	County	*online* and County files
July 28, 1988	Boettcher & Co	Financing Analysis CSA 9 Sewage and Collection	County CSA 9	County files
Aug. 1987	RWQCB	Staff Report-Water Quality Data LO/Baywood	RWQCB	County files
Aug. 1987	Morro Group	Final EIR, CSA 9 WW Treatment Facilities	County CSA 9	LOCSD
May 1986	Eng. Science	Draft Phase 1 Sewerage Planning Study	County	*online*
July 18, 1985	Earth Systems/ Pacific Geoscien.	Investigation of Soils for Proposed LO WW Facility	County CSA 9	County files
Jan. 24, 1984	RWQCB	Resolution 84-13	RWQCB	*online*
Jan. 4, 1984	RWQCB	Staff Report for Resolution 83-13: Basin Plan Ammendment	RWQCB	*online*
Jan. 1984	Brown & Caldwell	Phase 2 Facilities Planning Study	County CSA 9	County files
Jan. 1984	Brown & Caldwell	Supplement to Phase 2 Facilities Planning Study Project Report and EIS	County CSA 9	County files
Sept. 27, 1983	RWQCB	Memo on Resolution 83-13: Basin Plan Ammendment	RWQCB	*online* and County files
Sept. 16, 1983	RWQCB	Staff Report for Resolution 83-12: Basin Plan Ammendment	RWQCB	*online*
April 1983	Brown & Caldwell	Phase 1 Water Quality Management Study	County CSA 9	*online* and County files
Oct. 1979	SWRCB	Geohydrology and Water Quality Baywood-LO GW Basin	SWRCB	*online*
Aug. 1979	CA DWR	Morro Bay Sandspit Investigations	County	County Utilities files
Oct. 1974	Brown & Caldwell	Preliminary Groundwater Basin Management Study	County CSA 9	County files
Oct. 1973	CA DWR	LO-Baywood Ground Water	CA DWR	*online* and

Past Project Documents (County pre-1998 efforts and LOCSD efforts)				
Date	Author	Title	Prepared For	Stored At
		Protection Study		County files
Feb. 1972	CA DWR	Sea Water Intrusion: Morro Bay Area, SLO County, Bulletin 63-6	County	County Utilities files

P-2: Evaluation of Component Alternatives

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Los Osos EIR Technical Memorandum 2.2: Evaluation of Component Alternatives

13 November 2008



WJ Project No. 0893003

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- Table 2: Summary of Evaluation Criteria

Section 1: Introduction

The objective of this Technical Memorandum (Tech Memo) is to summarize the evaluation of the alternative project components described in Tech Memo 2.1 and identify the project alternatives to be analyzed in the Draft Environmental Impact Report (DEIR). The evaluation has been conducted using the criteria defined in Tech Memo 2.1.

The goal of the Los Osos Wastewater Project (LOWWP) is a complete system that makes it possible for the community to meet consistently and cost effectively the effluent limits from the Waste Discharge Requirements (WDR) issued by the Regional Water Quality Control Board (RWQCB) for the LOWWP. The WDR effluent discharge limits are summarized in Table 1:

Table 1: Effluent and Recycled Water Limitations from Previous Waste Discharge Requirements (Order No. R3-2003-0007)

Effluent Limitations			
Constituent	Units	Monthly Average	Daily Maximum
Settleable Solids	mg/L	0.1	0.5
BOD*, 5-Day	mg/L	60	100
Suspended Solids	mg/L	60	100
Total Nitrogen (as N)	mg/L	7	10
Recycled Water Limitations			
BOD, 5-Day	mg/L	30	90
Suspended Solids	mg/L	30	90
Turbidity	NTU	2**	5***
pH	Units	In range 6.5 - 8.4	

*Biological Oxygen Demand

**24-hour mean value

***Turbidity must not exceed 5 NTU more than 5 percent of the time within a 24-hour period and must not exceed 10 NTU.

The criteria used for the evaluation are summarized in Table 2:

Table 2: Summary of Evaluation Criteria

Baseline Criteria	Sub-criteria	Comments
1. Water Balance	A. Salinity Management	Project must contribute to mitigation of saltwater intrusion into lower aquifer
	B. Groundwater Recharge	Project must contribute to recharging groundwater resources in lower aquifer
2. Water Quality	A. Meeting RWQCB requirements for WDR (discharge limits)	Project must be effective in meeting effluent discharge levels for: BOD, total suspended solids (TSS), nitrogen, viruses, and bacteria.
	B. Meeting RWQCB requirements for	Project must involve mitigation of potential effects of effluent discharge

Baseline Criteria	Sub-criteria	Comments
	elimination of pollution to groundwater	on domestic water wells.
	C. Addressing emerging contaminants: pharmaceutical and other constituents	Project is required to be consistent with EPA standards for emerging contaminants
3. Energy	A. Contributing to improvements in air quality	Project must demonstrate: <ul style="list-style-type: none"> • Reduction in particulate emissions • Effectiveness in minimizing release of airborne pathogens, and exposure to vectors
	B. Promoting sustainability	Project must increase energy efficiency over conventional designs, reducing overall use of natural resources
	C. Reducing greenhouse gas emissions	Project must result in reduction of carbon footprint from conventional designs
4. Costs	A. Life Cycle Costs	Project must involve: <ul style="list-style-type: none"> • Efficient use of funds for capital improvements • Lowest feasible and practical operations and maintenance costs necessary to meet WDR discharge limits.
	B. Staffing Requirements	Project must minimize number of required management and staff positions.
	C. Community Acceptance	Includes consideration of: <ul style="list-style-type: none"> • Private property value • Aesthetics
5. Permittability	A. Coastal Permit	<ul style="list-style-type: none"> • Required for any work • Must be in compliance with the Local Coastal Plan (LCP)
	B. Endangered Species Habitat Areas (ESHA)	Includes considerations of what is permitted in the ESHA
	C. Environmental	Includes consideration of the following: <ul style="list-style-type: none"> • Endangered Species Protection Act Section 7 consultations with US Fish and Wildlife Service • Archaeology • Sensitive species/habitat • State Marine Reserve
	D. Land Uses	Includes: <ul style="list-style-type: none"> • No other feasible alternative for ESHA • Prime agricultural land • Siting of public utility facilities

Baseline Criteria	Sub-criteria	Comments
	E. Engineering	Includes the following elements: <ul style="list-style-type: none">• Health and Safety• Drainage• Noise• Odor• Traffic Trips• Operational Dependability

Section 2: Methodology

The methodology used to evaluate alternative project components involved the following major activities.

1. **Criteria Development** – Evaluation criteria were developed to assess each component summarized in Tech Memo 2.1. Initial versions of the criteria were inclusive primarily of engineering parameters, but the criteria required refinement to incorporate criteria reflective of the overall project objectives. The resulting list of criteria is summarized in Table 2.
2. **Screening Evaluation** – Using the evaluation criteria, an initial effort was conducted to screen all components. The components not in alignment with the project objectives were dropped from further consideration, and the short-list of remaining components was evaluated in the next evaluation step.
3. **Evaluation of Viable Components** – Each of the remaining components was evaluated using the baseline criteria and corresponding sub-criteria listed in Table 2. The outcome of this evaluation was an initial version of basic project definitions (i.e., assemblies of alternative project components) that would be considered for analysis in the DEIR.
4. **Project Definition** – The basic project definitions resulting from the viable component evaluation were refined using the project objectives, the evaluation criteria, and additional technical information presented in Technical Memoranda prepared by Carollo Engineers. A project priority ranking was developed to reflect the differentiation in the level of project analysis to be conducted in the DEIR. The basic project definitions were updated and assembled into projects and alternatives sorted into the following priority lists:
 - a. **Priority A** – viable projects for evaluation in the DEIR
 - b. **Priority B** – potentially viable alternatives that should be held for future consideration by the community
 - c. **Priority C** – non-viable alternatives which have been dropped from consideration

Section 3: Component Evaluation

Components identified in Tech Memo 2.1 were grouped into the following major categories, which reflect the general elements of a community wastewater system.

- Candidate Site Alternatives
- Wastewater Treatment Process Alternatives
- Collection System Alternatives
- Effluent Disposal/Reuse Alternatives
- Biosolids Disposal Alternatives

The alternative project components in each of the general system categories were evaluated using the criteria summarized above. The following summary provides the results of that evaluation.

3.1 Screening Evaluation

Initial screening was conducted to identify components that could be dropped from further consideration. A component was dropped from consideration if it was immediately clear it would not satisfy the project objectives (i.e., “fatal flaw” analysis). A component was also dropped if it was determined that it would not meet a sufficient number of the project objectives. The results of the screening evaluation are summarized in Table 3, and a synopsis of the analysis results are provided below for each of the general system categories. As part of this analysis, a summary of life cycle costs was developed from the available background technical documentation; life cycle costs are summarized in Table 4.

3.2 Initial Screening – Candidate Sites

The following candidate sites were screened. Each of these sites has been described in Tech Memo 2.1.

- Mid-Town
- Junior High School (Pismo Site)
- Cemetery
- Giacomazzi
- Andre2
- Iacono
- Morosin/FEA
- Branin
- Gorby
- Robbins1
- Robbins2
- Turri Road
- Tonini

Four of the sites were dropped from further consideration:

- Junior High School (Pismo) – Site has insufficient area for siting a wastewater treatment facility; is immediately adjacent to and highly visible residences and community uses; is

within the Urban Reserve Line (URL); contains ESHA; contains known endangered species population; and is in conservation ownership.

- Lacono – Site is within the Urban Reserve Line (URL); contains ESHA; includes habitat for endangered species; and contains native oak and chaparral stands. The site also includes sensitive archaeological sites.
- Morosin/FEA – Site is on highly visible sloping land and is in proximity to and highly visible from residences and community uses. Site has a potential for landslides and liquefaction, is located along the Los Osos fault line, and has only 10 to 11 acres of buildable area outside of the power line easement.
- Gorby – Site includes prime agricultural lands; is located along the Los Osos fault line; includes potential archaeological sites; is developed with active agricultural uses; is subject to flooding and stream bank erosion (site is within 100 year floodplain); is adjacent to and highly visible from residences; is irregularly shaped with limited or no buffer to surface water; is adjacent to endangered species aquatic habitat.

3.3 Initial Screening – Wastewater Treatment Process

The following wastewater treatment process components described in Tech Memo 2.1 were screened.

- Membrane Bioreactor (MBR)
- Extended Aeration
- Sequencing Batch Reactor (SBR)
- Oxidation Ditch
- Biolac
- Tricking Filter Solids Contact (TF/SC)
- Partially Mixed Facultative Ponds (PMFPs)

Three of the components were dropped from further consideration:

- Extended Aeration – Produces similar results to oxidation ditch and Biolac with more operational complexity. Less common implementation for new systems at smaller communities.
- SBR – Produces similar results to oxidation ditch and Biolac. More operational complexity and rarely implemented for new systems.
- TF/SC – High odor potential, and requires continuous nitrogen removal (not seasonal)

3.4 Initial Screening – Collection System

The following collection system components described in Tech Memo 2.1 were screened.

- Gravity
- STEP
- STEG
- Vacuum
- Low Pressure

Two of the components were dropped from further consideration:

- Vacuum – Involves relatively higher energy and maintenance costs than other components.

- Low Pressure (Complete System) – Requires maintenance of more than 4,000 pumps. Involves higher energy and maintenance costs than other components. However, low pressure in areas of high groundwater may be excluded from this elimination.

3.5 Initial Screening – Effluent Disposal/Reuse

The following effluent disposal/reuse components described in Tech Memo 2.1 were screened.

- Leach Fields
- Percolation
- Spray Fields
- Ag Reuse
- Urban Reuse
- Constructed Wetlands
- Conservation

3.6 Initial Screening – Biosolids Disposal

The following biosolids disposal components described in Tech Memo 2.1 were screened.

- Recycle Digested/Composted Class A
- Recycle Composted Class A
- Haul Digested Class B
- Haul Composted Class B
- Haul Dewatered Sub-Class B

Four of the components were dropped from further consideration:

- Recycle Digested/Composted Class A – Composting requires more staff time than other biosolids management processes. Achieving Class A through digestion requires anaerobic digestion process, which is economically attractive for facilities with dry weather flows greater than 5 MGD.
- Recycle Composted Class A – See notes for Recycle Digested/Composted Class A.
- Haul Composted Class B – Staff time required for producing Class B biosolids via composting exceeds the time required for producing Class B by aerobic digestion.

Section 4: Evaluation of Viable Components

Following initial screening, the remaining components, referred to in this Tech Memo as “viable” components, were evaluated further to identify collections of wastewater system components that could be prioritized into proposed projects and alternatives.

During the evaluation of components, the need was identified for prioritization of system component assemblies into proposed projects (Priority A) and alternatives (Priority B). The definitions of priority lists have provided above under “Methodology.” Proposed projects are defined as those assemblies of components that will be evaluated in the DEIR, while alternatives are to be maintained during the EIR process for possible future consideration by the community as the proposed projects are analyzed.

The evaluation of viable components is summarized in Table 5. The following notes summarize whether a component is to be incorporated into Priority A (i.e., part of a proposed project) or Priority B (i.e., part of an alternative), as a result of the evaluation.

4.1 Evaluation – Candidate Sites

4.1.1 Priority A

There are few criteria that distinguish the first three A Priority sites, Cemetery, Giacomazzi, and Branin, from each other, but they have the least number of undesirable factors when compared to the B Priority sites. They are out of town, creating distance from sensitive land uses, and are generally accepted as viable sites by the community (except for nearby residents). There are no Class I agricultural lands present. No areas are under Williamson Act Contract. The terrain on all three sites is generally level (0-10% slope) and there is an adequate amount of available buildable acreage on one or on combinations of the sites (depending upon the chosen treatment process). The presence of sensitive habitat (wetlands) and/or endangered species have been assessed and are limited to specific portions of the sites. Those portions can either be avoided or mitigation may be implemented as needed.

Tonini has different advantages from the sites described above. Tonini is the farthest from town, which creates a significant buffer zone between the treatment plant and sensitive land uses such as residences. There is ample acreage on-site for multiple project uses (e.g., treatment, storage, sprayfields). There are known archaeological and historical sites at Tonini. Also, biological resources are extensive and but be avoided or mitigated. The site is classified as agricultural and is protected under the Williamson Act.

4.1.2 Priority B

The B Priority sites are summarized below.

Mid-Town – this site has a history of community disapproval due to its position in the middle of town. Sensitive land uses surround the site. Also, the buildable acreage (approximately 11 acres) would only accommodate an MBR plant. Advantages that move the site to the B Priority list include shorter collection and pumping pipelines and distances, reduced energy consumption, and considerable prior disturbance. The California Coastal Commission also permitted the previous project with Mid-Town as the chosen site.

Robbins 1 and 2 and Andre 2 – the Robbins 1 and 2 sites are very similar to Cemetery, Branin, and Giacomazzi. The primary differences are that these sites are located slightly farther from town but they are closer to Los Osos Valley Road. There are also established structures on these sites that would need to be removed. Due to the extra distance, these sites were selected as alternative options (Priority B). An advantage for these sites is the considerable amount of buildable acreage. The Andre 2 site is small (approximately 9 acres) and would only accommodate an MBR plant, the most expensive technology. However, the combination of all three sites provide the flexibility to implement the proposed treatment alternatives.

Turri Road – This site was identified by the County in 1987 as the preferred project treatment site. It is located away from residences and other sensitive community land uses, adjacent to a closed landfill, and is easily accessed from County roadways. Multiple issues prevent this site from being considered an A Priority site: adjacent wetlands, challenging terrain for pipeline routes, somewhat limited buildable acreage (approximately 20 acres), prime agricultural soils, and Williamson Act contract lands.

Component	Priority A	Priority B
Branin	√	
Cemetery	√	
Giacomazzi	√	
Mid-Town	-	√
Robbins1	-	√
Robbins2	-	√
Andre	-	√
Tonini	√	-
Turri Road	-	√

4.2 Evaluation - Wastewater Treatment Process

4.2.1 Priority A

Treatment process components that were capable of producing high-quality effluent with relatively moderate energy requirements and low maintenance requirements were identified as Priority A. These components were oxidation ditch, Biolac, and PMFPs.

4.2.2 Priority B

MBR is one of the most commonly implemented treatment process components for smaller communities seeking high-quality effluent. MBR has a high energy demand and high capital cost for implementation. However, MBR has been included as a Priority B component for consideration of the significant benefits offered by the small physical footprint and very high-quality of the effluent produced by MBR systems. To provide a complete analysis, the Priority A components have been included in the Priority B list, as indicated below.

Component	Priority A	Priority B
MBR	-	√
Oxidation Ditch	√	√
Biolac	√	√
Partially Mixed Facultative Ponds (PMFPs)	√	√

4.3 Evaluation – Collection System

As summarized in Table 5, gravity and STEP/STEG are comparatively similar for most criteria. However, several criteria can distinguish the two systems from each other: energy use, staffing requirements, and engineering.

Energy Use/GHG emissions – Gravity is more energy intensive, but emits less GHG due to the absence of septic tank venting and less chemical production. STEP/STEG is less energy intensive, but overall the process emits a large amount of GHG due to septic tanks and chemicals. (Carollo, June 2008)

Staffing Requirements – Less staff are required for O&M of a gravity system. STEP/STEG requires more staff and time for O&M. (Carollo, August 2007)

Engineering –

Aesthetics: STEP/STEG would create more aesthetic impacts during operations than gravity due to two 24-inch grade lids, alarms, and lights. Construction impacts would be similar.

Odors: STEP/STEG would generate moderate to severe odors while odor impacts from a gravity system would be minimal to moderate.

Noise: Construction of a gravity system would generate more noise due to the deeper and larger diameter pipeline, and the consequent differences in construction equipment, potentially increased utility interference, and added import material being installed, while STEP/STEG would create more operational noise due to pumps and alarms.

Transportation: STEP/STEG traffic impacts would be considerably significant during installation and would occur in close proximity to sensitive land uses. Construction of a gravity system would lead to significant traffic impacts, but would be located further away from homes.

Because both options have certain advantages and disadvantages, STEP/STEG was chosen for one proposed project (A Priority) while a gravity system was selected for the three other proposed projects. The alternatives (B Priority projects) could use either STEP/STEG or gravity.

A summary below provides an overview of the combinations that might occur for collection, treatment, and disposal.

Proposed Project	Treatment Plant Site	Collection System	Conveyance Systems		Treatment Process	Storage Location	Effluent Disposal
			Raw Wastewater	Treated Effluent			
1	Cemetery/Giacomazzi/Branin	STEP/STEP G	Mid-Town Central Point to Giacomazzi	Giacomazzi to Broderson and Tonini	Facultative Ponds (Secondary Treatment)	Onsite at Cemetery/Giacomazzi/Branin	Broderson Leachfield, Tonini Sprayfields, and Conservation
2	Giacomazzi	Gravity	Mid-Town Pump Station to Giacomazzi	Giacomazzi to Broderson and Tonini	Oxidation Ditch or Biolac (Secondary Treatment)	At Tonini Sprayfield Site	Broderson Leachfield, Tonini Sprayfields, and Conservation
3	Giacomazzi/Branin	Gravity	Mid-Town Pump Station to Giacomazzi	Giacomazzi to Broderson and Tonini	Oxidation Ditch or Biolac (Secondary Treatment)	Onsite at Giacomazzi	Broderson Leachfield, Tonini Sprayfields, and Conservation
4	Tonini	Gravity	Mid-Town Pump Station to Giacomazzi	Tonini to Broderson and onsite at Tonini	Facultative Ponds (Secondary Treatment)	Onsite at Tonini treatment and sprayfield site	Broderson Leachfield, Tonini Sprayfields, and Conservation

Source: Appendix B-8: Kennedy/Jenks Consultants, 2008, LOWWP Environmental Impact Report Draft Proposed Projects Descriptions, Draft August 1.

4.4 Evaluation – Effluent Disposal/Reuse

4.4.1 Priority A

The combination of conservation, leachfields, and sprayfields is the effluent disposal option for all four proposed projects. Ultimately, the most significant advantage of this combination is that it provides the highest level of salt water intrusion (SWI) mitigation (approximately 187 AFY) that can be accomplished without the involvement of the water purveyors.

4.4.2 Priority B

The combination of conservation, leachfields, sprayfields, agricultural reuse, and urban reuse is the alternative effluent disposal option. The addition of agricultural reuse and urban reuse would open the door for water purveyor involvement that could benefit the community in significant ways in the future such as: increased level of salt water intrusion mitigation (additional 46 AFY and 35 AFY respectively; total SWI 268 AFY), community-endorsed sustainable reuse, and reduction in the use of lower aquifer water for irrigation at urban reuse sites.

Component	Priority A	Priority B
Ag Reuse	-	√
Conservation	√	√
Leach Fields	√	√
Spray Fields	√	√
Urban Reuse	-	√

4.5 Evaluation – Biosolids Disposal

Only one biosolids disposal component will be carried through the DEIR analysis. Hauling sub-Class B biosolids has been identified as both the Priority A and Priority B component, acknowledging the preferences of the community.

Component	Priority A	Priority B
Hauling Digested Class B Biosolids	√	√

Section 5: Project Definition

The results of the alternative project component evaluation produced an assignment of the components to different priority lists. Using the prioritized components, projects and alternatives were assembled according to priority, as summarized in Tables 6 and 7.

5.1 Priority A – Proposed Projects

A total of four proposed projects are summarized in Table 6. These four projects will be carried forward through the DEIR analysis to identify the environmentally preferred project.

5.1.1 Proposed Project Summaries

Project A.1: This proposed project has been developed to assess the effects of using STEP/STEG on the results of the environmental evaluation. In addition, the environmental evaluation will study the effects of implementing partially mixed facultative ponds (PMFPs), which requires the largest land area and results in the need to use three of the candidate sites for the construction of the treatment facility. Project A.1 includes constructing a secondary treatment process consisting of PMFPs and appurtenant facilities (including 30 acre-ft [AF] of treated effluent storage) on a combined site made up of the Cemetery, Giacomazzi, and Branin sites. The collection system would be STEP/STEG, and effluent disposal would be accomplished using conservation, leach fields at the Broderson site, and spray fields at the Tonini site.

Project A.2: This proposed project will be used to assess the effects of combining a gravity collection system with a treatment facility that requires less land area than PMFPs, allowing the treatment facility to be constructed on a single site. Project A.2 consists of constructing a secondary treatment facility (oxidation ditch/Biolac) and appurtenant facilities on the Giacomazzi site. A gravity collection system would be used, and effluent disposal would be accomplished using conservation, leach fields at the Broderson site, and spray fields at the Tonini site, where 30 AF of treated effluent storage would be located. A further consideration is that the combination of Biolac and gravity collection system generates the lowest mass of carbon emissions of the different component combinations (Carollo, June 2008).

Project A.3: This proposed project will be used to assess the effects of combining onsite storage with the treatment facility, eliminating the need to pump to a remote storage facility. Project A.3 is similar to Project A.2 except that 30 AF of treated effluent storage would be located onsite with treatment facility. The Branin site would be combined with Giacomazzi to provide the required area to fit the storage basin onsite.

Project A.4: This proposed project will provide the opportunity to evaluate the effects of using a gravity collection system and the most remote site for the treatment facility location. Project A.4 involves constructing PMFPs (secondary treatment process), appurtenant facilities, and 30 AF of treated effluent storage on the Tonini site. A gravity collection system would be used, and effluent disposal would be accomplished using conservation, leach fields at the Broderson site, and spray fields adjacent to the treatment facility at the Tonini site.

Following are notes related to each of the elements of the Priority A proposed projects summarized in Table 6.

5.1.2 Site

The primary differentiation between the four projects is the site for the treatment facility. Projects A.1 through A.3 involve some combination of the Cemetery, Branin, and Giacomazzi sites. Project A.4 involves the Tonini site, which is large enough to include treatment, storage, and disposal facilities. These sites have been selected to provide an opportunity to study the best combination of buildable area, site access, ability to control noise and odors, and long-term operation of a treatment facility.

5.1.3 Treatment

Two treatment alternatives are considered:

- Partially Mixed Facultative Ponds (Projects A.1, A.4)
- Oxidation Ditch/Biolac (Projects A.2, A.3)

These alternatives have been selected to allow for evaluation of treatment processes that combine the capability for achieving WDR discharge requirements at the lowest unit cost.

5.1.4 Disposal

Disposal involves the same combination of components for all of the proposed projects. The primary disposal options involve leach fields at the Broderson site and spray irrigation at the Tonini site. Each of these options requires pumping in a dedicated conveyance pipe to deliver treated effluent to the Broderson site. Pumping to Tonini for effluent disposal is required for Projects A.1 through A.3. Combined with conservation, the proposed use of leach fields (Broderson) and spray irrigation (Tonini) provides an opportunity to evaluate how these approaches address salt-water intrusion in the lower aquifer and groundwater recharge in the upper aquifer without directly affecting residents.

5.1.5 Storage

The Tonini site is used for storage of treated effluent for two projects (A.2, A.4), and onsite storage is used for the remaining two projects. Storage allows for delayed disposal of treated effluent during periods when the receiving rate at the disposal sites will not be exceeded.

5.1.6 Collection System

A gravity collection system has been included in three of the four proposed projects (A.2, A.3, and A.4). STEP/STEG has been included in Project A.1 to provide an opportunity to evaluate STEP/STEG as part of the DEIR analysis and compare this collection system approach to a gravity system.

5.1.7 Biosolids Disposal

Only one approach to biosolids disposal is considered: hauling sub- Class B biosolids for disposal. This approach is common to all of the proposed projects.

5.2 Priority B – Alternatives

Projects that have been identified as “Priority B” are summarized in Table 7. Priority B projects are defined as Alternatives that have been developed but which will be analyzed in less detail than the proposed projects as part of the DEIR. The Alternatives have been identified to allow the community to return to these projects if necessary during the EIR process.

5.2.1 Alternative Project Summaries

Alternative B.1: This alternative was developed to allow for evaluation of siting the treatment facility at Turri Road. Alternative B.1 includes constructing an oxidation ditch/Biolac secondary treatment process and appurtenant facilities on the Turri Road site. The collection system would be either STEP/STEG or gravity. Effluent disposal would be accomplished using conservation, leach fields at the Broderson site, and spray fields at the Tonini site, where 30 AF of treated effluent storage would be located. Biosolids disposal would be addressed by hauling digested sub-Class B biosolids for disposal, which would be the approach used for all five of the Priority B alternatives.

Alternative B.2: This alternative was developed to make it possible to evaluate the previous community wastewater project, which was originally scheduled for construction. Alternative B.2 includes constructing an MBR secondary treatment facility and appurtenant facilities on the Mid-Town site; MBR at the Mid-Town site was considered for the previous project in 2001. The collection system would be either STEP/STEG or gravity. Effluent disposal would be accomplished using conservation, leach fields at the Broderson site, and spray fields at the Tonini site, where 30 AF of treated effluent storage would be located. The differences between this alternative and the 2001 project include: reduced reliance on Broderson, no leach fields scattered in a large number of locations, no harvesting wells.

Alternative B.3: This alternative allows for the evaluation of tertiary treatment and effluent reuse. Alternative B.3 involves constructing an oxidation ditch/Biolac with tertiary treatment and appurtenant facilities on the Giacomazzi site. In addition to conservation, leach fields (Broderson), and spray irrigation (Tonini), both agricultural reuse and urban reuse would be used for treated effluent disposal. Up to 160 AF of treated effluent would be stored on the Tonini site to provide for seasonal reuse demands. Either STEP/STEG or gravity would be used for the collection system, and the collection/conveyance system would use Eto Lane as part of the alignment.

Alternative B.4: This alternative permits evaluation of the effects of using either STEP/STEG or gravity collection system in combination with PMFPs at the combined Cemetery/Giacomazzi/Branin site. Alternative B.4 involves constructing PMFPs (secondary treatment process), appurtenant facilities, and 30 AF of treated effluent storage on the combined site. Effluent disposal would occur using conservation, leach fields at the Broderson site, and spray fields at the Tonini site. Either a STEP/STEG or gravity collection system would be used, with the collection/conveyance system using the Hollister Lane alignment.

Alternative B.5: This alternative allows for evaluation of a secondary combined site, consisting of Robbins1/Robbins2/Andre2. Alternative B.5 involves constructing the secondary treatment process consisting of oxidation ditch/Biolac and appurtenant facilities on the combined site. Effluent disposal would occur using conservation, leach fields at the Broderson site, and spray fields at the Tonini site, where 30 AF of treated effluent storage would be located. Either a

STEP/STEG or gravity collection system would be used, with the collection/conveyance system following the Los Osos Valley Road to Eto Lane alignment.

5.3 Priority C – Other Alternatives

Four alternative approaches to LOWWP implementation were defined and evaluated as part of the EIR planning process. The evaluations of the following four alternatives have been summarized in separate Tech Memos, as listed for each alternative.

- No Project
- Onsite Treatment (Tech Memo 2.3)
- Regional Treatment (Tech Memo 2.5)
- Decentralized Treatment (Tech Memo 2.6)

The results of the evaluations indicated that three of these alternative approaches did not meet the project objectives, and the alternatives were dropped from further consideration. The fourth alternative is to be retained as part of the list of potentially viable alternatives. Following are summary notes regarding the status of each alternative:

No Project: The “no-action” alternative would maintain existing conditions, which involve septic systems and onsite leach fields. The negative effects from existing conditions on groundwater resources has been well documented, including continued salt-water intrusion, continued nitrogen loading in the upper aquifer, and a continuing decline in potable water quality. With the possibility of RWQCB enforcement action against the community if existing conditions are maintained, the “No Project” alternative was dropped from consideration as a non-viable option.

Onsite Treatment: Onsite treatment would involve constructing treatment facilities at each property location with habitable improvements. Several options for onsite treatment systems have been identified, including proprietary systems that have not been recognized by the RWQCB. Implementing onsite treatment would lead to extensive disruption throughout the project area, especially in sensitive habitat areas. In addition, the high life cycle costs for construction and maintenance of onsite systems resulted in onsite treatment being dropped from consideration as a non-viable option.

Regional Treatment: Regional treatment would involve collecting wastewater from the communities in the Morro Bay and/or the California Men’s Colony (CMC) vicinity and treating the combined flow at one of three optional sites for a regional treatment plant. This alternative would involve constructing treatment capacity at the Morro Bay treatment plant, the CMC treatment plant, or constructing a new treatment facility in the Chorro Valley. In addition, large diameter pipes would be constructed to convey raw wastewater to the regional facility. Construction of the treatment facility and associated conveyance piping would lead to extensive disruption throughout the project area, especially in sensitive habitat areas. In addition, community acceptance for this alternative is low, and regional treatment has been dropped from consideration as a non-viable option.

Decentralized Treatment: Decentralized treatment would involve collecting wastewater and treating the combined flow at between 2 and 30 neighborhood-level “cluster” treatment plants. Effluent disposal would occur through leach fields and/or agricultural/urban reuse. Construction of the treatment facilities and associated conveyance piping would lead to extensive disruption throughout the project area, especially in sensitive habitat areas. In addition, the additional staff time required for maintaining the decentralized system would increase life cycle costs over

centralized systems. Decentralized treatment, due to capital cost, operating cost, and operability requirements, will be dropped from further consideration.

References

Carollo Engineers – *Technical Memorandum: Projects Alternatives: Greenhouse Gas Emissions Inventory*, Final Draft; June 2008.

Carollo Engineers – *Technical Memorandum: Solids Handling Options*, Final Draft; April 2008.

Carollo Engineers – *Technical Memorandum: Effluent Reuse and Disposal Alternatives*. Final Draft; March 2008.

Carollo Engineers – *Technical Memorandum: Partially Mixed Facultative Pond Options*, Final Draft; March 2008.

Carollo Engineers - *Technical Memorandum: Low Pressure Collection System*, Final Draft; January 2008.

Carollo, August 2007; *Viable Project Alternatives: Fine Screening Analysis, Sal Luis Obispo County Los Osos Wastewater Project Development*; in association with Crawford, Multari & Clark, and Cleath & Associates. Final, August 2007.

Carollo, March 2007; *Potential Viable Project Alternatives: Rough Screening Analysis Report, Sal Luis Obispo County Los Osos Wastewater Project Development*; in association with Crawford, Multari & Clark, and Cleath & Associates. Final, March 2007.

P-3: On-Site Treatment

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Los Osos EIR Technical Memorandum 2.3: On-Site Treatment

13 November 2008



K/J Project No. 0893003

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Section 1: Description

The purpose of the Los Osos Wastewater Project is to provide a wastewater collection, treatment, and disposal system for the unincorporated community of Los Osos. Currently the community relies on septic tank/drainfield systems for wastewater disposal.

There are three categories of treatment available. There are:

- Centralized Treatment
- Decentralized Treatment
- On-site Treatment

For purposes of this technical memorandum centralized treatment consists of collection and taking all the wastewater to one location for treatment; on-site treatment consists of treating each individual discharge at the point of use; and decentralized treatment consists of utilizing two or more treatment facilities, each of which serves a nearby cluster of homes. This technical memorandum describes the on-site alternative.

On-site treatment has been briefly described in the past, but was typically eliminated since there were no individual treatment systems capable of nitrifying and denitrifying the Septic Tank Effluent (STE) to the level required to meet the appropriate discharge standards. However, in the past 10 years new on-site technologies have entered the market place that can meet the nitrogen standards and a more in-depth look at on-site alternatives is warranted.

Section 2: On-Site Alternatives

A recent technical memorandum has been released (Carollo, 2008a) that summarizes the options available for on-site nitrogen reduction. Prior to this technical memorandum, the most extensive work relative to on-site options was performed in 1995 (M&E, 1995). In the M&E study, no individual on-site advanced treatment technologies were identified that were practical, achieved the stated nitrogen reduction goal, and had a long operational track record.

2.1 Lack of space on many parcels

For these alternatives, in addition to constructing a new septic tank and treatment units, it is also necessary to construct a new effluent dispersal system, a new drainfield or perhaps a new drip irrigation system. The construction of these facilities on many of the small lots in Los Osos is problematic. For long-term operation and maintenance purposes these facilities should be located in the front of the house. This would require space for a new septic tank (approximately 12 feet by 6 feet by 8 feet deep for a 1500-gallon septic tank), a denitrification reactor of 100 – 300 s.f., and a new drainfield of approximately 200 square feet.

2.2 High Costs

The initial capital costs are high for onsite systems; the total capital cost for an onsite system, including the onsite facilities plus the solids disposal facilities, could be two to three times the combined costs for a centralized system including collection, treatment, and disposal. The cost of an individual advanced on-site system has been estimated as being between \$24,000 - \$43,000 (Carollo 2008a). The costs for the additional solids handling and disposal for each onsite system owner could be between \$5,000 and \$15,000. The cost per household or household equivalent for a central system would be \$15,000 to \$20,000.

2.3 Inability to meet effluent requirements

Basically there are two process approaches to achieving nitrogen reduction in individual on-site systems. One approach uses a reactor following the septic tank for nitrification purposes and then recirculates a portion of the nitrified effluent back to the septic tank where denitrification (pre- denitrification) occurs utilizing the available carbon sources in the anaerobic environment (Figure 1). In the second option, the septic tank and aerobic reactor is followed by an upflow filter with a carbon source present that also achieves denitrification under anaerobic conditions (post-denitrification). (Figure 2).

The onsite systems manufacturers describe the zone where denitrification occurs as an “anaerobic” condition, which raises a question about the ability to adequately perform denitrification. In the industry standard of practice, as defined in the Water Environment Federation (WEF) and the American Society of Civil Engineers (ASCE), the conditions that are prescribed for nitrification and denitrification include an anoxic zone and an oxic zone. An anaerobic zone is prescribed for phosphorus removal. In larger facilities where flow, even during

nighttime is available, provides a more conducive environment to maintain the proper anoxic condition for the denitrification step than in a small system for a single or few multiple residences.

There is limited data available regarding how these individual nitrogen removal systems work in real world conditions. There are several known studies that compared the results of various onsite systems that are commercially available. In one study, a total of 12 systems at multiple sites were monitored over a two year period. While the final report has not been released and is under review (It is to be noted that the author of this technical memorandum has been asked by USEPA to be one of the reviewers), there is some data on the project website (www.deschutes.org/deq) that indicates that most of the units performed poorly, see Figure 3.

A second study was performed by the Ventura Regional Sanitation District in 2000, in which a total of six systems were operated and their performances monitored. In this study, there were varying levels of nitrogen removal, some adequate for a consistent discharge if applied in Los Osos and some not. The systems tested included:

- Bio_Microbics FAST Regular
- Bio Microbics FAST Custom
- MicroSepTec
- Orenco – Ax
- Orenco – Rx
- 7H Technical Nitro Raptor
- Regular Septic System

The specific conclusions published included:

- “1. All systems provided improved treatment beyond that of a standard septic system.
2. All systems removed > 67 % of biological oxygen demand (BOD5) and 80% of total suspended solids (TSS) from the influent wastewater.
3. OSS treatment to mean values of less than 20 mg/l BOD5 and 20 mg/l TSS were met by Fast Regular, Fast Custom, MicorSepTec, and Orneco RX. Both the MicorSepTec and Orneco RX had mean effluent TSS and BOD5 values of < 10 mg/l.
4. OSS treatment to less than 30 mg/l BOD5 and 30 mg/l TSS were met consistently by MicorSepTec and Orenco RX. The Fast Regular and Fast Custom systems both met the goal in all but one sample from each.
5. Mean total nitrogen (TN) reductions of 35 % from the untreated influent wastewater are achievable by all systems.
6. The most effective TN reducing unit was Orenco RX, with a mean effluent TN concentration of 11 mg/l and no sample concentrations higher than 18 mg/l.
7. MicroSepTec was the only system capable of multi-log pathogen reduction because of its chlorinating treatment, reducing influent wastewater total coliform from >1,600 to a mean concentration of 357 mpn/100 ml and fecal coliform from >1,600 to a mean concentration of 220 mpn/100 ml. The chlorination and coliform reduction was not consistent, though.
8. All systems appeared to remove some total phosphorus (TP). Percent TP reductions were not very significant, ranging from 3% (MicroSepTec) to 22% (Orenco AX).
”

There may be a large number of other onsite treatment systems, however, they may not all have a published review by an independent third party that can be used to determine their applicability for Los Osos. One system which has been presented locally as an onsite alternative is the "Reclamator". Information of the Reclamator has been presented publicly. The data can be summarized as follows:

1. The influent waste strength was noticeably weaker on the organic and ammonia (Total Kjeldahl Nitrogen, TKN), than is typical for municipal wastewater systems. Typical municipal TKN is 45 mg/l to 65 mg/l. The range presented in the test results was between 20 and 40 mg/l.
2. The effluent contained ammonia and TKN concentrations higher than typically found in BNR systems for municipal plants. The normal effluent ammonia is 1 mg/l or less and TKN are not considered significantly different than ammonia because the organic nitrogen is typically hydrolyzed and oxidized.
3. The effluent BOD and TSS are low and favorable compared to typical municipal plants' effluent quality.

Judging by the unusually low concentrations on the effluent BOD and TSS, yet unusually high effluent ammonia (and TKN), it appears that the hydraulic retention time may be low. The low nitrate concentrations support this. The presence of nitrate combined with a reliably high dissolved oxygen content in the mixed liquor indicates that a solids retention time is probably high enough to support full oxidation of the TKN, however, the process appears to lose some of the mixed liquor before an adequate nitrification-denitrification is conducted on the full contents. The process would be improved with a mixed liquor recycle addition.

There is also a third approach to nitrogen reduction. This is source separation. Approximately 80% of all nitrogen present in the blackwater portion (urine and fecal matter) associated with domestic wastewater (USEPA 1980, Table 4-4). Nitrogen source separation can only be achieved by installing a dual plumbing system within each customer's building. Composting toilets is one method of source separation.

Composting toilets have been in limited use since the 1970s in remote areas. They have not achieved widespread use due to their size and need for significant homeowner attention. In addition, they are susceptible to process upset with resulting odor problems. They also have a large composting chamber located beneath the toilet that must be emptied periodically. In Los Osos, many homes consist of slab on grade construction. This would make it difficult to install composting toilet and leads to the elimination of this option.

Urine separation has been proposed as a source separation technique in several Scandinavian countries. The male urinal is an example of a urine separation fixture. Toilets have been developed that can be used by both sexes for urine separation, but they require a significant change in usage patterns by the public.

The urine generated is stored in a below grade vault and pumped out regularly by the system management entity and applied at agronomic rates on agricultural land as a source of fertilizer. Given the need to retrofit all toilets in Los Osos, change the public's usage patterns, and create a urine management entity; urine separation is not considered to be a feasible option.

2.4 Complex and expensive monitoring requirements

Every discharger is required under public law 92-500 to have an approved permit issued by the regulating agency, in Los Osos, the Central Coast Regional Water Quality Control Board (CCRWCQB). The CCRWCQB is required to issue requirements in accordance with various Federal and State laws and in compliance with the Basin Plan, prepared and updated in accordance with Section 208 of PL 92-500. The Basin plan sets such governing requirements and receiving water requirements and discharge requirements based on the administratively determined beneficial uses of the local water.

In order to verify that these Basin Plan requirements, and through the permit, specific monitoring requirements are set by CCRWCQB action that will mandate frequency, sampling technique, and specific test requirements to observe and report the effluent water quality. The fact that a large number of onsite systems could serve in lieu of a central wastewater treatment system does not allow for an averaging effect of the potentially large number of systems. Each system would be required to monitor individually and incur the management, administrative, and laboratory costs for each onsite system. Each discharger could be expected to pay these recurring costs.

The regulatory and monitoring requirements are unclear. Assembly Bill (AB) 885 that was signed by the Governor in September 2000 requires the establishment of minimum statewide standards for on-site systems, and it is anticipated that extensive monitoring of these systems will be required. In addition it is unclear how or if the Central Coast Water Quality Control Board will permit these advanced individual on-site systems. The regulatory requirements for these systems are unclear at this time and will add to the costs of these systems and will delay project implementation (Carollo 2008a).

2.5 Complex and expensive maintenance and management requirements

These systems are quite complex with multiple pumps and process controllers required to operate both the anaerobic and aerobic processes. This complexity applied to 4,679 individual units would impose a major, long-term operation and maintenance (O&M) burden on the management entity set up for this project. This has led at least one expert (Lombardo Associates, Inc. (LAI) and equipment vendor) to dismiss this option as not being “technically feasible” (Lombardo 2007). It is to be noted that the individual on-site denitrification system developed by LAI was the only system that met the required discharge standards in LaPine.

Typically, maintenance could include periodic checks on all mechanical systems, observation of valves and openings, and observation of the local electrical and control panel. Readings should be taken on local indicators for status of operating equipment. A log should be kept of these readings to determine if any changes in performance is occurring over time.

Section 3: Conclusions

No on-site system that requires 4,769 individual units that must be operated and maintained by a public entity is considered feasible; therefore the on-site option is eliminated from further consideration. These are the factors that make this conclusion evident:

- Lack of space on some parcels
- High cost (compared to a community system)
- Community acceptance issues
- Inability to meet effluent requirements
- Complex and expensive monitoring requirements
- Complex and expensive maintenance and management requirements

Figure 1: Septic Tank Recirculation Alternative

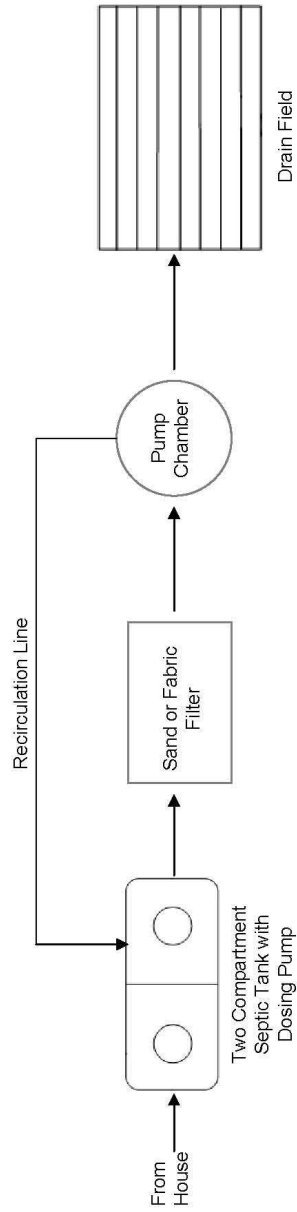


Figure 2: Denitrifying Filter Alternative

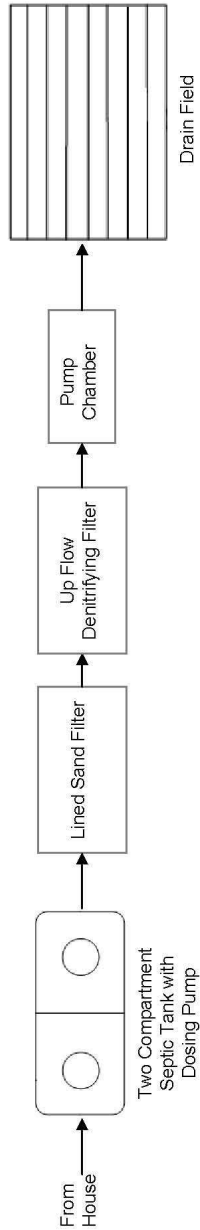
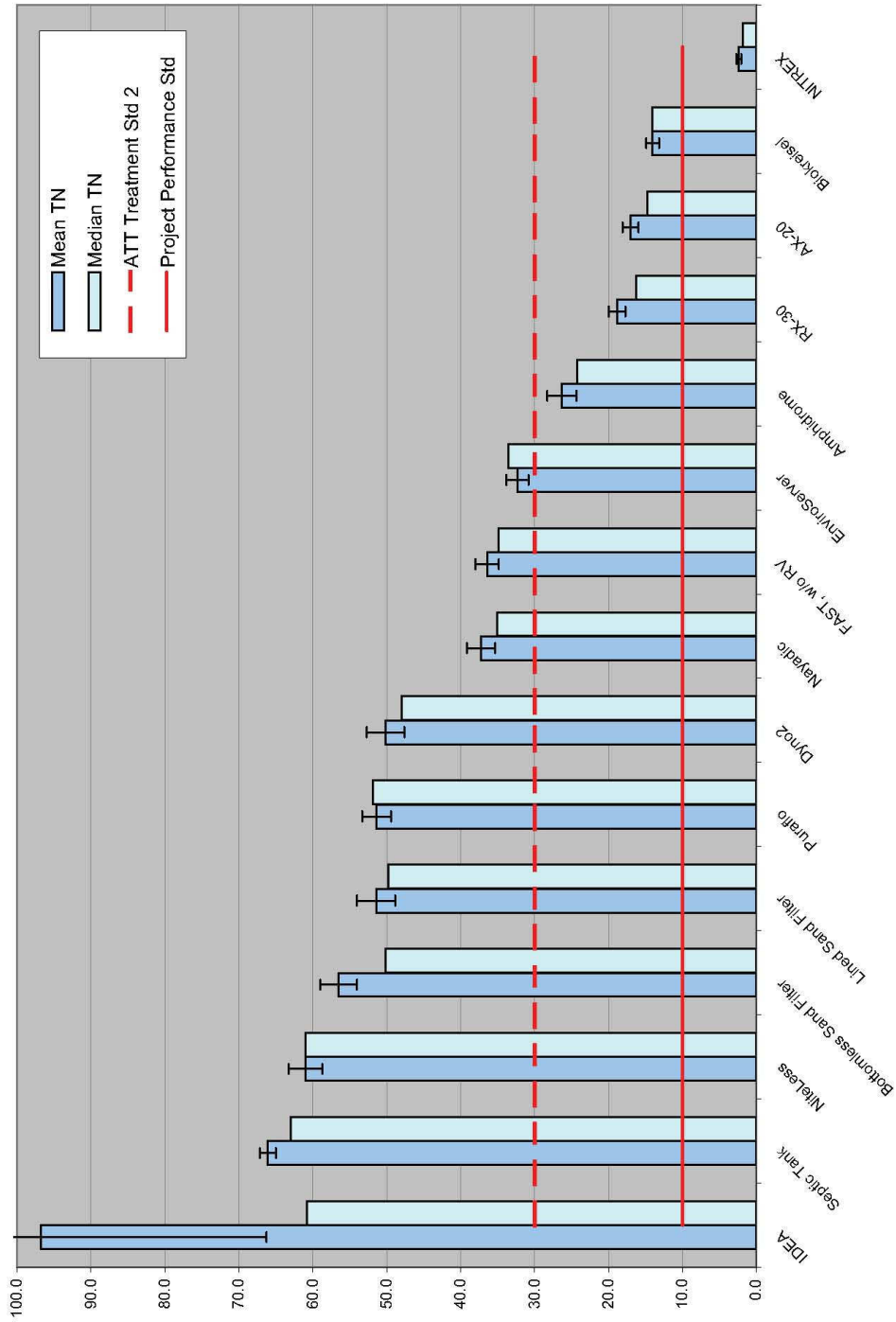


Figure 3: La Pine, OR Demonstration Project Results



(www.deschutes.org/deq)

References

Carollo 2008 a: Carollo Engineers
Technical Memorandum
Onsite Treatment
January 2008

Deschutes Country
La Pine National Demonstration Project
www.deschutes.org/deq

Lombardo Associates, Inc. 2007
Letter from Pio Lombardo to Paavo Ogren
8 June 2007

M&E 1996: Metcalf & Eddy, Inc.
Final Los Osos Wastewater Project
Collection System Evaluation Technical Memorandum
5 July 1996

USEPA 1980: USEPA 625/1-80-012
Design Manual – Onsite Wastewater Treatment and Disposal Systems
October 1980

P-4: Regional Biosolids Management

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Los Osos EIR Technical Memorandum 2.4: Regional Biosolids Management

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Section 1: Introduction

The objective of this technical memorandum (TM) is to present the technical evaluation of alternatives for regional biosolids management and treatment using the criteria defined in TM 2.1.

Background

The safe and effective collection, treatment, and disposal of wastewater for the unincorporated community of Los Osos are the main objectives of the Los Osos Wastewater Project (LOWWP). As part of any collection and treatment system, whether centralized or decentralized, biosolids will be generated and must be handled in an appropriate, cost-effective manner. Options for solids handling and disposal in Los Osos were discussed by Carollo Engineers in an April 2008 Technical Memorandum, which has been used as the basis for this TM.

The largest quantity of solids for the LOWWP would result from use of a central point for treatment of wastewater, as discussed in the Proposed Project Descriptions. Therefore, the single point treatment source estimate of 4,000 pounds of dry solids per day (Carollo, 2008) will be used for purposes of this evaluation for the Los Osos community. Biosolids management, treatment, and disposal will be evaluated in this TM as a comparison of two alternatives: (1) a program owned and operated solely for the community of Los Osos , and (2) a regionalized biosolids program owned and operated by a joint group of local agencies.

Section 2: Biosolids Treatment and Disposal Alternatives

2.1 Options

A number of options exist for treatment and disposal of biosolids for the Los Osos community area. Treatment alternatives include anaerobic digestion, aerobic digestion, composting, dewatering, and drying. Potential disposal options include landfilling, composting, and land application, depending upon the level of treatment. The most critical decision is whether the biosolids can be locally land applied or they will be hauled to a disposal out of the Los Osos community area. Depending upon this decision, the end product (either Class A – for local land application; or Class B – for landfill disposal, as defined below) will determine the requirements for stabilization of the raw biosolids. For both Class A and for Class B, there exist a variety of methods for stabilization that are discussed below.

Recycling of Digested/Composted Class A Biosolids

US Code of Federal Regulations Title 40, Part 503, (40 CFR Part 503), Subpart D identifies different levels of pathogen concentrations in treated biosolids: Class A and Class B. Biosolids with levels of pathogens (i.e., *Salmonella sp.* bacteria, enteric viruses, and viable helminth ova) that are below detectable levels are referred to as “Class A”. (USEPA, 1994) Class A biosolids may be produced through digestion, composting, and/or drying.

Conventional mesophilic anaerobic digestion typically produces biosolids with Class B pathogen levels, which are higher than in Class A (see below). Subsequent treatment, such as composting or drying, is used to reduce pathogen levels in the digested solids to Class A levels. Successful digestion requires well-trained staff to maintain a well-operated process, which involves consistent and careful attention to operational parameters. Anaerobic digestion typically makes economic sense for facilities with average dry weather flows starting at 5 MGD.

Class A biosolids are characterized in 40 CFR Part 503 as “Exceptional Quality” (EQ), which indicates biosolids have been treated to levels that “meet low-pollutant and Class A pathogen reduction (virtually absence of pathogens) limits and that have a reduced level of degradable compounds that attract vectors.” (USEPA, 1994) With treatment to reduce metals concentrations so requirements for land disposal are satisfied, Class A “biosolids are considered a product that is virtually unregulated for use, whether used in bulk, or sold or given away in bags or other containers.” (USEPA, 1994). Recycling or reuse of EQ biosolids provides an opportunity to reduce hauling costs and the associated carbon footprint associated with hauling biosolids for land application or disposal.

Recycling of Composted Class A Biosolids

Composting is a recognized method for on-site production of Class A biosolids. In the absence of a digestion process, sludge to be composted must be dewatered through mechanical means or through drying; mechanical systems, such as belt or screw presses, are typically used because of the reduced area requirement for the mechanical system over a pond-based or bed-based drying system. Composting involves four main steps:

- Pre-processing: conditioning dewatered solids with wood chips or similar materials

- Composting: use of vessels or windrows to promote the degradation of organic residues and neutralization of pathogens. This process step involves high heat, up to 160°F; much of the stabilization of the biosolids occurs during this stage (Metcalf & Eddy, 2003)
- Curing: use of piles and/or windrows to allow the temperature of biosolids to decline and results in additional stabilization
- Post-processing: involves removal of residual inorganics (e.g., metal and plastic refuse) and preparation for disposal or reuse, such as transfer of biosolids into bags or other containers for use in the community by municipalities and/or residents.

Hauling of Digested Class B Biosolids

Biosolids are identified in 40 CFR Part 503, Subpart D, as “Class B” if pathogens are detectable but at levels that do not pose a threat to public health and the environment provided measures are taken to prevent exposure to the biosolids after disposal. (USEPA, 1994) Anaerobic digestion is one of the most common technologies for producing a Class B biosolids on-site. As noted above, digestion requires a high level of operations and maintenance to be effective, and proper conditioning and heating of the incoming sludge is necessary to ensure effective digestion. Hauling of digested Class B biosolids is one of the most common methods of offsite disposal. This approach to disposal is subject to variable fuel costs and tipping fees at the disposal site. Tipping fees are typically based on wet weight, making the effectiveness of solids dewatering a major focus of the treatment operation. Dewatering is typically accomplished using mechanical dewatering equipment (e.g., belt or screw presses, centrifuges); mechanical systems achieve solids concentrations ranging from 15% to 25%. Mechanical dewatering is occasionally supplemented or replaced by drying systems (ponds, beds, or mechanical drying systems), with the goal of reaching concentrations of at least 50% solids prior to hauling.

Hauling of Composted Class B Biosolids

Under a scenario involving hauling of composted biosolids, the composting process would be managed to achieve Class B pathogen concentrations. As described above, dewatering sludge prior to composting would be necessary, and the method for dewatering would involve either mechanical or drying systems. The dewatered sludge would then be transferred to an onsite composting location to undergo pathogen and vector reduction to achieve Class B status prior to hauling. Hauling under this scenario is subject to the same issues of variable fuel costs and tipping fees as identified for hauling of digested Class B solids.

Hauling of Sub-Class B Dewatered Biosolids:

Sub-Class B biosolids start as waste sludge taken directly from the final liquid treatment process (e.g., secondary clarifier). The waste sludge is not subjected to further stabilization (i.e., no digestion or composting). Sub-Class B biosolids contain pathogen concentrations greater than Class B levels. A scenario involving hauling sub-Class B biosolids requires fewer onsite biosolids management facilities (e.g., no digestion or composting facilities), but this approach could result in increased disposal costs over a Class B hauling scenario. Sub-Class B biosolids cannot be directly land applied and must first be processed further at an offsite receiving facility. Some of these facilities are implementing drying systems to process the bulk sludge deliveries. Receiving facilities charge a premium for receiving sub-Class B biosolids.

2.2 Disposal Opportunities for LOWWP

Based on research conducted of sludge treatment alternatives for the LOWWP (Carollo, 2008), disposal opportunities essentially dictate treatment method for biosolids produced in Los Osos. San Luis Obispo County recently adopted an urgency ordinance that restricts land application in the county to 1,500 cubic yards of Class A biosolids per year. Class B biosolids are not allowed to be land applied in San Luis Obispo County or neighboring Monterey, Kings, Kern, and Santa Barbara Counties. As shown in Table 1, landfilling of Sub-Class B or higher biosolids as cover material or co-disposal, and bulk distribution of Class A only biosolids in the form of amended compost are the only remaining viable disposal opportunities available within the County.

Table 1: Biosolids Disposal Opportunities for LOWWP

Disposal Alternative	Required Treatment Level	Possible Treatment Methods	Allowed by Local and State Regulations ^(1,2)
Landfill	Sub-Class B	Dewatering or Drying	Yes
Compost	Class A	Dewatering + Composting + Testing	Yes
	Class B	Dewatering + Composting	No
Land Application	Class A	Dewatering + Composting + Testing	Yes ⁽³⁾

(1) Carollo, 2008.

(2) County of San Luis Obispo, 2008.

(3) Limited to total disposal of 1,500 cubic yards per year in San Luis Obispo County.

2.3 Regional Biosolids Treatment Alternative

Although composting on a regional basis does not appear logical as an immediate option, due to limitations of the site resources, the proposed project may include composting as a long term option solely for the Los Osos community biosolids. The mere potential for this as a long term option has an immediate impact in that siting requirements should include space for a future composting operation. The mentioned limitations on site resources include limited physical area within the Morro Bay/Cayucos treatment plant, and limited personnel operating and maintaining the California Mens Colony treatment plant.

The alternative to a single point solids treatment and disposal system, in accordance with the above methods, includes regionalization with one or more treatment facilities in the area:

1. Morro Bay/Cayucos Wastewater Treatment Plant
2. California Men's Colony Wastewater Treatment Plant

The Morro Bay/Cayucos Sanitary District Treatment Facility (MBCSD) currently treats an average of 1.3 million gallons of wastewater per day. Solids are dewatered and converted to a compost product that is amended with different materials and bagged for public distribution. MBCSD must meet Federal 40 CFR 503 regulations for Class A biosolids in order to dispose of their biosolids in this manner. However, expanding their composting operation for a regional

capacity would be limited by the site area. It is currently occupied with treatment facilities and is planned to be converted from a TF/SC liquid treatment process to an oxidation ditch process. Essentially, this conversion, combined with a doubling of capacity to hypothetically incorporate flow from LOCSD, would exceed the space availability to continue with a composting operation.

The California Men's Colony Wastewater Treatment Plant (CMC) currently treats an average of 1.33 million gallons of wastewater per day. Sludge produced by the liquid treatment processes is anaerobically digested to produce Class B biosolids. The biosolids are dewatered and hauled offsite for landfill disposal. No plans are in place for composting or other beneficial uses for biosolids from CMC. Furthermore, the staffing capabilities limit the ability of this treatment plant to incorporate processes, such as composting, into the current operations to produce a Class A sludge.

Based on the current status of biosolids programs at these agencies, there is a reduced benefit for LOCSD to combine efforts with both MBCSD and CMC to form a regional biosolids management program. Neither of the existing agencies have sufficient site space to provide for additional treatment and storage of solids on a regional basis, which would require that a regional biosolids facility be located offsite or at the location of the new LOCSD treatment facility. Because MBCSD already has an established composting program, they would not immediately benefit from construction of a new facility offsite, and would experience an increase in operating costs for hauling solids to the LOCSD for final treatment.

The estimated solids produced by the CMC wastewater treatment facility is 3,000 pounds per day dry solids. (Carollo, 2008) Combined with LOCSD, the resulting estimated daily solids production is 7,000 pounds of dry solids. At a 25% solids concentration (assuming preliminary dewatering at both facilities), a 20 ton capacity truck would need to be employed to haul solids from the individual facilities to the regional facility once per day. The hauling effort could be reduced by more than 50% if a regional facility were located at the new LOCSD site.

The only remaining option for a regional biosolids program is to combine solids waste streams from LOCSD and CMC and treat the combined solids at a facility located on the new LOCSD site.

2.3.1 Summary Description of Regional Biosolids Facility

A regional biosolids program would need to include a treatment and disposal method that is beneficial to both agencies involved. Land application in San Luis Obispo County is limited for the interim, so the only options available for disposal are landfilling and composting for beneficial community reuse. As the former typically involves onsite dewatering before hauling to the landfill, Los Osos and CMC would not benefit from hauling diluted solids to a regional facility for further dewatering. Subsequently, composting to a Class A level becomes the only technically feasible disposal alternative for a regional biosolids facility in San Luis Obispo County. However, this potential would not prove to be beneficial if the local community does not readily accept the land application of the biosolids – which is not likely to occur within the agricultural sector.

Existing CMC Wastewater Treatment Facility - The existing CMC treatment process includes anaerobic digestion, which reduces the total amount of solids (volatile fraction) that would normally be hauled offsite. CMC would most likely continue use of anaerobic digestion if

entering into a regional biosolids program because digestion reduces the overall amount of sewage sludge hauled. Biosolids collected and hauled to a regional facility from CMC would already meet the requirements for Class B biosolids.

Existing MBCSD Wastewater Treatment Facility - The existing MBCSD treatment process includes anaerobic digestion, which reduces the total amount of solids (volatile fraction) that would normally be hauled offsite. MBCSD would most likely continue use of anaerobic digestion if entering into a regional biosolids program because digestion reduces the overall amount of sewage sludge hauled. Biosolids collected and hauled to a regional facility from MBCSD would already meet the requirements for Class B biosolids

New Los Osos Wastewater Treatment Facility - Anaerobic digestion was found to be impractical for use at Los Osos due to the type of liquid treatment process employed. The wastewater treatment process alternatives included in Technical Memorandum 2.2 (e.g. MBR, Extended Aeration, Oxidation Ditch, etc.) all require air to be added to the wastewater to reduce the organic component, a portion of which is volatile solids. Transferring solids from an aerobic system for treatment in an anaerobic system is inefficient in light of the already reduced solids quantity.

Regional Facility - An integrated system for a regional biosolids facility would include a program for hauling dewatered solids from CMC and from MBCSD to the LOWWP plant, dewatering of sludge from LOCSO to match the concentration from CMC/MBCSD, a composting facility with soil amendments, storage per EPA 503 regulations, and bagging for beneficial reuse similar to MBCSD. Significant public outreach would be necessary to find a market for the bagged compost material, which may be in competition with the material produced by MBCSD. As an alternative, composted material could be marketed to users outside of the County, resulting in hauling costs exceeding standard operating and maintenance costs for the regional facility.

2.3.2 Summary Description of Proposed LOCSO Facility

If Los Osos were to treat and dispose of solids as a sole owner and operator, they are not required to produce Class A biosolids for composting. Los Osos can utilize the landfill disposal option at a significantly lower capital and operational cost than other disposal alternatives.

However, the plant site should be adequate to provide for a long term potential operation that may include composting and the sizing of the waste solids holding (and aeration equipment) be adequate to aerobically upgrade from a sub-Class B level to Class B.

Landfills in the region, including Cold Canyon and Chicago Grade (Carollo, 2008), require that solids include less than 50% moisture due to landfill lining requirements. Both landfills can use the Sub-Class B biosolids for cover material, which is a more desirable fill method than co-disposal. As in the case of other biosolids scenarios, the LOWWP onsite facility would include dewatering equipment consisting of a mechanical system (e.g. belt filter press, centrifuge, screw press) to reduce the water content of the sludge. Additional drying by a thermal or solar drying system would reduce the moisture content to the level needed for use as cover material at a local landfill.

2.4 Results of Evaluation

The criteria to be used in evaluating a regional (with composting as currently performed by MBCSD) versus a non-regional biosolids (sub-Class B, non-composting) facility are based on the LOWWP project objectives. These objectives were developed to address the major issues that are driving the LOWWP. A comparison of these results indicates that a regional biosolids facility does not compare favorably with a non-regional Los Osos facility and the other two agencies (MBCSD and CMC) continuing with their current biosolids strategies and operations. The project objectives and specific comments based on evaluating the two options are listed in Table 2:

Table 2: Results of Criteria Evaluation for Biosolids Alternatives

Baseline Criteria	Sub-criteria	Comments Based on Regional vs. Non-Regional (LOCSD) Facility
1. Water Balance	A. Salinity Management	No known impact.
	B. Groundwater Recharge	No known impact.
2. Water Quality	A. Meeting RWQCB requirements for WDR (discharge limits)	No known impact.
	B. Meeting RWQCB requirements for elimination of pollution to groundwater	Use of composted material by residents of Los Osos and CMC could potentially increase the level of salts and heavy metals in the groundwater if used in large quantities
	C. Addressing emerging contaminants: pharmaceutical and other constituents	No known impact.
3. Energy	A. Contributing to improvements in air quality	Transportation of Class B biosolids from individual treatment plants to a landfill would emit less greenhouse gases than would be associated with a regional composting facility, due to the need for hauling bulking agents and the increased volume of composted material produced.
	B. Promoting sustainability	Energy used in transporting material is wasted, so neither alternative provides a benefit to the LOWWP.
	C. Reducing greenhouse gas emissions	The greenhouse emission associated with a regional biosolids facility would be approximately twice that of the Los Osos facility due to (3.A)

		above.
4. Costs	A. Life Cycle Costs	See below.
	B. Staffing Requirements	A composting facility would require two staff in addition to what would be required for a Los Osos biosolids facility.
	C. Community Acceptance	Both alternatives include minimal impact to private property; however, the composting facility would be more noticeable to neighboring residents than a simple dewatering or drying system at the Los Osos
5. Permittability	A. Coastal Permit	The regional alternative creates an impact within the coastal area thereby increasing the permitting considerations beyond the proposed project.
	B. Endangered Species Habitat Areas (ESHA)	No known impact.
	C. Environmental	No known impact.
	D. Land Uses	A composting facility would exceed the site requirements of a simple dewatering system, but be similar to a solar drying system at the Los Osos
	E. Engineering	No differences based on permissibility.

Section 3: Life-Cycle Costs

The construction, operating, and maintenance costs together form the total future costs and determine the life-cycle costs. (Life cycle is defined as the equivalent present worth cost of project and future annual costs for a 20-year period). The life cycle cost to Los Osos would be prohibitively high for a regional biosolids facility, primarily due to extensive labor and material costs. A summary of the life cycle and detailed cost calculations follows.

Life Cycle Cost Calculations – Biosolids Management Alternatives

	Local LOWWP	Regional Facility
Project:⁽¹⁾		
Construction		
Dewatering	\$1,500,000	\$1,500,000
Drying	\$3,400,000	\$0
Composting	\$0	\$4,000,000
Subtotal, construction	\$4,900,000	\$5,500,000
Engr & Admin	\$1,715,000	\$1,925,000
Subtotal, project	\$6,615,000	\$7,425,000
Operating:		
Labor ⁽²⁾	\$156,000	\$468,000
Electricity	\$27,000	\$74,000
Supplies	\$10,000	\$50,000
Hauling	\$59,000	\$18,000
Subtotal, operating	\$252,000	\$610,000
Maintenance:		
Labor	\$26,000	\$78,000
Materials	\$49,000	\$55,000
Subtotal, maintenance	\$75,000	\$133,000
Life Cycle:		
Project	\$6,615,000	\$7,425,000
O&M	\$6,540,000	\$14,860,000
Total	\$13,155,000	\$22,285,000
LOWWP Share⁽³⁾	\$13,155,000	\$19,093,000

Operating Cost Basis

Capacity, lbs dry solids/day	4000	7000
20 cy Truckloads/Week	1	2
\$/Truckload to Regional Facility ⁽⁴⁾	-	\$168
\$/Truckload to Landfill ⁽⁵⁾	\$1,125	-

Equipment Energy, kwh/yr ⁽⁶⁾	179,711	490,122
Unit cost, \$/kwh	\$0.15	\$0.15

Notes:

(1) Construction costs are from April 2008 Carollo report. Engineering and administrative costs are estimated at 35%.

(2) Assumes two additional staff required for composting facility.

(3) Project costs for regional facility on a pro rata basis using 57% solids capacity for LOWWP share.

(4) Based on 20 miles roundtrip to Regional Facility, 25% solids concentration, 5.65 mpg, \$5.00/gal diesel + labor.

(5) Based on 40 miles roundtrip to Cold Canyon landfill, 50% solids concentration, \$47/wet ton tipping fee, 5.65 mpg, \$5.00/gal diesel + labor.

(6) Based on assumed power demands of 50 HP dewatering, 5 HP drying, and 100 HP composting for 12 hrs/day.

References

Carollo, 2008; "Technical Memorandum: Solids Handling Options – Final Draft, San Luis Obispo County, Los Osos Wastewater Project Development." April 2008.

Metcalf & Eddy, 2003; Wastewater Engineering, Treatment and Reuse. McGraw-Hill Companies, New York, NY. 2003.

San Luis Obispo County, 2002; Letter to Board of Supervisors," The San Luis Obispo County Treated Sewage Sludge/Biosolids Land Application Task Force Report and Recommendations."

San Luis Obispo County, 2008; Title 8, Chapter 13 – Land Application of Treated Sewage Sludge/Biosolids, Government Ordinances.

USEPA, 1994; "A Plain English Guide to the EPA Part 503 Biosolids Rule"; EPA/832/R-93/003; September, 1994.

P-5: Regional Wastewater Treatment

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Los Osos EIR Technical Memorandum 2.5: Regional Wastewater Treatment

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Section 1: Introduction

The objective of this technical memorandum (TM) is to present the technical evaluation of alternatives for regional wastewater treatment using the criteria defined in TM 2.1.

1.1 Background

The purpose of the Los Osos Wastewater Project is to provide a wastewater collection, treatment, and disposal system for the unincorporated community of Los Osos. Currently the community relies on septic tank/drainfield systems for wastewater disposal. There are two existing and one potential wastewater treatment plants that have been considered as three alternative sites to evaluate as destinations for the Los Osos wastewater.

The current proposed plan is to collect the Los Osos wastewater in one of several types of pipeline collection systems (refer to Draft Proposed Project Descriptions) and then provide treatment at a single point. Alternatives to a single point treatment have been discussed in Technical Memoranda 2.2 (The Systems Components), and 2.3 (On-Site Based Alternatives). In this memorandum, the single point of regional treatment (and subsequent disposal of effluent and biosolids) is discussed at three alternative locations:

1. An existing treatment plant site off Atascadero Road in Morro Bay (the existing Morro Bay Cayucos wastewater treatment plant).
2. An existing treatment plant site in the California Men's Colony (California Men's Colony Wastewater Treatment Plant).
3. A potential site for a regional wastewater treatment plant, for planning purposes, in the general vicinity of South Bay Boulevard and Quintano Road. This area is generally known as the Chorro Valley, and the approximate site location is referred to as the Chorro Valley site.

At the Morro Bay plant site, the present plant is a mix of facility origins and of only partial secondary treatment. The most recent component was completed in 1985, thus is at least 23 years old. The plant is also outdated by the process capabilities and is on a timeline to be operating with a full secondary process by the year 2014. In addition to the conversion to full secondary from partial, a tertiary upgrade is also being considered, for at least a partial capacity. The intended program is to replace the aging facilities with a completely new plant.

At the California Men's Colony (CMC) plant site, the 68-year old plant has been recently replaced and converted to a new process, biological secondary treatment using an oxidation ditch for both nutrient (nitrogen) removal, and biological stabilization coupled with tertiary treatment and chlorination/de-chlorination for both reuse benefits and stream discharge into Chorro Creek.

Section 2: Regional Wastewater Treatment Alternatives

A recent technical memorandum has been released (Carollo, 2008a) that summarizes the options. They projected the capacity requirements for any of several regional treatment alternatives as follows:

Table 1: Regional Facility Flows and Alternatives, Los Osos Wastewater Development Project, San Luis Obispo County

Source	Design Flow, (mgd)	Los Osos + CMC (1) , (mgd)	Los Osos +MBCSD (2), (mgd)	Los Osos + CMC (1)+MBCSD (2), (mgd)
Los Osos	1.4	1.4	1.4	1.4
CMC	1.3	1.3	-	1.3
MBCSD	1.33	-	1.33	1.33
Total Flow	-	2.7	2.73	4.03

Notes:

- (1) California Men's Colony
- (2) Morro Bay/Cayucos Sanitary District

2.1 Summary Descriptions of the Wastewater Treatment Scenarios

2.1.1 Morro Bay Cayucos Sanitary District Treatment Facility

Review of existing unit process capacity. The existing MBCSD plant has a primary process capacity of 1.33 mgd, and a secondary treatment capacity of 0.97 mgd. Under their current regulatory authorization they are permitted partial secondary treatment because of a 301 H waiver granted by the Central Coast Regional Water Quality Control Board (CCRWQCB).

Existing Process. The hydraulic capacity presents one limitation of the existing facilities and the current process train presents a second limitation, effluent quality. The nature of an attached growth biological treatment system, such as the trickling filter/solids contact (TF/SC) process at

MBCSD, is somewhat less effective for a reliable tertiary filtration system than a suspended growth system such as the activated sludge process (e.g. oxidation ditch type activated sludge). The potential for reuse of effluent at Morro Bay depends on the ability to have a continuously-reliable tertiary effluent. Thus, converting the existing TF/SC to an activated sludge (oxidation ditch) system would provide a more reliable effluent for reuse. The only downside of this conversion is that a higher energy usage and cost will occur. The chief advantage of a TF/SC process is its inherent energy efficiency.

A Regional Plant Expansion. In order to create a regional plant, the existing plant would require both an upgrade in process and an expansion in capacity. The upgrade, which is already planned, would consist of conversion to a full secondary treatment with at least a partial capacity upgrade for tertiary. The expansion in capacity would be from the 1.33 to a total of 4.0 mgd.

2.1.2 California Men's Colony Treatment Facility

Review of existing unit process capacity. The existing new plant is adjacent to an older rock media trickling filter plant. The current process unit is an oxidation ditch with an average flow capacity of 1.3 mgd.

Existing Process. The existing process is activated sludge in an oxidation ditch configuration providing a highly stabilized biosolids and easily filtered secondary effluent. This process can provide tertiary effluent for unrestricted reuse and for safe discharge to an inland waterway. The only concerns for the future in regards to process would be (1) the mass loading into the Chorro Creek should a future nutrient Total Maximum Daily Loading (TMDL) be conducted by the CCRWQCB, and (2) a California Toxics Rule limitation on specific toxics (e.g. copper or arsenic) that may exceed the ability of the activated sludge process.

An important factor is the limitation of treatment process that potentially occurs with biological nutrient removal (BNR). In order to reduce the raw wastewater total nitrogen from the influent concentration (40 to 60 mg/l) to a limited effluent concentration of 8 or 10 mg/l, one of the adverse results can be an increase in the effluent toxics concentration. It can occur by the phenomenon known as "secondary release". The biological process in BNR requires much longer solids retention time. The biomass, as a result of this longer retention time, often releases more of the micro-constituents, such as the toxics, than they would have during a process not designed to remove nitrogen simply because of a much shorter solids retention time.

A Regional Plant Expansion. In a comparative sense, the alternative to expand the plant at CMC is less challenging than at MBCSD. This reason is because of (1) a larger space for expansion, and (2) a less urbanized surrounding. The challenges at the plant site are related to the agreements with multiple federal and state agencies and the restrictive environment of a prison facility.

However, as with all of the regional alternatives, the largest challenges lie in the construction of lengthy interceptors; the costs, and permitting.

2.1.3 In the Chorro Valley

There is no existing treatment facility. A new facility on a site would require at least 10 to 20 acres, depending on how the buffer zone for odor protection is determined. Although no specific requirement for a buffer has been determined, some buffer zone should be established, in light of sensitivity to potential public reaction. The area chosen for this evaluation is located within an agricultural zone but still close to established transportation corridors and would require proper mitigation of potential air, noise, and visual impacts. If the oxidation ditch process is utilized, with a biosolids process comparable to the process implemented for the CMC and proposed for the MBCSD plant sites, then mitigation measures would be reasonably achievable.

2.2 Description of an Integrated System

An integrated system for a regional wastewater treatment facility would consist of interceptors, a regional treatment plant, and disposal for effluent and treated biosolids. Of the three alternatives, not one is without challenges in environmental, political and economic components. However, the second alternative may present the least amount of technical challenges

The interceptor construction would be the most challenging component, from a technical standpoint because of the length of pipelines, the amount of traffic control required, and the permitting. The expansion of the CMC wastewater plant would be within a reasonably spacious existing site, although constrained by numerous permitting and agreement requirements. The effluent is already permitted to a discharge into Chorro Creek and effluent reuse is already being practiced. The current issues with the plant are some permit violations that are of a transient nature and should be remedied without modifying the plant's basic process configuration. Expanding the oxidation ditch could be completed with a parallel track. The sludge processing may need a substantial upgrade in an effort to not only increase capacity but to also prepare for the future disposal options of land application (Class A quality).

Effluent disposal into Chorro Creek is both beneficial to the local environment (shallow recharge and support for wildlife) and more readily available from the CMC facility site than pumping effluent from the Chorro site.

2.2.1 Biosolids Disposal

The potential for land application is very poor, incineration is non-existent, and thus only landfill disposal is likely. Ultimately, a new method of disposal may be necessary not only for Los Osos but all of San Luis Obispo County.

2.2.2 Effluent Disposal and Reuse

Effluent disposal is only available to Chorro Creek and to the Pacific Ocean. The potential to reuse the effluent in the Los Osos community is prohibitively expensive because none of the alternative regional treatment sites are within the Los Osos community.

2.2.3 Development of Water Balance

The first alternative, a regional facility at Morro Bay, would have a negative impact on the water balance. The current Los Osos wastewater situation is addition to the shallow groundwater from the septic system discharges. The Morro Bay Wastewater plant discharges effluent into the Pacific Ocean through a deep water outfall. This would be a complete loss of the effluent.

The second alternative, a regional facility at the CMC, would essentially be a relocation of the Los Osos effluent to the Chorro Creek basin. The third alternative, a regional facility in the Chorro Valley, would also require that the effluent be discharged into the Chorro Creek basin. The Chorro Valley plant, should it be constructed, could not discharge in a conveniently proximate location due to the seasonally high groundwater table and the impermeable clay soils.

2.3 Consideration of Environmental Impacts

Environmental impacts must be considered for construction and long term disturbances. The construction would involve excavations to depths of 25 to 30 feet. In the Morro Bay wastewater plant, excavations for depths as great as 25 to 30 feet would likely entail the use of either caissons or cofferdams. Either option would incur significant noise due to pile-driving equipment and considerable need for temporary piles, and sheeting or large concrete structures formed above grade and sunk into place.

Pipeline construction for the interceptors would incur lengthy disturbances over miles of right-of-way, some in highly restrictive areas and in areas with substantial traffic control.

The other disturbances would be long term such as continuous traffic for the removal of biosolids by trucks, the importation of chemicals, regular commute traffic by plant employees, and the occasional need for large vehicles to perform non-routine maintenance activities.

2.4 Financial Considerations

The final issue at hand is the need for a capital cost allocation agreement. There would be a normal procedure for an interagency discussion and negotiation and formal agreement. The agencies with existing facilities would believe that an "incremental cost" approach would be fair to them. There is a distinct difference between average total costs and incremental or marginal costs (Bonbright, 1961). An incremental cost approach means that the cost of an expansion to either the MBCSD or the CMC facility would be borne entirely by the Los Osos community. Also, if an entirely new facility were constructed, such as would be at the Chorro Valley site, then the cost to join that site for MBCSD and for the CMC would be borne by the Los Osos community.

From the perspective of the Los Osos community, they would be more likely to pursue a traditional "pro rata" cost allocation approach. This provides several complicating issues. For the CMC, they have invested in a new plant which is now an asset with a useful life of at least 20 years if not longer. They would want to be made whole for any arrangement with Los Osos. MBCSD has not yet made the same investment in new fixed assets and their existing assets have likely expired in a financial sense. Thus, their situation, although wanting to be made whole by Los Osos, has less cost involved. They would want to be subsidized on their

interceptor cost. Then, the cost of a regional facility for Los Osos and MBCSD could be reasonably shared on a “pro rata” basis.

Section 3: Summary of Technical Evaluation of the Feasibility of a Regional Wastewater Treatment System

There are three sites, two existing (Morro Bay and CMC) and one proposed (Chorro). The existing Morro Bay site is landlocked between the coastline and developed urban structures. The site is already utilized with an existing trickling filter/solids contact (TF/SC) plant with anaerobic digesters that are aged more than 20 years and not adequate for future permit requirements or for a capacity to include Los Osos flow. Thus, the existing TF/SC process needs to be replaced for reasons of effluent quality (full secondary) and for longevity of facilities. Their proposed local project includes two upgrades:

- Conversion from a partial primary, partial secondary to full secondary
- Conversion to a partial tertiary

The potential to add the capacity for Los Osos is possible by use of several different processes that require a small footprint. The master plan for Morro Bay (Carollo, 2007) has indicated the best process for that site, costs, and effluent conditions to be an oxidation ditch. This was predicated on the capacity of 1.3 mgd. However, an expansion to 2.7 mgd would be prohibitive because of space limitations as described below.

The significant challenges technically are first of all the completion of not only an entirely new process train (for MBCSD) but also a parallel train with the capacity to serve Los Osos and to construct these facilities on an already congested site while maintaining continuous service to the MBCSD customers.

The second challenge is the magnitude and the obstacles for an interceptor pipeline to convey raw wastewater from the Los Osos community to the MBCSD plant site. The interceptor pipeline would require potential State and Federal permits for construction in a State Park, construction in stream crossings, paralleling a State highway, and acquisition of permanent maintenance easements.

3.1 Result of Evaluation

Project objectives (criteria) have been used to rate each of the three regional treatment alternatives. The comparison of these results indicates that none of the regional alternatives compares favorably with the proposed project for a LOCSO treatment system. If comparing within the framework of regional alternatives, overall the best regional alternative from a technical perspective is as follows:

- Chorro Valley Regional Wastewater Treatment Plant

This evaluation is limited to technical comparisons of the three regional strategies. From a financial perspective, it represents the most costly largely due to two factors:

1. Interceptors would be required to combine all three service areas into a single point of treatment and the effluent would have to be pumped back to Chorro Creek

2. The cost burden to replace the new treatment plant just completed for the CMC would have to be assumed that of LOCS D

Project Objectives (Criteria)

- Water balance (with effluent disposal playing an important part); none of the three regional treatment alternatives provides the community of Los Osos with a water balance. The MBCSD alternative eliminates any potential benefit as the water is disposed to the ocean. The other two regional treatment alternatives provide some benefit. The Chorro Creek discharge would indirectly benefit the community of Los Osos as a basin recharge.
 - Saltwater intrusion into lower aquifer
 - Groundwater recharge
- Water quality; the three regional alternatives would provide effluent quality standards equal to (or greater than) the standards that would be required for a LOWWP treatment plant, assuming that MBCSD does proceed with a reuse program and includes Title 22 effluent standards (disinfected tertiary effluent).
 - RWQCB requirements for WDR (discharge limits)
 - RWQCB requirements for elimination of pollution to groundwater
 - Need to address pharmaceutical and other constituents consistent with EPA standards
- Energy (Green House Gasses); the energy consumption (and the consequent results in reduced air quality and increased use of non-sustainable fuel material) would be greater than the energy consumption for the LOWWD treatment plant. The significant difference in the energy usage lies with the transportation cost of regionalization. The above described regional alternatives, compared to the LOWWD treatment plant, would use comparably equal amounts of energy for the same wastewater flow. Approximately 50 percent of the energy consumption in the plant is directly proportional to the wastewater flow and loading of biochemical oxygen demand and total kjehldahl nitrogen (the combination of organically bound nitrogen and ammonia in wastewater). The remaining energy use in the treatment plant is not directly proportional but can be affected by the design requirements for the site development.

In summary- there is little difference in energy demand for the regional alternative treatment plants. The plants would use roughly equal amounts of energy for the same flow and loading. The real difference is seen with the interceptor pumping energy costs. This will make the regional systems use more energy than the LOWWP treatment system uses.

- Air quality
- Sustainability
- Costs; the capital and operating and maintenance costs together form the total future costs and determine the life-cycle costs. (Life cycle is defined as either the present worth of total future costs or as the equivalent annual cost of all future costs). Either definition is supported by:
 1. Initial project costs (capital)
 2. Annual operating and maintenance costs
 3. Life period for evaluation (20 years or longer)
 4. Discount rate (interest factor for financing or agency cost of capital)

Assuming a 20-year period for evaluation and a cost of capital approximately five to six percent, the life cycle cost, on a present worth basis, then becomes the sum of the project cost plus approximately 11 times the assumed annual cost of operation and maintenance. However, due to the expectation for significant increases in energy, as is presently occurring, the formula for life cycle could be more realistically equal to the project cost plus as much as 15 to 20 times the initial annual cost of operation and maintenance. For the analysis below, the life cycle calculation includes 20 times the present day annual O&M. A summary of the life cycle and detailed cost calculations is detailed below as Table 2-5.x.

The local communities represented by the three regional treatment alternatives have clearly expressed their rejection for the idea of a regional project and from a financial perspective; the local cost to LOCSD would be prohibitively high for any regional project. Each regional project is more expensive than the proposed project.

- Permittability
 - Coastal Permit for any work (compliance with LCP). Each of the regional alternatives creates impacts within the coastal area thereby increasing the permitting considerations beyond the proposed project.

These considerations are described within the environmental assessment:

- ESHA considerations of what can and cannot be done in the zone
- Environmental (Section 7 consultations, archeology, sensitive species/habitat, State Marine Reserve, etc.)
- Land uses (no other feasible alternative for ESHA, prime ag land, siting of public utility facilities)

Table 2: 2-5.x Life Cycle Cost Calculations (For Los Osos' Share)

Cost Comparison of Treatment Alternatives				
	Local LOWWP	Regional Alternatives		
		MBCSD	CMC	Chorro Valley
Initial:				
Construction				
WWTP	\$19,600,000	\$16,871,795	\$18,600,000	\$42,275,434
Interceptor Pipe	\$0	\$4,700,000	\$8,700,000	\$16,600,000
Interceptor PS	\$0	\$1,000,000	\$1,000,000	\$3,000,000
Subtotal	\$19,600,000	\$22,571,795	\$28,300,000	\$61,875,434
Engr & Admin	\$6,860,000	\$7,900,128	\$9,905,000	\$21,656,402
Project	\$26,460,000	\$30,471,923	\$38,205,000	\$83,531,836
Annual:				
Operating-				
WWTP	\$564,000	\$897,000	\$888,000	\$1,236,000
Pumping	\$0	\$120,638	\$222,228	\$427,524
Subtotal, operating	\$564,000	\$1,017,638	\$1,110,228	\$1,663,524
Maintenance				
WWTP	\$376,000	\$598,000	\$592,000	\$824,000
Interceptor Pipe	\$0	\$23,500	\$43,500	\$83,000
Interceptor PS	\$0	\$10,000	\$10,000	\$30,000
Subtotal, maintenance	\$376,000	\$631,500	\$645,500	\$937,000
Total O&M	\$940,000	\$1,649,138	\$1,755,728	\$2,600,524
Life Cycle:				
Initial	\$26,460,000	\$30,471,923	\$38,205,000	\$83,531,836
O&M	\$18,800,000	\$32,982,760	\$35,114,557	\$52,010,481
Total	\$45,260,000	\$63,454,683	\$73,319,557	\$135,542,317
O&M Costs				
Plant O&M (est.)	\$940,000	\$1,494,675	\$1,478,250	\$2,059,330
Personnel	\$275,000	\$275,000	\$275,000	\$300,000
Materials and supplies	\$275,000	\$385,000	\$385,000	\$490,000
Contract Services	\$250,000	\$500,000	\$500,000	\$770,000
Capital Outlay	\$140,000	\$335,000	\$320,000	\$500,000
Subtotal, O&M WWTP	\$940,000	\$1,495,000	\$1,480,000	\$2,060,000

Interceptor O&M				
Pumping Station				
Operation	\$0	\$120,638	\$222,228	\$427,524
Maintenance	\$0	\$50,000	\$50,000	\$150,000
Pipeline				
Maintenance	\$0	\$23,500	\$43,500	\$83,000
Flow. Mgd	1.40	2.73	2.70	4.03
Miles of Int. Pipeline	0	5.7	10.5	13.2
Miles of Eff. Pipeline	0	0	0	7
Pump. Energy, kwhr/yr	0	804,253	1,481,519	2,850,160
Unit cost, \$/kwhr	\$0.15	\$0.15	\$0.15	\$0.15

Notes:

1. Costs are from Carollo's memorandum using 2007 level construction cost estimates.
2. Project costs shown are for LOCSD's share
3. LOCSD would have to bear cost of relocating CMC's plant capacity in regional alternative at Chorro Valley.
4. Use 0.5 percent of capital cost for interceptors as estimate of annual maintenance cost.
5. Interceptors are required for regional treatment; LOCSD proposed project pipelines are not calculated as interceptor for comparison because their project requires pipeline for customer collection system.

References

Carollo 2008 a: Carollo Engineers
Technical Memorandum
Regional Treatment
May 2008

Bonbright, James C., *Principles of Public Utility Rates*, Columbia University Press, NY, NY, 1961

P-6: Decentralized Treatment

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Los Osos EIR Technical Memorandum 2.6: Decentralized Treatment

13 November 2008



K/J Project No. 0893003

29 October 2008

Technical Memorandum

To: Michael Brandman and Associates (MBA)
From: Kennedy/Jenks Consultants
Subject: Los Osos Draft EIR Technical Memorandum 2.6
The Decentralized Treatment Appendix
K/J 0893003

DESCRIPTION

The purpose of the Los Osos Wastewater project is to provide a wastewater collection, treatment, and disposal system for the unincorporated community of Los Osos. Currently the community relies on septic tank/drainfield systems for wastewater disposal. There are three categories of treatment available. There are:

- Centralized Treatment
- Decentralized Treatment
- On-site Treatment

For purposes of this technical memorandum centralized treatment will consist of collection and taking all the wastewater to one location for treatment; on-site treatment consists of treating each individual discharge at the point of use; and decentralized treatment consists of utilizing two or more treatment facilities, each of which serves a nearby cluster of homes. This technical memorandum describes the decentralized alternative.

DECENTRALIZED ALTERNATIVES

The decentralized alternative is similar to the on-site alternative except that larger numbers of homes (100-500+) may be cluster together and individual treatment units are provided for each cluster. Disposal would still be performed subsurface either at common facilities or returned to the individual homes for on lot disposal.

This option is presented in a recent technical memorandum (Carollo, 2008c) that includes a three technical memorandum prepared by Lombardo Associates, Inc. (LAI, 2008a, b, and c). These technical memorandum addresses:

- Design Criteria
- Alternative Scenarios
- Cost

Two alternative scenarios were presented by LAI:

- Scenario 1 – Multiple Locations within Los Osos.
- Scenario 2 – Two Locations within Los Osos

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There are a number of elements that are common to both scenarios. These commonalities include:

- A treatment process consisting of flow equalization, a recirculating media filter (RMF), a denitrification filter, a polishing filter, and final disinfection by UV and/or ozone.
- A disposal process consisting of individual residential on-lot drip irrigation facilities and/or non-residential drip irrigation and on-site subsurface disposal
- The treatment process area would be sized based on 0.23 sf/gpd, not including buffer and set back requirements
- The disposal area would be initially sized assuming a loading rate of 1 gpd/sf
- Storage of approximately 20 days would be required for periods when complete subsurface disposal could not be practiced due to climatic events.

Scenario 1

In Scenario 1, treatment is provided at 7 locations in Los Osos. The exact locations were not identified rather some representative sites were described. These included school property, vacant lots and “paper” street (“paper streets” are dedicated road rights-of-way that were never developed into streets maintained by a governmental entity. In a similar manner a number of potential disposal sites were identified, but final recommendations were not given.

Scenario 2

In Scenario 2, treatment would occur at two sites. One site would be the Mid-Town site and would have a flow of approximately 767,000 gpd. The second site would be located in the northeast portion of Los Osos and have a flow of approximately 439,000 gpd. The potential treatment sites are better defined than those for Scenario 1, but the disposal sites are not defined in any greater detail than they were in Scenario 1.

COST CONSIDERATIONS

Preliminary construction and operation and maintenance costs have been developed for these two Scenarios. These costs are presented in Table 1. It is to be noted that the capital costs include the costs of the collection system.

TABLE 1: DECENTRALIZED OPTIONS – COST SUMMARY

ITEM	SCENARIO 1		SCENARIO 2	
	Residential	Non-Residential	Residential	Non-Residential
DISPOSAL				
CAPITAL COST (\$M)	216-240	171-1851	214-238	169-182
O&M COST (\$M)	2.1	1.9	1.5	1.3

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NON-COST CONSIDERATIONS

A number of items were identified in this technical memorandum as areas of concern that were not fully described. These areas of concern include:

- These decentralized facilities would be located in town in Environmentally Sensitive Habitat Areas (ESHAs) as defined by the California Coastal Commission and therefore unique siting and permitting issues must be addressed
- Adjacent homeowner opposition may exist
- The availability of vacant parcels for purchase and the County's position on vacating "paper streets" is unknown

REFERENCES

Carollo 2008 C: Carollo Engineers
Technical Memorandum
Decentralized Treatment
October 2008

LAI 2008a Lombardo Associates, Inc. 2008
Technical Memorandum, Task 1 – Design Criteria
May 2008

LAI 2008b Lombardo Associates, Inc. 2008
Technical Memorandum, Task 2 – Decentralized Wastewater Treatment Scenarios
3 July 2008

LAI 2008c Lombardo Associates, Inc. 2008
Technical Memorandum, Task 3 – Cost Estimate for Decentralized Scenarios
22 August 2008