BASIS OF DESIGN REPORT

Los Osos Wastewater Collection System Project

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Los Osos Wastewater Collection System Project Basis of Design Report

1. Project Description

1.1 Introduction

The community of Los Osos is located along the central coast of California on the southern edge of Morro Bay in San Luis Obispo County as shown in Figure 1.

Los Osos is a predominately residential community with 14,600 residents. The community's drinking water system is composed of a series of groundwater wells in the Los Osos area. The community's wastewater system is composed of individual septic tanks with associated leachfields or pits. The County of San Luis Obispo (County) is the government body responsible for wastewater management within the community.

Figure 1. Project Location

1.2 Project Background

Groundwater resources in the Los Osos area are divided into four distinct aquifers. The fault dividing the community into east and west also divides the groundwater resources into an eastside aquifer and a westside aquifer. In addition, an aquitard further divides both the eastside and westside aquifers into an upper and lower aquifer. In general, the upper aquifer is within 150 feet of the ground surface and the lower aquifer is below approximately 190 feet of the ground surface. Most of the community's drinking water wells draw groundwater from the lower aquifers.

Elevated levels of nitrate are present in the upper aquifers of the groundwater basin on both the eastside and westside of the community. High nitrate levels in drinking water are a public health concern, particularly for newborns where it can cause "blue baby syndrome". To protect public health, the California Department of Health Services (DHS) has established a drinking water limit of 10 mg/l nitrate (as N) in drinking water supplies.

In the early 1980's, nitrate levels in the upper aquifers within Los Osos exceeded the drinking water limit of 10 mg/l (as N). In several areas, water quality data suggested that a buildup of nitrate was occurring in the upper aquifers. The primary source of nitrate contamination was

identified by the Regional Water Quality Control Board (RWQCB) to be septic tanks and their associated leach fields. As a result, the RWQCB amended its Basin Plan and adopted Resolution 83-13 prohibiting the use of septic tanks with leach fields and seepage pits within the Prohibition Zone of Los Osos.

1.3 Facility Description

The recommended project presented in the final Project Report includes a wastewater collection system with pump stations and standby power facilities and a recycled water system. A description of these project components is presented below. The wastewater treatment facility will be designed under a separate project.

1.3.1 Collection System

The Los Osos wastewater collection system will be a conventional gravity sewer with pump stations. The gravity sewer system will include approximately 200,000 lf of predominantly 8-inch diameter sewer mains. Nine wastewater submersible pump stations and approximately 12 pocket grinder pump stations have been identified at this time. Each submersible pump station will be provided with standby power facilities. The pocket grinder pump stations will not require standby power capability.

The collection system will be divided into four geographic areas based on drainage characteristics. The basis of design for the wastewater collection system will be to design the main sewers, trunk sewers, and laterals in a manner that will maximize gravity connections and to minimize pumped connections for customers. The sewers for a given drainage area will be routed to pump stations that will be designed to convey the collected wastewater via force main to subsequent gravity sewers and the Mid-Town pump station for ultimate delivery to the wastewater treatment facility. The pump stations and standby power facilities will be designed with communication to the SCADA system.

1.3.2 Recycled water System

Recycled water disposal will be accomplished with a percolation (subsurface distribution) system, landscape irrigation, and agricultural reuse. The percolation system will be divided into a number of application fields. The application fields will consist of horizontal perforated piping. The connection to each percolation zone will be equipped with an isolation valve. There will be no “harvest wells” on this project and all references to same will be deleted.

Monitoring wells will be provided to allow periodic measurement of groundwater levels and to obtain groundwater samples at key locations in the vicinity of the percolation sites. The turnouts for potential water reuse sites will be equipped with an isolation valve and there will also be no automatic flow control at irrigation sites.

The recycled water system will be designed with a transmission pipeline from the WWTF to percolation fields and potential water reuse sites.

2. Design Criteria

2.1 Introduction

The Design Criteria section is intended to summarize the key design criteria that will serve as the basis of design for the Los Osos Wastewater Collection System Project. The design criteria presented herein are subject to revision based on review and comment by the County and consultants. The design criteria will be further refined as the final design effort advances.

The design criteria are presented in sections corresponding to the three major design tasks — Collection System, Pump Stations, and Recycled water. Please contact CDM's Project Manager if any additional clarification or detail of the design criteria is desired.

2.2 Collection System

This section presents design criteria for the collection system gravity sewers and force mains. The design criteria are based upon the San Luis Obispo County Standard Plans and Specifications and supplemented by CDM standards as appropriate.

2.2.1 Gravity Sewers

Design Standards

- <u>Design Flow</u>
  1. Average dry weather flow will be 50 gallons per capita per day and 2.5 persons per benefit unit in lieu of 300 gallons per day per single family residence.
  2. Peaking Factor (PF) per Gifft equation from WEF MOP No. 9 is

     $PF = 5/P^{(1/6)}$ where P = Population in 1000s (for Los Osos, P=14.5)

  3. Peak hour dry weather flow will be the average dry weather flow times the peaking factor.
  4. Allocation for I/I contribution will be 200 gpd per inch mile.
  5. Peak hour wet weather flow will be the sum of the average dry weather flow times the peaking factor (peak hour dry weather flow) plus the I/I contribution.
  6. At peak hour wet weather flow, the hydraulic depth will be less than or equal to 0.7 d/D.
  7. A hydraulic model was created using the Los Osos Community Services District collection system as a base case with the flow generation factors outlined above. The results of the model are included as Appendix A.

- <u>Grades</u>
  1. Preferred velocity will be 2.0 feet per second at peak hour dry weather flow using Manning's n=0.0011. Several reaches of the gravity collection system do not meet this preferred velocity as noted in the 30% design documents due to low flow volumes. Collection system reaches that do not meet the preferred velocity may require additional maintenance for optimal operation and are recommended to be included in a regular inspection and cleaning program.
  2. Design velocity guidelines will be as follows:
     a. Design for 2 fps

b. If that is not possible or reasonable without drastic changes then go in this order **for 8 inch pipes**
   1) Try to design for minimum slope of .0033 if still lower than 1.2 fps, then
   2) Try to design to get 1.2 fps - If still too low, then make a reasonable judgment but do not go deeper than 8 feet deep from ground surface
   3) All lines that have less than 2 fps will be noted in a table and the design velocity noted

3. Minimum sewer grades per County standards except that 6-inch sewers will not be used and minimum slope for 8-inch sewers will be 0.0033.
4. Sewer laterals will use 0.25-inch per foot slope except that 0.125-inch per foot will be considered on a case by case basis. Where this grade cannot be achieved to allow a benefit unit to connect by gravity, a private grinder pump system will need to be installed to pump up to the point of connection at the property line. Costs for the private grinder pump installation, operation, and maintenance will be borne by the private property owners.

Location and Alignment

- Separation from Water Mains
  1. Horizontal clearance between existing water mains and the sewer will be 15 feet where feasible to facilitate the future replacement of existing water mains as the minimum separation required is 10 feet. Vertical separation shall adhere to DHS separation requirements.
- Depth
  1. Minimum cover of 36-inches for pipelines on secondary roads and 48-inches for pipelines in primary roads.
  2. House lateral minimum cover at the property line of 36-inches. Minimum cover less than 36-inches will be considered on case by case basis.
- Pre-treatment
  1. Require grease traps for all restaurants and other oil and/or grease producing facilities.
  2. Provide monitoring manholes (for inspection and manual wastewater sampling) for all industrial facilities (garages, laundries, metal working shops, etc.). Monitoring manholes shall be provided with a Palmer-Bowlus flume and ultrasonic flow meter as directed by the County Engineer. An automatic wastewater sampler shall also be provided as directed by the County Engineer.

Gravity Sewers

- PVC Sewers
  1. Pipe shall be SDR 35 or AWWA C900, SDR of 25. Either SDR 35 or C900 wyes will be used where available. A separate Technical memorandum discusses the use of C900 in high groundwater areas.

     Appendix H contains the Los Osos Wastewater Project – Pipe Material Technical Memorandum which details pipe recommendations for the project.

2. Use integral bell and spigot type with elastomeric gasket only conforming to ASTM D 3212.

- Sewer Size
  1. Shall be 8-inch minimum diameter.
- Trenching and Backfill
  1. Bedding depth below the pipe shall be 6-inches and materials will be specified in standard details on the drawings.
  2. Provide 90% relative compaction in pipe zone and 95% above.
  3. For wet and/or soft trench bottom areas, over-excavate a minimum of 12 inches and provide foundation material (1-inch to 3-inch drainrock) wrapped in geotextile or controlled density fill backfill as will be specified on the drawings.
  4. Provide warning tape 12 inches above pipe for PVC gravity sewers.
- Large Laterals
  1. Laterals 6 inches and larger shall be connected to the sewer main at a manhole.
- Cleanouts
  1. Provide cleanout at property line and at dead end of sewer runs.
- Curb Marking
  1. Consider use of concrete marker marked "S" for areas without curbs. In all cases install 2x2 redwood stake at end of lateral to facilitate location for homeowner lateral connection.

Sewer Manholes

1. Manholes shall be either PVC lined from manhole bench elevation (bottom of barrel sections) to the underside of the manhole frame or use a Predl system throughout. Manhole should be spaced a minimum of 300 feet and maximum of 500 feet center to center and at all deflections in alignment and include an appropriate drop for the deflection taking place as discussed below. Where different sizes of pipe enter and exit the manhole an appropriate drop should be provided to assure adequate flow.
2. Coat manhole bench with epoxy Polibrid, or use a Predl system or equal.
3. Manhole frames and covers shall be County standard. Water tight covers will be used in areas where flooding may occur.

- Future Stub Outs
  1. Provide terminal manhole for all sewers greater than 200 feet in length.
- Manhole Elevations
  1. Do not provide any drop through manhole in lieu of 0.15-feet drop where single sewer passes through manhole with no change in alignment.
  2. Use 0.l0-foot drop through manhole in lieu of 0.15-feet drop where sewer alignment direction changes or at junction manholes.
- Cast in Place Bases

1. Use 9 inches of crushed rock under base.

- Straight Runs
  1. Cut out portion of pipe within manhole from springline up.
- Precast Manhole Base
  1. Use 9 inches of crushed rock under base.
  2. Use mastic type joint sealant only.
- Drop Manholes
  1. Per County Standard 5-1a
  2. Change 30 inches invert elevation difference to 36 inches.
  3. Install cross fitting on drop pipe instead of tee. Extend vertical leg of cross to grade and install clean-out valve box.

Laying Sewer Pipe
Use County Standard.

Discharge into Sewers
Use County Standard.

Testing of Sewer Mains

- Deflection Test
  1. Use 5% initial and 7.5% long term deflection (with typical 1.5 deflection lag factor). Require long tern deflection test at 11 months after installation.

2.2.2 Force Mains (FM)

The raw wastewater conveyance force mains will convey the pumped wastewater from each of the pump stations and discharge into the gravity collection system that drains to the Mid-Town Pump Station on Los Osos Valley Road. From the Mid-Town Pump Station, a force main will be aligned primarily along Los Osos Valley Road and will convey the wastewater to the wastewater treatment facility at the Giacomazzi site. The following force main design criteria shall be used.

Sewage Pump Station Force Mains (FM)

1. Use C-900 PVC pipe and provide a bid alternate for DR11 HDPE.
2. Use PVC or PE lined DIP fittings for FMs.
3. Provide pressure clean-outs at 1,500 feet spacing.
4. Provide blow-offs at low points where crown of pipe at low point is below the invert of any reach of upstream pipe.
5. Provide combination air and vacuum release valves (CARV) at all high points. All CARVs will be housed in precast vaults with activated carbon canister for odor control.

6. The profile of force mains should be carefully considered to minimize the installation of blow-offs and CARVs where possible. The discharge of any blow-offs or CARVs should be routed to a nearby gravity sewer manhole.
7. FM isolation valves are not proposed, (except on the LOVR FM) due to small diameter and comparatively short runs. The LOVR conveyance force main isolation valves will be direct-buried "solid wedge" plug gate valves for sewage service with stainless steel trim.
8. Design the force main hydraulics for a range of pipeline friction losses. Use Hazen-Williams value of C = 130 for design condition and verify that C=120 and C=150 is within the Acceptable Operating Range of the pump.
9. Minimum velocity of 2 fps, maximum velocity of 8 fps.
10. FM minimum cover of 3 feet in secondary roads and 4 feet in primary roads.
11. Minimum nominal 4-inch diameter for pump station FMs and minimum nominal 1 1/2-inch diameter for pocket grinder pump station FMs.
12. FM alignment may be curved (vertically and horizontally) as allowed by County water main standard.
13. Use restrained joint system in lieu of thrust blocks.

2.2.3 Pump Stations

The facilities included in this section are submersible pump stations with standby power facilities, and pocket grinder pump stations. The preliminary locations of the submersible pump stations are shown in the Drawings and pump station summary tables are presented in Tables 1 and 2.

The Mid-Town Pump Station is a submersible pump station located at the Mid-Town site that receives all of the flows from the collection system. The Mid-Town Pump Station pumps these flows to the headworks of the wastewater treatment facility located at the Giacomazzi site. The stand-by generator for this pump station will be located nearby the Los Osos Public Library, per CDP Special Coastal Condition 1d. Refer to the Drawings for the location of the Mid-Town site.

Submersible Pump Stations will have the following features (see Table 1):

1. Pumps will be rail-mounted submersible type with semi-open impeller design to reduce the potential for pump plugging.
2. Pumps will be duty + standby configuration; either 1+1 or 2+1.
3. Wet wells will be pre-cast concrete with PVC liner and equipment access hatch at grade; wet wells will be 8 or 10 feet in diameter and depth will be as required for the application. Wet wells shall be designed in accordance with Hydraulic Institute Standards.
4. Influent gravity pipe will be fitted with a tee to create a drop downward such that the influent invert entering the wet well is below the low water level in the wet well to prevent cascading flow inside the wet well. Gravity sewer will be vented into the wet well above the normal high water level (see drawings).
5. Wet wells will be sized to target 2 hours of storage based on average day flows and 30 minutes of storage based on peak wet weather flow. (This is not practical for the triplex

stations; method of providing the necessary storage at these stations is discussed in the 'Pump and Collection System Storage Capacity Section.')

6. Subsurface valve vaults will be concrete and located adjacent to the pump stations.
7. Each pump will have an associated swing check valve and isolation valve (either gate valve or plug valve) housed in the valve vault.
8. Discharge piping will have fittings to facilitate connection of a trailer mounted pump that can discharge into the forcemain in the event that the pumps or generator fail.
9. Access to wet well and valve vault will be provided such that submersible pumps and valves can be removed for service using a boom truck.
10. Standby power will be diesel generators mounted on double containment fuel tanks or connections to natural gas distribution pipes where feasible.
11. Electrical buildings will house engine generator, pump control panels, motor control centers, and switchgear. Building will be constructed acoustical treatment and will have intake louvers and exhaust plenum to control engine noise.
12. Electrical connection will be provided to allow hook-up of trailer mounted engine generator for backup.

Table 1: Submersible Pump Stations – Preliminary Design Criteria

Description	No. of Pumps[1]	Pump Station Capacity (gpm)	Pump Capacity (gpm)	Pump TDH (ft)	Maximum Pump Motor Size (hp)	Generator Size KW (kw)
Lupine	1 + 1	623	623	130	70	50
West Paso[2]	2 + 1	1,549	775	166	100	200 [2]
Baywood[2]	1 + 1	380	380	35	7.5	
East Ysabel	1 + 1	168	168	100	20	30
East Paso	1 + 1	213	213	80	15	30
Mountain View	1 + 1	54	54	33	5	30
Solano	1 + 1	168	168	55	7.5	30
Mid-Town	2+1	2,322	1,161	126	100	200
Sunny Oaks	1+1	153	153	15	5	30

(1) x + y, where x = number duty pumps and y = number of standby pumps

(2) West Paso and Baywood pump stations share common standby power facility at 3rd Street well site

Pocket Grinder Pump Stations will have the following features (see Table 2):

1. Pump station will be a package type system equipped with submersible grinder pumps.
2. Pumps will be in a 1 duty + 1 standby configuration.
3. Wet wells will be pre-cast reinforced concrete with PVC liner; wet well storage capacity will provide at least 12 hours storage based on average day flows and 2 hours of storage based on peak wet weather flows.
4. Each pump will have an associated check valve and isolation valve housed within the package pump station.
5. Access to the pump station will be provided such that submersible pumps and valves can be removed for service either manually or using a boom truck.

6. Pumping equipment control panel will be mounted in a secure cabinet adjacent to the pump station.
7. Electrical connection will be provided to allow hook-up of trailer mounted engine generator.

Table 2: Pocket Pump Stations – Preliminary Design Criteria

Description	No. of Pumps[1]	Pump Station Capacity (gpm)	Pump Capacity (gpm)	Pump TDH (ft)	Maximum Pump Motor Size (hp)
04A	1+1	28	28	47	3
07A	1+1	9	9	31	2
08A	1+1	13	13	60	3
09A	1+1	18	18	71	3
09B	1+1	16	16	20	2
09C	1+1	45	45	14	3
10A	1+1	22	22	56	3
11A	1+1	22	22	52	3
12A	1+1	22	22	38	3
13A	1+1	20	20	31	2
15B	1+1	17	17	24	2
Palisades	1+1	51	51	39	3

(1) x + y, where x = number duty pumps and y = number of standby pumps

2.2.4 Pump Station & Collection System Storage Capacity

In an effort to reduce the area available for solids to settle and reduce the residence time at the pump station under normal conditions the wet well diameters were reduced from the original design. Triplex stations were reduced from 12’ to 10’ and some duplex stations were reduced from 10’ to 8’. In some cases this requires the floor of the wet well to be slightly deeper to allow adequate pump cycle time, and slightly decreases the available storage in the well in the event of a power outage.

Storage capacity in the gravity lines was estimated by assuming full pipe storage capacity in all lines that were completely below the lowest point in the system. This assumption excluded lines that were partially below the lowest point, and would therefore partially contribute to storage, and excluded storage in the manholes below the lowest point. When compared to the collection system storage volume estimates presented in the Pump Station Storage Memo, prepared by Carollo in 2009, these estimates are relatively close. See below for a summary table of storage. A summary of the storage volumes and projected storage times is presented in Table 3.

Table 3: Projected Storage Time in the Event of Pump Station Failure

Lift Station	Pump Station Storage Volume (gal)	Gravity Main Storage Volume (gal)	Modeled Average Dry Weather Flow rate (gpm)	Modeled Peak Wet Weather Flow rate (gpm)	Average Dry Storage Time (hrs)	Peak Wet Storage Time (hrs)
Lupine	3,076	38,705	153	623	4.6	1.1
West Paso	5,193	34,180	455	1,549	1.4	0.4
Baywood	3,760	10,710	85	380	2.8	0.6
East Ysabel	3,497	1,991	31	168	2.9	0.5
East Paso	3,459	9,883	40	213	5.5	1.0
Mountain View	3,797	1,673	8	54	11.3	1.7
Solano	3,102	4,225	32	146	3.8	0.7
Sunny Oaks	1,316	881	25	168	1.7	0.3
Mid-Town	4,817	3,358	739	2,322	0.18	0.06
04A	5,017	-	3.45	28	24	3
07A	2,782	-	1.2	9	40	5
08A	3,383	-	1.2	13	49.	4.5
09A	3,571	-	2.3	18	26	3.2
09B	3,447	-	2.3	16	25	3.6
09C	5,187	-	5.8	45	15	1.9
10A	4,399	-	2.3	22	32	3.4
11A	4,173	-	2.3	22	30	3.2
12A	4,699	-	2.3	22	34	3.6
13A	4,229	-	2.3	20	31	3.6
15B	2,880	-	2.3	17	21	2.8
Palisades	5,757	-	8	51	12	1.9

In many cases the storage in the collection system is far greater than in the wet well and a 2 or 4 foot increase in wet well diameter does not have a significant impact on the projected storage time. As currently designed the Mid-Town station will have less than 15 minutes of storage in the event of a pump station failure, but this is only increased by 3 minutes if the wet well is upsized from 10 to 12 feet.

Table 4: Pocket Pump - Landscaping

Site Feature	Supplier	Materials/Special Features	Code
Perimeter Landscape	Local Native Plant Nursery	Native Trees, Shrubs & Grasses	None

2.2.5 Pump Stations – SCADA

Control

1. On-Site Remote Telemetry Unit (RTU) consisting of a small Programmable Logic Controller (PLC) in a suitable enclosure located in the Standby Power Building or Pedestal Mounted next to the Pump Station.
2. Manual On/Off control will also be provided at each location.

Telemetry

Fiber Optic connections at each pump station and pocket pump station will communicate with the hub operator workstation located at the 8th and Moro standby power facility, where it will then be transferred to the master station located at future Wastewater Treatment Plant.

1. Man Machine Interfaces (MMI's) will be provided to monitor and control the pump stations.
2. Workstations will be located at the future Wastewater Treatment Plant and at the West Paso/Baywood standby power facility on 8th and Moro Ave. .
3. Each workstation will consist of a PC suitable for the application, loaded with Supervisory Control and Data Acquisition (SCADA) software that will operate in an "Open Architecture" Microsoft Windows environment.
4. The County plans to link each location via a fiber optic backbone to ensure maximum reliability. New fiber optic lines required will be installed in pipeline trenches as much as possible.
5. The Workstations will provide pump status monitoring capability for each station with limited control, such as reset and acknowledgement of alarms and potential manual start/stop of individual pumps.

Instruments

1. Continuous level monitoring in wastewater pump stations used for pump control with a high-level float switch for alarm condition notification.
2. Monitor the power source at each location for loss of utility or failure of standby power equipment communicated back to the central monitoring facilities.

Standards

1. ANSI/ISA Symbols, Tagging and Numbering conventions per ISA S5.l.

Interlocks

1. Interlocks deemed critical to the protection of personnel and major equipment will be hardwired to the MCC with interposing relays providing isolated inputs to the PLC.
2. Interlocks and control devices not deemed critical for the protection of personnel and major equipment will be wired to the PLC.
3. All interlocks will be in affect when equipment is operated via the PLC.
4. The critical interlocks only will be in affect when equipment in operated from the HOA station.

2.3 Recycled water

2.3.1 Recycled Water Main (REW)

The Recycled Water Conveyance Pipeline (REW) will convey recycled water flows from the treatment facility to the Broderson site and adjacent community for reuse and disposal. The pipeline shall be primarily routed along Los Osos Valley Road. The Effluent Pump Station will be located at the treatment facility, which will pumps flow through the REW pipeline.

The Recycled Water Distribution Mains and turnouts will convey recycled water to various locations within the community including the existing Bayridge Estates leach fields, Sea Pines Golf Course, South Bay Community Park, three elementary schools and Los Osos Middle School.

The recycled water main will be routed from the future WWTF to leach fields (existing and new) and reuse sites. Leachfield and reuse sites details are shown on Table 5. Table 6 lists an additional reuse location, the landscape irrigation at the Broderson Site. The Recycled water main will be sized based on the recycled water pump station and WWTF design capacity. Currently, it is sized as 14 inch based on the Out of Town Conveyance tech memo dated July 2008. The design criteria for the recycled water main will be consistent with the design criteria for the collection system force main. Separation and depth design criteria are described below.

Table 5: Recycled water - Design Criteria

Description	Capacity (gpd)	Approx. Area (sq ft)	Number of Zones	Capacity per Zone (gpd)	Peak Capacity per Zone (gpm)
West Side Urban Reuse Sites					
New Leachfield Sites					
Broderson Leachfield	800,000	351,000	8	100,000	138.9
Potential Irrigation Sites					
Sea Pines Golf Course	50,000	305,000	1	50,000	143.6
Monarch Grove Elementary School	4,500	87,000	1	4,500	12.9
East Side Urban Reuse Sites					
Leachfield Sites					
Bayridge Estates Leachfields	29,500	25,000	2	14,750	10.2
Potential Irrigation Sites					
Los Osos Middle School	22,000	435,600	1	22,000	63.2
Baywood Elementary School	7,000	130,680	1	7,000	20.1
South Bay Community Center	4,500	87,120	1	4,500	12.9
Sunnyside Elementary School	4,500	87,120	1	4,500	12.9
Agricultural Reuse					
Clark Valley Road – Start-Up	145,000	3,484,800	1	145,000	416.5
South Creek Valley - Future	175,000	4,356,000	1	175,000	502.7
North Creek Valley - Future	270,000	6,534,000	1	270,000	775.6

Notes:

Broderson Leachfield: no peak seasonal; assume 100% redundancy, utilize 4 zones for capacity

Bayridge Estates Leachfields: no peak seasonal

All irrigation sites: Seasonal peaking is 17% of annual flows in July; assume 12 hours irrigation per day

Table 6: Recycled water - Landscaping

Site Feature	Supplier	Materials/Special Features	Code
Perimeter Landscape @ Broderson Site	Local Native Plant Nursery	Native Trees, Shrubs & Grasses	None

Separation and Depth

- Separation

1. Recycled water mains will be treated as sewer mains when considering their separation from potable water.
2. Recycled water mains will be treated as potable water mains when considering their separation from sewers.
3. Horizontal clearance between existing water mains, sewer and the recycled water main will be 15 feet where feasible to facilitate the future replacement of existing water mains.

- Depth
  1. Minimum cover of 36-inches for pipelines on secondary roads and 48-inches for pipelines in primary roads.
- Valves
  1. The REW force main isolation valves will be direct-buried butterfly valves.

2.3.2 Recycled Water Locations

The recycled water system consists of recycled water main that serves the various locations for subsurface disposal via percolation fields as shown in Figure 2. The effluent distribution pipeline will also be provided with turnouts for reclaimed water uses such as landscape irrigation as shown in Figure 3. The locations of the recycled water sites were based on work conducted by Cleath-Harris Geologists and Fugro Consultants.

The locations were selected where the hydrogeology was suitable to prevent excessive mounding or daylighting. The hydrogeological work by Cleath-Harris Geologists and Fugro Consultants established the amount of effluent that can be safely discharged at each location.

2.3.3 Recycled water- SCADA

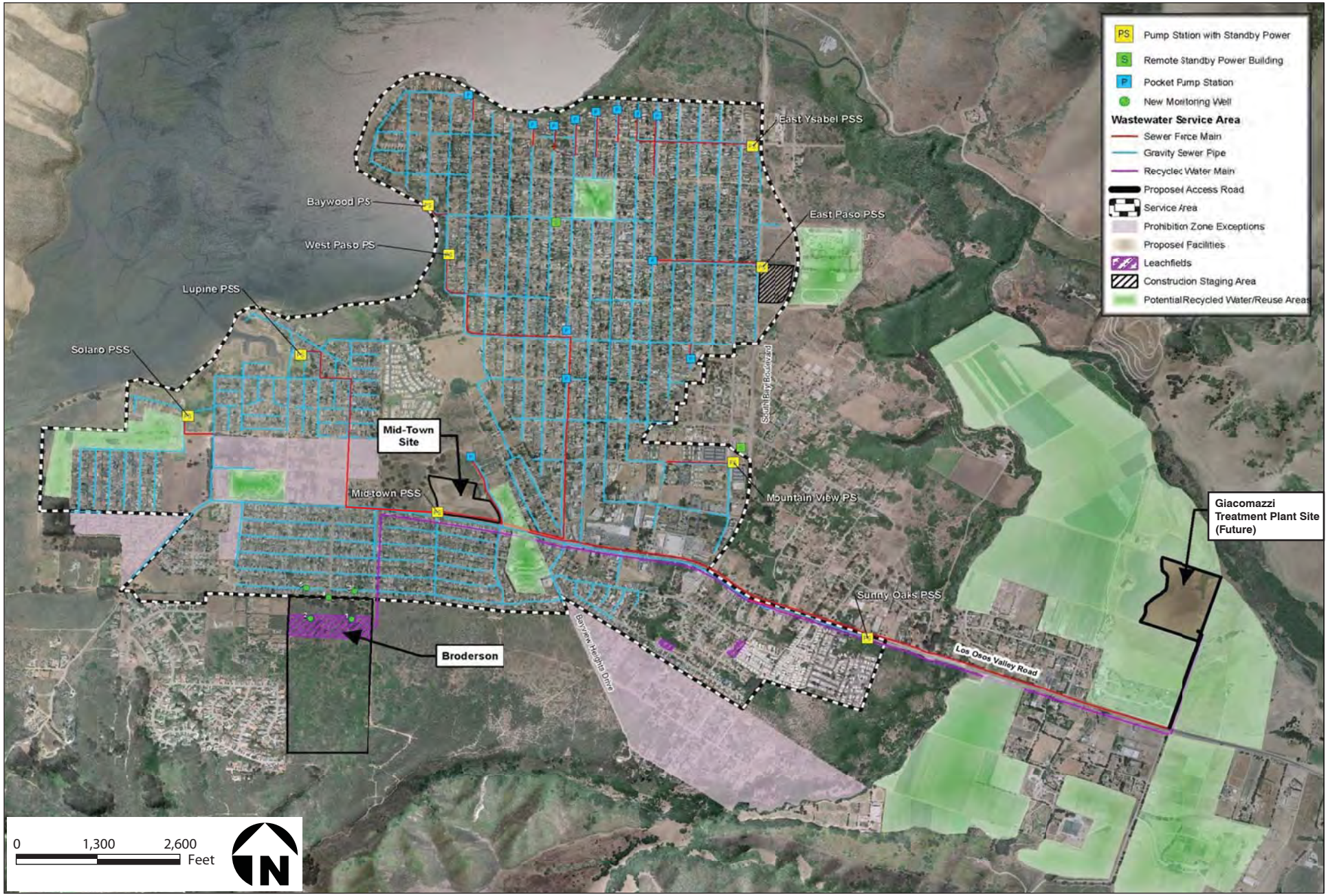
Control

1. Future On-Site Remote Telemetry Unit (RTU) consisting of a small Programmable Logic Controller (PLC) in a suitable enclosure located near each disposal site.
2. Fiber optic cable will be installed with treated effluent pipeline for SCADA communication.

3. Cost

3.1 30 Percent Opinion of Probable Construction Cost

The current opinion of construction cost based on the 30 percent design is $76,500,000.



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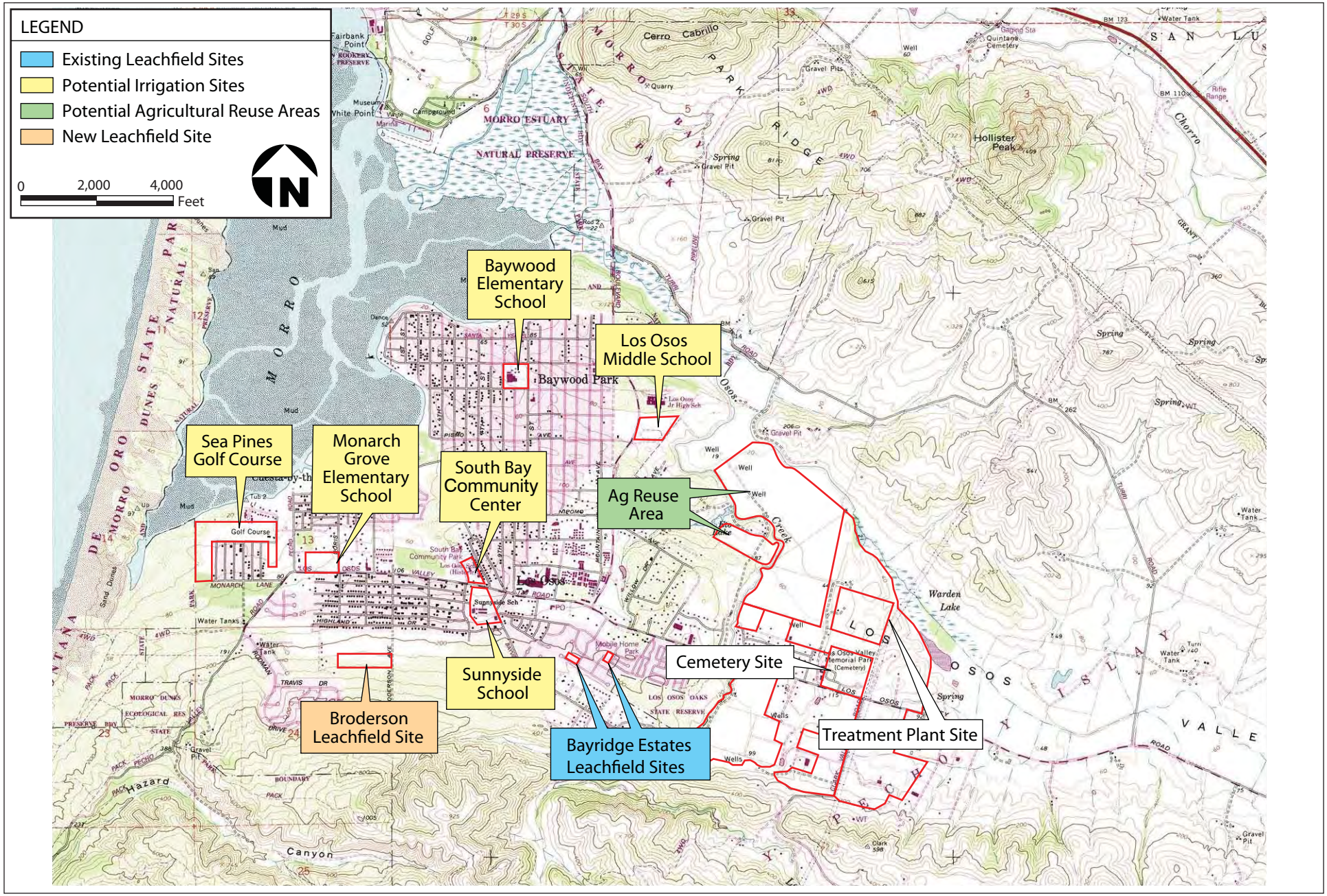
CDM

Figure 2
Site Plan
Los Osos Wastewater Collection System Project – San Luis Obispo County



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CDM

Figure 3

Potential Recycled Water Disposal Sites

Los Osos Wastewater Collection System Project – San Luis Obispo County

APPENDIX A

CDM Hydraulic Model Memorandum

Memorandum

To: *Mike Middleton, CDM*

From: *Paula Kulis, CDM*
James Kim, CDM
Kevin Trott, CDM

Date: *August 15, 2011*

Subject: *San Luis Obispo County - Los Osos Wastewater Project Collection System – Preliminary Model Development Summary*

The purpose of developing a hydraulic model was to assess whether the existing collection system design meets the minimum slope and velocity parameters given the revised sewer load rate of 50 gallons per day (gpd) per capita. From information extracted from the existing 100 percent design drawings, a model was built in InfoSewer (version 5, update 2), which uses ArcGIS as a base program.

Preliminary Dry Weather Flow Model Results

For dry weather flows, model results for total flows from Areas A, B, C and D are summarized in Table 1.

Table 1
Preliminary Model Results for Dry Weather Flow

Average Flow	0.96 MGD
Peak Hour Flow	3.03 MGD
System Peaking Factor	3.16

Three figures have been produced to summarize the preliminary model results:

In Figure 1, gravity mains are color coded by slope. Per the draft Basis of Design Report, minimum slope for 8-inch gravity mains will be 0.0033. Mains less than the minimum slope are highlighted in red in the figure.

In Figure 2, gravity mains color coded by velocity during peak hour dry weather flow. Per the draft Basis of Design Report, minimum velocity at peak hour dry weather flow is to be 2 feet per second (fps). Mains with a modeled flow velocity of less than 1.5 fps are red; between 1.5 and 1.95 fps are orange; between 1.95 and 2.00 fps are green; and greater than 2.o fps are blue. Solid lines represent mains that are a flowing at a depth of d/D > 0.100; while dotted lines represent mains flowing at a depth of d/D < 0.100.

In Figure 3, gravity mains color coded by d/D during peak hour dry weather flow plus Infiltration and Inflow (I/I). The I/I rate used is 200 gallons per inch-mile. Per the draft Basis of Design Report, maximum d/D at peak hour dry weather flow plus I/I is to be less than 0.7. Mains with a modeled d/D of 0.0 to 0.1 are blue, 0.1 to 0.4 are green, 0.4 to 0.7 are orange, and above 0.7 are red. Two 8-inch pipelines near the Mid-Town pump station exceeded the design standard and were flowing full. To meet the d/D< 0.70 requirement, the pipeline diameter may be increased to 12 inches.

The flows into the pump station wetwells were calculated in the model. Table 2 presents the flows into the wetwells.

Table 2
Los Osos - Pump Station Flows

Model ID	Description	Comments	Dry Weather Peak Hour Plus I/I Flow		Base Dry Weather Flow	
			gpm	MGD	gpm	MGD
Midtown Inflows						
C-TESTOUTFALL-2	Collection from East half of Area C, Lupine PS, and West Paso PS	Midtown Inflow	2019	2.91	643	0.93
Total Inflow into Midtown			2019	2.91	643	0.93
Pump Stations						
WW-BAYWOOD	Baywood Pump Station		330	0.48	74	0.11
WW-EPASO	East Paso PS		185	0.27	35	0.05
WW-MV-01	Mountain View Pump Station	Currently pumps into Area D collection lines. This flow is included in D-WW-WP inflow. (Possibly pumps into Midtown Force Main)	47	0.07	7	0.01
WW_SOLANO	Gravity Line into Solano Pump Station from B	Solano PS flow includes Monarch Grove Flows	146	0.21	28	0.04
C-SO-OUTFALL	Sunny Oaks Pump Station	May Pump directly or flow by gravity into the Midtown Forcemain	133	0.19	25	0.04
WW-YSABEL	East Ysabel Pump Station		146	0.21	27	0.04
WW_LUPIN	Lupin Pump Station	Includes collection from Solano PS and west side of Area C	542	0.78	133	0.19
D-WW-WP	West Paso Pump Station	Includes collection from Area A, Area D, and Mountain View PS	1347	1.94	396	0.57
Pocket Pump Stations						
D-WW-09B	Pocket Pump Station 9B		14	0.02	2	0.00
D-WW-09C	Pocket Pump Station 9C		39	0.06	5	0.01
D-WW-15B	Pocket Pump Station 15B		15	0.02	2	0.00
WW-10A-A01	Pocket Pump Station 10A		19	0.03	2	0.00
WW-11A-A01	Pocket Pump Station 11A		19	0.03	2	0.00
WW-12A-A01	Pocket Pump Station 12A		19	0.03	2	0.00
WW-13A-A01	Pocket Pump Station 13A		17	0.02	2	0.00
WW-4A-A01	Pocket Pump Station 4A		24	0.04	3	0.00
WW-7A-A01	Pocket Pump Station 7A		8	0.01	1	0.00
WW-8A-A01	Pocket Pump Station 8A		11	0.02	1	0.00
WW-9A-A01	Pocket Pump Station 9A		16	0.02	2	0.00
WW-PALISADE	Pocket Pump Station Palisade		44	0.06	7	0.01

Model Development

Model development to date has included the steps described below:

- **Data was gathered** from drawings for the proposed Los Osos sewer system, including:
  - Manhole
    - Manhole Identification
    - Northing and Easting
    - Rim Elevations
  - Pipelines
    - Manhole Identification at endpoints
    - Diameter
    - Invert elevations at manhole connections
    - Length
  - For gravity lines, a manning's n number of 0.011 was used per draft BODR design standards.

- **Manhole/gravity main data QAQC** was performed in GIS. Once in GIS, the model was checked visually for errors in locations. This was done using the street centerlines from the San Luis Obispo County GIS Datafinder, which has current GIS layers applicable to the entire county. When pipelines and manholes were found to not follow the street centerline, the locations of these facilities were checked versus the design drawings and corrected.

- **Pump stations** were added to the drawing individually. This consisted of placing the wetwell in the appropriate location and creating the pump and force main. Data applicable to this process was provided in the drawings and a spreadsheet or pump stations provided by the design team.
  - Wetwell
    - Diameter
    - Bottom Elevation
    - Minimum Level
    - Maximum Level
    - Invert elevation of the influent pipeline
  - Pumps
    - Number of pumps
    - Design flow
    - Design head
  - Forcemains
    - Diameter
    - Length
    - Starting centerline elevation
    - Ending Invert elevation

- The **manhole loadings** were calculated using the sewer connection lateral (laterals) provided in the CAD drawings. The laterals were imported into GIS from CAD. Each lateral was assigned a land use category based on the General Land Use obtained from the San Luis Obispo County GIS Datafinder. Each lateral was assigned a sewer use load based on the corresponding land use. Table 3 provides an overview of the modeled loading rates.

Table 3
Los Osos Wastewater Collection System
Loading Rates

Landuse Code	Landuse Description	Count of Laterals	Loading Rate by Lateral (gpd/lateral)	Base Flow Loading Rate (mgd)
CR	Commercial Retail[1]	175	860	0.151
CS	Commercial Services[1]	34	860	0.029
OP	Office Professional[1]	45	860	0.039
OS	Open Space	1	0	0.000
PF	Public Facility[2]	5	7,400	0.037
REC	Recreational	3	0	0.000
RMF	Res - Multi Family[3]	239	338	0.081
RSF	Res - Single Family[4]	4,290	125	0.536
WH	(Privately Owned Nature Preserve)	3	0	0.000
Large Users[5]	Includes Mobile Home Parks	--	--	0.09
Total Flow				0.96

[1]Commercial and office professional loading rates based on 2011 Water Demand Analysis and Water Conservation Evaluation: 85% of potable water unit rates. 1,012 gpd/account x 0.85 = 860 gpd/lateral (assuming 1 account per lateral).
[2]Public Facility loading rate based on the total institutional water demand reported in the 2011 Water Demand Analysis and Water Conservation Evaluation, April 4, 2011. See Table 4 for details.
[3]Rate multi-family rate provided by San Luis Obispo County: 50 gpd per person, 2 people per unit, and 809 total units (approx. 3.4 units per lateral).
[4]Residential single-family rate provided by San Luis Obispo County: 50 gpd per person, and 2.5 people per household.
[5]Large Users include Moro Shores, Vista de Oro, Bay Ridge Estates, Sea Oaks, Daisy Hill, Monarch Grove and Sunny Oaks.

- **Manhole loadings** were calculated by determining the closest pipe to each lateral and assigning the load of the lateral to the nearest upstream manhole.
- Loading Rates for **Public Facilities** was estimated based on 85 percent of the total institutional water demand reported in the 2011 Water Demand Analysis and Water Conservation Evaluation, April 4, 2011. Table 4 presents a detailed calculation of the loading rate.

Table 4
Sewer Loading Rate Estimate for Public Facilities

Row	Description	Source	Value
1	Water Demand for Public Facilities	Per 2011 Conservation Report[1]	0.052 MGD
2	Sewer Loading (Estimated at 85% of Water Demand)	0.85 x Row 1	0.044 MGD
3	Laterals Associated with Public Landuse	GIS Landuse Map	6
4	Public Facilities Loading Rate	Row 2 / Row 3	7,400 gpm/ Lateral
5	Laterals Within Sewer Collection System	GIS Landuse Map	5
6	Base Loading for Public Facilities	Row 4 x Row 5	0.0368 MGD

[1]2011 Water Demand Analysis and Water Conservation Evaluation dated April 5, 2011.

- In addition to the above loading, **large users** totaling 0.08 MGD was added to the model to account for Moro Shores, Vista de Oro, Bay Ridge Estates, Sea Oaks, Daisy Hill, Monarch Grove and Sunny Oaks. See Table 5 for details.

Table 5
Estimate of Large User Loads

	Number of Units	Unit Rate by Lateral (gpd/lateral)	Total Flow (gpd)	Total Flow (mgd)
Monarch Grove[1]	83	125	10375	0.0104
Vista de Oro[2]	73	125	9125	0.0091
Bay Ridge Estates[2]	147	125	18375	0.0184
Moro Shores[1]	167	100	16700	0.0167
Sea Oaks[1]	124	100	12400	0.0124
Daisy Hill[1]	144	100	14400	0.0144
Sunny Oaks[1]	89	100	8900	0.0089
			Total Flow	0.0903

[1] Rate provided by San Luis Obispo County: 50 gpd per person, and 2.5 people per household.
[2] Rate provided by San Luis Obispo County: 50 gpd per person, and 2 people per household.

- The **peaking factor** provided by San Luis Obispo County in the form of a population curve is applied to the model:

$$Q_P = \frac{5}{P^{1/6}} Q_{av}$$

Where Q_P is peak flow, P is population in thousands, and Q_{av} is average flow. The peak is applied to load points in the steady state model, and routing attenuates the modeled peak downstream. The model calculates the peaking factor using the following general peaking curve equation:

$$Q_{Peak} = kQ_{Base}^{P}$$

By plotting points on the County's population curve, an equivalent equation in the form above was obtained. The constants k and P were determined to be 3.26 and 0.833, respectively. The resulting equivalent equation is:

$Q_{Peak} = 3.26Q_{Base}^{0.833}$, where Q is in cubic feet per second.

Converting the equation to gallons per minute, the constants k and p were determined to be 9.039 and 0.833, respectively. The resulting equation is:

$Q_{Peak} = 9.039Q_{Base}^{0.833}$, where Q is in gallons per minute

- As summarized in Table 1, **base flow** in the model is 0.96 MGD. Per model results, the total peak hour dry weather flow for the Los Osos wastewater system is 3.03 MGD. Thus the modeled peaking factor at the treatment plant is 3.16 (3.03 MGD / 0.96 MGD).
- In addition to the peak hour dry weather loading, an Infiltration and Inflow (I/I) load of 200 gallons per inch-mile was applied to the pipelines. This load was applied to the peak hour dry weather loading and adds and additional 0.07 MGD to the dry weather peak hour flow for a total of 3.10 MGD observed at the Treatment Plant.
- **The modeled network QAQC** was performed by subarea and for the overall model.
    - By subarea. Fictitious outfalls were created for each subarea to confirm that the area was properly connected and flowing as proposed by the design drawings.
    - System-wide. The total flows exiting the system were compared with modeled loadings, for both a peaked and unpeaked case to verify that all loadings in the system are accounted for correctly in the model.
    - By Pipeline. A profile of each pipeline was reviewed to check for incorrect connections like pipeline inverts below the bottom of manholes, incorrect rim elevations, and incorrect wetwell connections.

Figure 1
Los Osos Wastewater Collection System

Slope of Gravity Mains 8-inch Diameter or Smaller

<0.0033

>0.0033

Gravity Mains Larger Than 8-inch Diameter

All Slopes

8-11-2011

Figure 2

Los Osos Wastewater Collection System

Velocity in Gravity Lines During
Peak Hour Dry Weather Flow - 3.03 MGD
(Base Flow 0.96 MGD, Peaking Factor 3.16)
Monarch Grove is Included

Flow Depth d/D < 0.10	Flow Depth d/D > 0.10
< 1.50 fps	< 1.50 fps
1.50 - 1.95 fps	1.50 - 1.95 fps
1.95 - 2.00 fps	1.95 - 2.00 fps
> 2.00 fps	> 2.00 fps

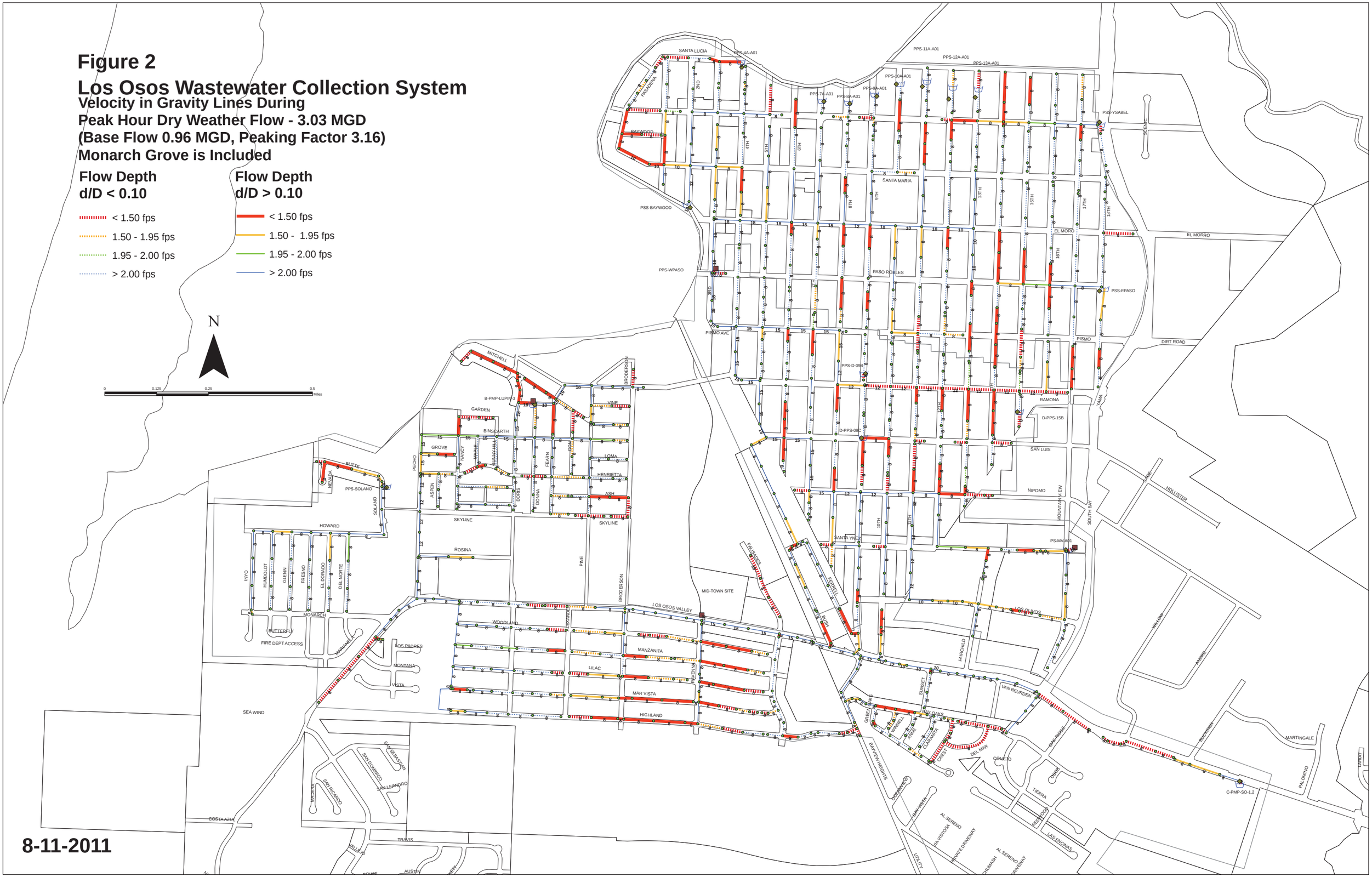

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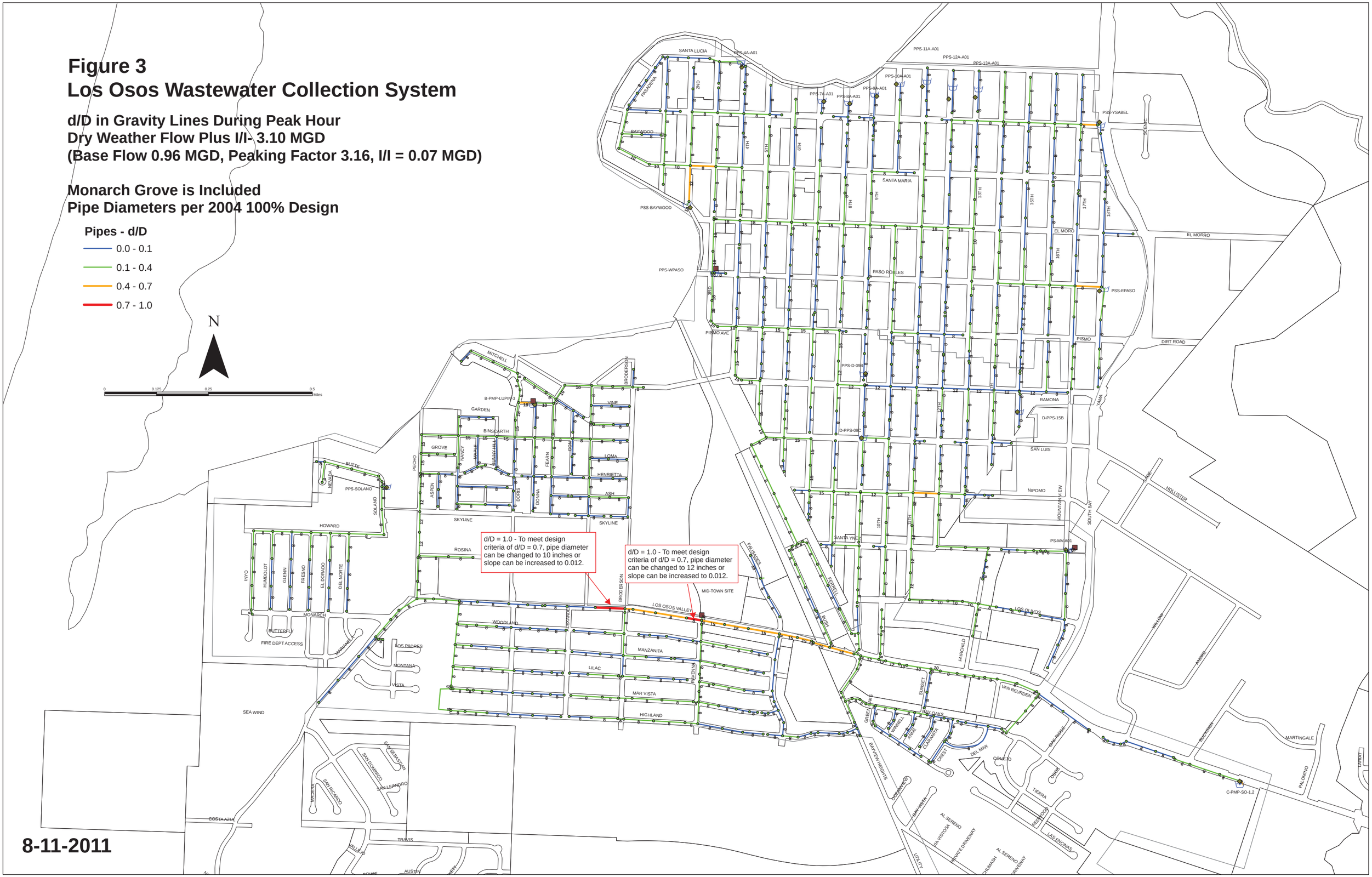
Figure 3
Los Osos Wastewater Collection System

d/D in Gravity Lines During Peak Hour
Dry Weather Flow Plus I/I- 3.10 MGD
(Base Flow 0.96 MGD, Peaking Factor 3.16, I/I = 0.07 MGD)

Monarch Grove is Included
Pipe Diameters per 2004 100% Design

Pipes - d/D

- 0.0 - 0.1
- 0.1 - 0.4
- 0.4 - 0.7
- 0.7 - 1.0



8-11-2011

APPENDIX B

Permit Condition Compliance Summary

Condition 1	**Approved Development**	This approval authorizes construction and operation of a community-wide sewer system for the portion of Los Osos described in Resolution No. 83-13 issued by the Regional Water Quality Control Board (see Attachment 1) and as described by application materials, supplemental materials made a part of the record, and shown in the EIR, including: a. A wastewater treatment facility, including all appurtenant structures, landscaping and site access to be located on the Giacomazzi site (APN 067-011-022); b. A wastewater collection system, including lateral lines from individual structures to the street, connection lines at each property, sewer mains, back-up power facilities and pump stations; c. Construction staging areas; d. Wastewater disposal facilities, distribution lines for urban and agricultural re-use, and monitoring wells; e. Wastewater sludge handling facilities at the wastewater treatment plant to enable the hauling of sludge to a disposal, recycling facility or cogeneration facility; f. Primary staging areas at East Paso Robles Street including minor and temporary staging areas in the project area including the Giacomazzi site; g. Construction activities associated with the installation of approved facilities, including dewatering operations; h. A program for the mitigation of direct impacts to habitat for endangered species and agricultural resources; i. Construction of an underground pump station located at 3rd Street and the intersection of Paso Robles Avenue (unimproved), within 75' of a coastal wetland; j. Construction of harvesting wells and their associated piping and facilities are NOT authorized by this approval; and k. A water conservation program allowing a maximum water usage of 50 gallons per day / person for indoor water usage.	Design of the Wastewater Collection system will adhere to requirements b, c, d, f, g, h, i, j, and k. For item k, a system model was created with 50 gpcd as the base flow generation criteria.

Condition 2	**Development Consistent with Approved Plans**	Except as otherwise required by the conditions of this permit, all development shall be substantially consistent with the site plan attached as Attachment 2, as well as with all final architectural elevations, color boards and landscape plans to be reviewed and approved by the Planning Director.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 3	**All Development Consistent with Conditions**	All development shall be consistent with the conditions contained herein. Prior to final design / layout of the East Paso Robles Avenue pump station and the Doris Avenue / Lupine Street pump station, the applicant shall provide verification to the satisfaction of the Planning Director, that the required 75 foot wetland setback will be met with the redesign / layout of said pump stations.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 4	**Permit Limitations**	The approved service area for the wastewater treatment facilities corresponds to the area shown on the Service Area Map attached (see Attachment 1). Future additions to the wastewater treatment service area shall require a separate coastal development permit, and must be preceded or submitted concurrently with a Local Coastal Plan (LCP) amendment that incorporates the proposed service area expansion within the Urban Service Line designated by the LCP.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 5	**No Guarantees of Development Approvals**	No Guarantees of Development Approvals. Approval of this permit, or any method of financing the project utilized by the County (e.g., the established assessment program), does not guarantee County approval of any new or intensified uses within the service area. All new development proposals must be reviewed for consistency with the San Luis Obispo County certified Local Coastal Program (and/or the California Coastal Act, as applicable); such review shall consider, among other issues, the environmental impacts of the new development, including the impacts associated with the installation of lateral connections necessary to tie into the approved collection system. Wastewater treatment service shall only be provided to developments that have obtained the required coastal development approvals in a manner consistent with such approvals. Prior to construction, the County shall prepare a public notice to all property owners of record within the service area that includes a copy of this condition, and an explanation of its effect upon the ability to obtain wastewater treatment service for future development. Prior to the commencement of construction, said notice shall be mailed to all property owners within the service area, or noticed in three local newspapers and included in public information handouts provided by the County.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 6	**Tertiary Treatment**	Tertiary Treatment. The treatment plant shall provide Disinfected Tertiary Recycled Water as defined at Section 60301.230 of Title 22 of the California Code of Regulations, which means a filtered and subsequently disinfected wastewater that meets the following criteria: (a) The filtered wastewater has been disinfected by either: (1) A chlorine disinfection process following filtration that provides a CT (the product of total chlorine residual and modal contact time measured at the same point) value of not less than 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes, based on peak dry weather design flow; or (2) A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999 percent of the plaque-forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least as resistant to disinfection as polio virus may be used for purposes of the demonstration. (b) The median concentration of total coliform bacteria measured in the disinfected effluent does not exceed an MPN of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100 milliliters in more than one sample in any 30 day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 milliliters. Prior to providing tertiary treated water for agricultural uses the applicant shall develop a Recycled Water Management Plan for Agricultural Re-use. The use of tertiary treated water shall be consistent with resource protection strategies including but not limited to those designed to protect on and off site soils, and surface and groundwater resources through the use of appropriate site-specific management practices. The applicant shall consult with technical resource providers such as the University of California Cooperative Extension and USDA Natural Resources Conservation Service. The Plan shall be reviewed and approved by the Director of Planning and Building in consultation with the Agricultural Commissioner's Office prior to providing tertiary treated water for agricultural uses.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 7	**Permits-Corps**	Prior to construction, an application for a Nationwide or Individual Permit shall be submitted by the County to the United States Army Corps of Engineers (USACE) pursuant to Section 404 of the Clean Water Act (CWA). If required, the County shall obtain a Nationwide or Individual Permit from the USACE for any impacts, temporary and permanent, to any areas within the proposed project which are determined to qualify as jurisdictional waters and wetlands of the U.S. The County shall implement all required conditions and special considerations stipulated within the Nationwide or Individual Permit during all relevant phases of development / construction.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 8	**Permits-Regional Water Quality Control Board**	Prior to construction, an application for a Water Quality Certification shall be submitted by the County to the Central Coast RWQCB pursuant to Section 401 of the Clean Water Act and the State Porter-Cologne Water Quality Act. If required, a Water Quality Certification shall be obtained from the Central Coast RWQCB for any impacts, temporary and permanent, to any areas within the proposed project which are determined to qualify as jurisdictional waters of the State. The County shall implement all required conditions and special considerations stipulated within the Water Quality Certification during all relevant phases of development / construction.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 9	**Permits-California Department of Fish and Game**	Prior to construction, a Notification of Lake or Streambed Alteration shall be submitted by the County to the CDFG pursuant to CFG Code Section 1602. If required, a Streambed Alteration Agreement shall be obtained from the CDFG for any impacts, temporary and permanent, to any areas within the proposed project which are determined to qualify as jurisdictional streambed or riparian habitat. The County shall implement all required conditions and special considerations stipulated within the Streambed Alteration Agreement during all relevant phases of development / construction.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 10	**Permits-NPDES**	Prior to construction, an NPDES Construction Activity Storm Water Permit shall be obtained. Appropriate BMPs, as established in the project NPDES Construction Storm Water Permit, shall be employed during project construction, which may include, but are not limited to, temporary sand bagging; construction of berms; installation of geofabric, and revegetation of areas by hydroseeding and mulching; actions for control of potential fuel or drill tailing release; the use of trench stabilizing and de-watering and requirements for disposal (i.e., location, quality) of water from dewatering activities. The NPDES permit shall apply to all proposed facilities, and shall address 50 to 100-year precipitation events to the extent feasible. Any erosion and sedimentation control netting or other erosion and sedimentation control devises used for temporary or permanent erosion and sedimentation control, shall be limited to biodegradable mesh or other biodegradable products.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. CDM's scope includes the preparation of a dewatering plan to assist the County in this effort. The County will lead the permitting effort.
Condition 11	**Fire Safety Plan**	Prior to construction, the applicant shall provide an approved Fire Safety Plan from Cal Fire (consistent with their letter dated February 5, 2009) and prior to operation of the waste water treatment facility shall implement the requirements of the plan.	The County of San Luis Obispo will address this requirement.
Condition 12	**Portable Engines**	Prior to initiating grading activities, if it is determined that portable engines and portable equipment would be utilized, the contractor shall contact the SLOAPCD and obtain a permit to operate portable engines or portable equipment, and such engines or equipment shall be registered in the statewide portable equipment registration program. The SLOAPCD Compliance Division shall be contacted in order to determine the implementation requirements of this mitigation measure.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 13	**Encroachment Permit**	Prior to construction, the applicant shall obtain an encroachment permit from the County Department of Public Works for all work to be done in the County rights-of-way.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 14	**Stormwater**	The project shall comply with the requirements of the National Pollutant Discharge Elimination System General Discharge, the Industrial Stormwater Program, and the County's Stormwater Pollution Control and Discharge Ordinance 3143. All discharges and dewatering activities shall be authorized by the Regional Water Quality Control Board.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. CDM's scope includes the preparation of a dewatering plan to assist the County in this effort. The County will lead the permitting effort.
Condition 15	**Facility Design**	Building heights for structures shall conform to the following, as measured in accordance with CZLUO 23.04.122: a. Treatment Plant. The buildings at the wastewater treatment facility will not exceed the following: i. Administrative Building: 28 feet ii. Maintenance Building: 35 feet iii. Bio-Air Building: 30 feet iv. Solids Building: 35 feet v. RAS WAS Station and Storage Tank: 31 feet vi. Secondary Clarifier (A): 25 feet vii. Secondary Clarifier (B): 23 feet viii. Electrical Building: 35 feet ix. Tertiary Treatment Building: 26 feet b. Standby Power Stations. Buildings shall not exceed 14 feet.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 16	**Parking**	All facilities shall be designed to provide adequate and safe parking for facility operations personnel.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 17	**Parking**	Signs shall conform to LUO 23.04.300. Prior to completion, the County shall provide signage at the treatment plant site indicating the facility and public amenities. Signs shall be approved by the Planning Director.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 18	**Title 24 Requirements**	Buildings shall be designed to conform to energy efficiency requirements outlined in Title 24 of the California Code. Additional measures to be shown on construction plans include: a. Provide an on-site lunch room with refrigeration and food preparation (i.e., microwave) appliances to reduce daily trips to and from the treatment facility; b. Use of double paned windows in office area where interior heating/air conditioning will occur; and c. Use of energy efficient interior lighting where applicable.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 19	**Erosion Control**	Prior to commencement of grading activities for each facility, erosion control measures shall be incorporated into the grading plans to minimize the potential for erosion or loss of top soil during grading to the satisfaction of the Planning Director. Any erosion and sedimentation control netting or other erosion and sedimentation control devises used for temporary or permanent erosion and sedimentation control, shall be limited to biodegradable mesh or other biodegradable products.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 20	**Erosion Control-Landscaping**	Prior to commencement of grading activities for each facility, vegetation/landscaping shall be provided on the graded cut and fill slopes to reduce the long-term potential for soil erosion or loss of topsoil to the satisfaction of the Planning Director.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 21	**Erosion Control-Surface Waters**	Prior to commencement of grading activities for each facility, the plans shall provide for the control of surface water away from slopes to the satisfaction of the Planning Director in consultation with the Public Works Department.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 22	**Seismic Requirements**	All proposed facilities shall be designed and constructed in accordance with UBC Seismic Zone 4 regulations.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 23	**Geotechnical Reports**	Prior to the commencement of construction for buildings at each proposed facility, the design of each facility shall be based on a facility-specific geotechnical report prepared by a California registered geotechnical engineer and professional geologist. The geotechnical report shall provide seismic data for use with at least the minimum requirements of the California Building Code (2007), as adopted by the County of San Luis Obispo.	The Wastewater Collection System design will adhere to these requirements.
Condition 24	**Liquefaction**	Prior to completion of the improvement plans for the proposed project, a geotechnical report that addresses liquefaction hazards shall be prepared and approved by the Planning Director. The geotechnical report shall state the recommended actions for the collection system, effluent disposal system, treatment plant site, and all appurtenant facilities so that potential impacts from seismically-induced liquefaction would be reduced to less than significant. These recommendations shall be incorporated into the design of all proposed facilities that are part of the collection system and at the treatment plant site.	The Wastewater Collection System design will adhere to these requirements.
Condition 25	**Emergency Response Plan**	Prior to completion of improvement plans, an Emergency Response Plan (ERP) shall be prepared as part of the operation and maintenance plan for the proposed collection system. The ERP shall recognize the potential for liquefaction, seismic hazards and ground lurching, to impact the pipeline or other proposed facilities, and specific high hazard areas shall be inspected for damage following an earthquake. “Soft Fixes” shall be incorporated in the ERP. Soft fixes typically consist of having a plan in-place to address the hazards, such as can be achieved by storing supplies and equipment for repair.	The County will lead the effort and prepare this plan.
Condition 26	**Geotechnical-Subsidence and Lurching**	Prior to completion of the improvement plans for the proposed facilities, a geotechnical report that addresses the potential for lateral spreading, ground subsidence, and ground lurching and provides measures to reduce potential impacts to less than significant shall be prepared and approved by the Planning Director. These recommendations shall be incorporated into the design of the improvement plans for the proposed facilities.	The Wastewater Collection System design will adhere to these requirements.

Condition 27	**Geotechnical-Expansive Soils**	Prior to completion of improvement and building plans for the proposed project, a design-level geotechnical report shall be prepared that addresses and reduces potential expansive soil impacts to less than significant. The expansive soil data shall be used with the requirements of the California Building Code (2007), as adopted by the County of San Luis Obispo. These recommendations shall be incorporated into the design of all proposed facilities that are part of the collection system and at the treatment plant site.	The Wastewater Collection System design will adhere to these requirements.
Condition 28	**Cultural Resources**	Avoidance of cultural resources is the paramount mitigation measure to protect cultural resources potentially impacted during project development. Avoidance of all known and unknown cultural resources shall be the primary and preferred mitigation. If avoidance is infeasible, then work shall only continue when it has been determined to be consistent with the required Treatment Plan and testing requirements.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 29	**Cultural Resources-Treatment Plan**	A Treatment Plan shall be prepared that would detail the extensive scope of the proposed project, establish site types with corresponding levels of effort for mitigation, and detail data recovery and monitoring plans for the extent of the proposed project. The former Treatment Plan (Far Western 2001) prepared for the wastewater project shall be adapted and modified where appropriate for the current project.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 30	**Cultural Resources-Testing and Data Recovery**	If avoidance of recorded archaeological sites within any portion of the approved project design is not possible through project redesign, a phased program of site testing shall be undertaken to establish boundaries and evaluate the resources' potential eligibility to the California Register of Historical Resources under CEQA and the National Register of Historic Places under NEPA. If a site is determined ineligible, no further work is required. If a site is determined eligible, data recovery excavations shall be required to mitigate adverse effects incurred from project development.	The County will lead the effort and handle all CEQA requirements.
Condition 31	**Cultural Resources-Geoarchaeology**	Preconstruction monitoring shall occur in areas ranked as high in sensitivity for buried deposits. The area subject to this requirement is located along Los Osos Valley Road from Los Osos Creek east to the Cemetery Parcel. Mechanical backhoe trenching shall be conducted within the sensitive areas where any construction impacts will occur and shall be monitored by a qualified geo-archaeologist. Any identified intact deposits will be evaluated, and any deposits determined to be eligible to the California Register and/or National Register shall require project redesign to avoid impacts, or data recovery to mitigate unavoidable impacts.	The County will lead the effort and handle all CEQA requirements.

Condition 32	**Traffic Management Plan**	Prior to construction, a traffic management plan shall be prepared for review and approval by the County of San Luis Obispo Traffic Department in consultation with the Planning Director. The traffic management plan shall be based on the type of roadway, traffic conditions, duration of construction, physical constraints, nearness of the work zone to traffic and other facilities (bicycle, pedestrian, driveway access, etc.). The traffic management plan shall include: a) Advertisement. An advertisement campaign informing the public of the proposed construction activities should be developed. Advertisements should occur prior to beginning work and periodically during the course of project construction. The advertising shall include notification of changes to bus schedules and potential changes to bus stop locations, potential impacts during school drop-off and pick-up times, and major intersections that may be impacted during construction. b) Property Access. Access to parcels along the construction area shall be maintained to the greatest extent feasible. Affected property owners shall receive advance notice of work adjacent to their property access and when driveways would be potentially closed. c) Schools. Any construction adjacent to schools shall ensure that access is maintained for vehicles, pedestrians, and bicyclists, particularly at the beginning and end of the school day. d) Buses, Bicycles and Pedestrians. The work zone shall provide for passage by buses, bicyclists and pedestrians, particularly in the vicinity of schools. e) Intersections. Traffic control (i.e. use of flag men) shall be used at intersections that are determined to be unacceptably congested due to construction traffic.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications, with support from the County of San Luis Obispo during construction. The County will prepare the traffic management plan.

Condition 33	**Driveway Construction Plans**	Prior to commencement of grading activities, the applicant shall submit driveway construction plans to Public Works Encroachment for review and approval in consultation with the Planning Director. The plans shall show the reconstruction of the project driveway approach(es) at the Giacomazzi site in accordance with County Public Improvement Standard Drawing Numbers B-1e and A-5a (sight distance). The applicant shall secure an encroachment permit from Public Works prior to commencing any work within the public right-of-way.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 34	**Environmental Permits Compliance**	If environmental permits from the Army Corps of Engineers or the California Department of Fish and Game are required for any public improvements that are to be maintained by the County, the applicant or his engineer, prior to the approval of the plans by the Department of Public Works in consultation with the Planning Director shall: a) Submit a copy of all such permits to the Department of Public Works and Planning Department; OR b) Documentation that the regulatory agencies have determined that said permit is not required.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 35	**Construction Activity Management Plan**	Prior to commencement of grading activities, the applicant shall submit a Construction Activities Management Plan for the review and approval of the SLOAPCD. This plan shall include but not be limited to the following Best Available Control Technologies for construction equipment: a. Minimize the number of large pieces of construction equipment operating during any given period. b. Schedule construction related truck/equipment trips during non-peak hours to reduce peak-hour emissions and overall daily and quarterly emissions. c. Properly maintain and tune all construction equipment according to manufacturer's specifications. d. Fuel all off-road and portable diesel powered equipment including but not limited to: bulldozers, graders, cranes, loaders, scrapers, backhoes, generators, compressors, auxiliary power units, with ARB certified motor vehicle diesel fuel. e. All diesel construction equipment shall meet ARB's Tier 3 standard for off-road heavy duty diesel engines. f. All on-road heavy-duty trucks shall meet the ARB's 2007 or newer certification standard for on-road heavy-duty diesel engines. g. All on and off-road diesel equipment shall not be allowed to idle for more than 5 minutes. Signs shall be posted in the designated queuing areas and or job sites to remind drivers and operators of the 5 minute idling limit. h. Electrify portable equipment where possible throughout the project area. i. All diesel powered portable equipment used shall have tier 2 or tier 3 engines and retrofitted with an ARB level 3 verified diesel emissions control strategy (VEDEC). j. Locate construction staging areas at least 1000 feet from sensitive receptors.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 36	**Construction Activity Management Plan**	The Construction Activity Management Plan (CAMP) should include but not be limited to the following elements: a. Schedule construction truck trips during non-peak hours to reduce peak hour emissions; b. Limit the length of the construction work-day period, if necessary; c. Phase construction activities to minimize overlapping emissions; and d. Construction Equipment composition and schedule including: 1. Equipment Type 2. Equipment Model 3. Equipment Year 4. Engine Type 5. Engine Model 6. Engine Year 7. Engine Horsepower 8. Schedule of use	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 37	**APCD Off-Site Mitigation Program**	APCD and the County will establish an off-site mitigation program based on the ozone precursor, PM exceedence, and greenhouse gas emissions. The County may use the funding of this program to implement APCD approved emission reduction projects near the project site or may pay that funding level plus a 15 percent administration fee to the APCD for the APCD to implement emission reduction projects in close proximity to the project. The County will provide the funding at a time or schedule approved by the APCD to help facilitate emission offsets that are as timely.	The County of San Luis Obispo will take the lead in addressing this requirement.

Condition 38	**Update CAMP Prior to Construction**	Prior to commencement of grading activities, an updated air quality emissions analysis consistent with the CAMP and mitigation measures above will be submitted to determine if additional measures (e.g. off-site mitigation) are required to reduce the air quality impact below the levels of significance.	The County of San Luis Obispo will take the lead in addressing this requirement.

Condition 39	**Naturally Occurring Asbestos**	Prior to any grading activities associated with the project, the project proponent shall ensure that a geologic evaluation is conducted to determine if Naturally Occurring Asbestos (NOA) is present within the area that will be disturbed. If NOA is not present, an exemption request must be filed with the District. If NOA is found at the site, the applicant must comply with all requirements outlined in the Asbestos ATCM. This may include development of an Asbestos Dust Mitigation Plan and an Asbestos Health and Safety Program for approval by the APCD. Please refer to the APCD web page at http://www.slocleanair.org/business/asbestos.asp for more information or contact the APCD Enforcement Division at 781-5912.	The County of San Luis Obispo will take the lead in addressing this requirement.
Condition 40	**Odor Control Plan**	An Odor Control Plan shall be submitted for review and approval of the San Luis Obispo County Air Pollution Control District prior to commencement of grading activities which shall be incorporated as conditions of the permit issued by the County for the construction and operation of the Los Osos wastewater project. The Odor Control Plan shall contain a Complaint Response Plan to address at least the following: a. A public outreach plan, including operator training in the handling of complaints; a program for informing the public regarding the complaint process; periodic neighborhood surveys of performance and responsiveness to complaints; and, a complaint hotline phone number. This public outreach plan shall be in place upon startup; b. An odor point identification map, which will aid the wastewater system operators and the SLOAPCD by identifying potential odor sources, a description of the odor point. This identification map and related information shall be completed within the first 3 months of startup; c. A list of immediate responses or actions to be taken to complaints, including, but not limited to: 1. The upstream addition of ferrous chloride (or other) injection system adjustments; 2. On-site odor checks to identify odor sources or system malfunctions, neighborhood complaint patrol and actions to be taken; d. A Contingency Action Plan detailing the methods to which odor sources will be studied and a response action plan to control odors over the long term. This Plan shall be in place upon startup. Possible responses include, but are not limited to, the following: 1. Providing additional "negative air" containment or recovery system areas; 2. Additional treatment containment enclosure; 3. Additional or improved odor control, dispersal and/or air movement at pump stations, wet wells and the wastewater treatment plant; 4. Additional study of odor sources and possible solutions, which may include a dilution to threshold measurement for each potential odor source using the Bay Area Air Quality Management District's procedure outlined in their Regulation 7 "Odor Substances" 7-400 et seq and "Manual for Procedures", Volume IV, ST-l, ST-8, ST-il, 51-16 and ST-22 or SLOAPCD equivalent	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 41	**Noise**	The County shall require that the treatment plant be designed so that the mechanical aeration system is located a minimum of 250 feet away from the nearest residence.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 42	**Noise**	The County shall require that the treatment plant be designed so that the backup diesel generator is enclosed in a structure and is located a minimum of 250 feet away from the nearest residence.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 43	**Operation and Management (O&M) Plans**	Operation and maintenance plans for the treatment facility will ensure that all pumps and aerators are kept in proper working order.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 44	**Noise-Collection**	The County shall require that the backup power facility structures for the in-town collection system be designed so that the noise created from the backup diesel generator that would be located inside the structure would not exceed 45 dBA Leq at the nearest property line. The noise from the backup diesel generator may be attenuated through the use of a "manufacturer enclosure" or through incorporation of noise attenuation design features into the backup power facility structure.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 45	**Soil Hazards**	Prior to any onsite construction activities at the proposed treatment plant sites, soils shall be sampled and analyzed by a licensed engineer or geologist approved by the County of San Luis Obispo Health Department to determine the level of residue for pesticides, herbicides, chemicals, and associated metals. If residues are found to be within acceptable amounts in accordance with the San Luis Obispo County Health Department (SLOCHD) and Environmental Protection Agency/Department of Toxic Substance Control (DTSC) standards, then grading and construction may begin. If the residue is found to be greater than the SLOCHD and DTSC standards, all contaminated soils exceeding the acceptable limits shall be remediated and/or properly disposed of in accordance with SLOCHD and DTSC requirements. An appropriate verification closure letter from SLOCHD and DTSC shall be obtained and submitted to the County of San Luis Obispo Planning Department. Depending on the extent of contaminated soils, a verification closure letter from the California Regional Water Quality Control Board may also need to be submitted to the County of San Luis Obispo Planning Department. Site remediation can occur by the use of onsite transportable thermal treatment units or bioremediation. The soil can also be excavated and shipped offsite to fixed incineration or bio-remediation facilities.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 46	**Hazardous Materials Management Plan**	Prior to operation of the wastewater treatment system, a Hazardous Materials Management Plan shall be developed and submitted to the County of San Luis Obispo Environmental Health Services Division for approval. The plan shall identify hazardous materials utilized at the proposed wastewater facilities and their characteristics, storage, handling, training procedures, and spill contingency procedures. Additionally, the Hazardous Materials Management Plan shall identify procedures in the event of accidents such as the release of raw wastewater or secondary treated water into watercourses such as Los Osos Creek. These procedures shall include immediate response personnel to limit public access to spill areas, potentially shutting down pump stations, creating berms, use of vacuum trucks, and use of water booms to contain spills within open water areas. Furthermore, the Plan shall address response and containment of fuel at pump station sites.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 47	**Temporary Fire Flows**	To reduce the potential temporary loss of water for firefighting that may occur as a result of construction activities, the project shall compensate for the potential temporary loss of water through means determined by the County Fire Chief.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 48	**CAL-OSHA Standards**	All contractors shall comply with relevant provisions of CAL-OSHA CAC Title 8 regarding the provision of safety and rescue equipment, to the satisfaction of the County Department of Public Works in consultation with the Planning Director.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 49	**Aesthetics-Colors and Landscaping**	At the time of construction, walls, roofs, and other building components shall be constructed in colors and tones compatible with the surrounding environment. Landscaping that will either screen from in front or grow over from above any fencing shall be established prior to operation of the facility.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 50	**Lighting Plan**	A final lighting plan shall be prepared for the treatment and disposal facilities in accordance with Estero Area Plan AES-5. The lighting plan shall meet County design standards. This shall include proper shielding, proper orientation, and applicable height standards. All lighting fixtures shall be shielded so that neither the lamp nor the related reflector interior surface is visible from adjacent properties or public areas. Light hoods shall be dark-colored. Lighting associated with all project components shall be the minimum needed for plant/pump station operations which require lighting for operations and/or during emergency situations.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 51	**Architectural Compatibility**	Any buildings associated with collection facilities at the Broderson and Mid-Town parcels shall be designed in such a manner so they are architecturally compatible with other buildings in the vicinity.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 52	**Architectural Compatibility**	Any building (equipment areas, pumping stations) associated with treatment and disposal facilities shall be designed to conform to an agricultural / rural landscape. Buildings shall be designed to appear as barns or other farm related structures.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 53	**Architectural Elevations**	Prior to construction, the applicant shall submit architectural elevations of all proposed structures to the Department of Planning for review and approval in consultation with the Environmental Coordinator. The elevations shall show exterior finish materials, colors, and height above the existing natural ground surface. Colors shall minimize the structure massing of new development by reducing the contrast between the proposed development and the surrounding environment. Colors shall be compatible with the natural colors of the surrounding environment, including vegetation, rock outcrops, sand dunes, etc. Darker or neutral, non-reflective, earth tone colors shall be selected for walls and buildings, and darker green, gray, slate blue, or brown colors for the roof structures.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 54	**Staging-Visual**	Construction staging areas shall conform to Estero Area Plan AES-1 and be located away from sensitive viewing areas to the extent feasible. Before construction activities begin, an area of construction equipment storage away from direct views of sensitive viewing corridors (e.g. residences and major roads in the project area) shall be designated.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 55	**Landscaping Plan**	A final landscaping plan shall be prepared for the entire project site and approved by the County prior to commencement of construction activities. Said landscaping plan shall emphasize native plant materials and shall include sufficient planting to screen views of the project from nearby roads, public areas, and residential developments. The landscaping plan shall be designed to visually integrate the project into the rural landscape, while preserving and enhancing existing views.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 56	**CDFG "No Take Agreement"**	Prior to the initiation of any vegetation clearing, soil disruption, grading, or any other construction related activities, the County shall formalize a "no take agreement" with the CDFG for the Morro Bay kangaroo rat. The "no take agreement' shall outline a monitoring and contingency plan for the Broderson leach field, as on-going maintenance of the leach field may create suitable Morro Bay kangaroo rat habitat.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 57	**Biological Preconstruction Surveys**	Where construction will necessitate disturbance in undeveloped lots and other potentially sensitive areas, a pre-construction survey will be conducted to assess and minimize any potential impacts to sensitive resources in these areas.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 58	**Monarch butterfly Surveys**	The proposed project shall avoid Monarch butterfly winter roost habitats where feasible. If the proposed project will impact potential winter roost habitat, a qualified biologist with expertise in positively identifying the Monarch butterfly and winter roosting behavior shall conduct preconstruction surveys within all suitable habitat that occurs within the proposed impact area during the months of October through February. All potential roost sites that have a potential to be impacted as a result of construction activities shall be fenced and avoided. No construction activities shall be permitted in the vicinity (within 500 feet) of potential roost sites during the winter roosting months.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 59	**Morro blue butterfly Surveys**	Prior to construction activities on the Broderson and Mid-town properties, a qualified biologist shall be retained to identify and demarcate all host silver dune lupine (Lupinus chamissonis) shrubs that occur within the impact area. The qualified biologist shall inspect each host lupine for the presence of any Morro blue butterfly eggs, larvae, or pupae. In an effort to avoid mortality of butterfly eggs, larvae, or pupae prior to the onset of adult emergence, any host lupine specimens determined to contain eggs, larvae, or pupae shall be considered for relocation outside of the impact area and within suitable coastal dune scrub habitat on either the Broderson or Mid-town properties. To avoid take of the Morro shoulderband snail (Helminthoglypta walkeriana) while conducting Morro blue butterfly survey activities, any person conducting such surveys shall be a qualified biologist knowledgeable in the general habitat requirements of the Morro shoulderband snail and familiar with the diagnostic features of all native and introduced snail species. Any planting and restoration efforts proposed as mitigation for the project shall include silver dune lupine within the plant palette to encourage the species to continue to use the area.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 60	**Broderson Mitigation**	Prior to project construction, land containing coastal dune scrub and maritime chaparral habitat shall be acquired on the Broderson property that is sufficient to compensate the loss of habitat for the Morro shoulderband snail and other sensitive species on the Broderson and Mid-town properties, and sensitive areas in the collection system. Seventy-three acres of the Broderson property not used for the proposed leachfields shall be preserved in perpetuity and granted to an appropriate agency or conservation organization with the responsibility of management and monitoring the preserve as determined during agreements with USFWS, CDFG, and the County. A long-term management and monitoring program shall be prepared for the area to be preserved. The County shall be responsible for the allocation of appropriate funding for the longterm management and monitoring of the mitigation land. Such funding expense may be recouped through fees imposed upon wastewater system users and others.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 61	**Broderson Leachfield Revegetation / Resource Management Plan**	Immediately following construction of the leachfields within the Broderson property, the disturbance area and all existing and unaffected coastal sage scrub (or coastal dune scrub) within the property shall be restored, enhanced, and maintained to promote the land's function and value as suitable habitat for sensitive plants and wildlife that are local or endemic to the area. Restoration and enhancement efforts, including at minimum, seeding with native plant species and eradication of exotic non-native plant species, shall be repeated immediately following all long-term maintenance activities resulting in temporary disturbance of the leachfields. This shall be applied to the ripping and backfilling activities that will be required every 5 to 10 years to maintain the leachfield function. Restoration activities shall be conducted according to a Restoration Plan or similar plan specifically prepared for the effort and approved by USFWS, CDFG, and/or the CNPS. The Restoration Plan shall require at minimum, a description of the prescribed restoration and methodology, feasibility and likelihood for success, and a schedule and program for maintenance, monitoring and reporting the progress of the restoration effort. All restoration activities shall be conducted by qualified personnel with expertise in restoration ecology and knowledge of sensitive plant and wildlife species in the area. The restoration effort shall include the implementation of a seed collection program to gather seeds to be used during restoration from native sources. The seed collection program shall be prepared for approval by the County prior to project construction activities. The seed collection program shall include the use of native plants that will be removed as a result of the project, including but not limited to: mock heather (Ericameria ericoides), silver dune lupine (Lupinus chamissonis), California sagebrush (Artemisia californica), black sage (Salvia mellifera), bush monkey flower (Mimulus aurantiacus), and deerweed (Lotus scoparius). Collection shall take place by qualified personnel with expertise in botanical resources during the appropriate time of year for seed production and harvesting. Unless otherwise determined during consultation with the USFWS, the restoration effort shall be monitored against performance standards for a minimum of five years, or until the first ripping event for the restored areas within the leachfield area, after which the maintenance and monitoring of the restored areas shall be covered within specific management directives contained within a Resource Management Plan. The performance standards shall include, at minimum, at least 80 percent native plant species coverage and no greater than 1 percent coverage of invasive non-native plant species (e.g. pampass grass, veldt grass). At minimum, the restored areas must demonstrate a continued ability to support the functions and values necessary to sustain the Morro shoulderband snail. Quarterly monitoring shall be conducted for the first two years of the restoration effort, with annual monitoring efforts to follow for the remaining three years. All monitoring and maintenance of restoration areas shall be conducted by qualified personnel with expertise in botanical resources and knowledge of sensitive species that occur in the local area, including the Morro shoulderband snail, Morro Bay kangaroo rat, and Morro blue butterfly. The County shall provide annual reports to the USFWS documenting the results of all restoration and monitoring activities. Annual reports shall be provided to the USFWS for a minimum of five years or until it is determined by the USFWS that requisite performance criteria have been met. These reports should include any noted changes in the plant community structure or composition or surface hydrology down-slope of the Broderson leachfields, in addition to other requirements as determined through USFWS consultation and stipulated within permit conditions. All on-going and long-term restoration, enhancement, and maintenance of preserved lands on the Broderson property shall be implemented according to a Resource Management Plan or similar mitigation and monitoring plan that may be developed during consultation with the USFWS. The Resource Management Plan shall include management directives that are specific to the preserve and the resources present. The Resource Management Plan shall include measures for the removal and eradication of invasive exotic plant species known to occur in the local area, including veldt grass and pampas grass. Activities that involve the removal of invasive species should not result in unnecessary trampling or removal of native species, and techniques for invasive removal shall be least damaging to native species.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 62	**Section 7 Consultation**	The proposed project may affect federally-listed species (including Morro shoulderband snail and California red-legged frog) and as such, the EPA shall initiate formal consultation with USFWS pursuant to Section 7(a)(2) of the federal ESA. All mandatory terms and conditions, and reasonable and prudent measures pertaining to incidental take prescribed within the Biological Opinion and Nationwide Permit for the project the shall be fulfilled and implemented.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 63	**Morro shoulderband snail Monitoring**	Prior to construction, a biologist authorized by the USWFS shall conduct intensive surveys to identify and relocate all Morro shoulderband snails within the proposed impact area on the Broderson and Mid-town properties, and all suitable habitat areas within the proposed collection system. Only USFWS authorized biologists shall survey for, monitor, handle, or relocate Morro shoulderband snails. A biologist authorized by the USFWS shall be retained to monitor all construction activities that will take place within suitable habitat for the Morro shoulderband snail. Monitoring activities shall be required daily until completion of initial disturbance at each construction area. The monitoring biologist shall be granted full authority to stop work at his or her discretion. The monitoring biologist shall be responsible for implementing avoidance and minimization measures during construction. The monitoring biologist shall stop work if project-related activities occur outside the demarcated boundaries of the construction footprint. The monitoring biologist shall stop work if any Morro shoulderband snails are detected within the proposed construction footprint, and shall implement measures to relocate them to suitable habitat out of harms way prior to construction activities resuming. If no suitable habitat opportunities are available in the immediate vicinity of the construction footprint, salvaged and relocated specimens may also be transported to an offsite location approved by the USFWS.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 64	**California red-legged frog Monitoring**	Prior to project construction, the County shall retain a qualified biologist to conduct preconstruction surveys for the California red-legged frog according to protocol approved by the USFWS. Surveys shall be conducted within all areas that at are determined to contain suitable habitat for this species and that occur within 100 feet of proposed construction, or at a distance determined through USFWS consultation. To avoid potential timing conflicts with the California red-legged frog breeding period, construction activities in the vicinity of California red-legged frog habitat shall be completed between April 1 and November 1. This measure shall apply to construction activities at the Los Osos Valley Road bridge and Los Osos Creek crossing, and all other areas determined during pre-construction surveys to contain suitable habitat for the species, including areas that occur within 100 feet of proposed construction, or at a distance determined through USFWS consultation. Prior to construction, the County shall retain a USFWS-approved biologist to permanently remove any individuals of exotic species, such as bullfrogs, crayfish, and centrarchid fishes from the project area, to the maximum extent possible. The USFWSapproved biologist will be responsible for ensuring his or her activities are in compliance with the California Fish and Game Code. Prior to construction, the County shall retain a USFWS-approved biologist responsible for monitoring construction activities. Ground disturbance shall not be authorized to begin until written approval is received from the USFWS that the biologist is qualified to conduct the work. Only USFWS-approved biologists will participate in activities associated with the capture, handling, and monitoring of California red-legged frog. To ensure that diseases are not conveyed between work sites by the USFWS-approved biologist, the fieldwork code of practice developed by the Declining Amphibian Populations Task Force shall be followed at all times. A USFWS-approved biologist shall be present at the active work sites until such time that the initial survey for California redlegged frogs, instruction of workers, and (upland) habitat disturbance have been completed. After this time, the contractor or County shall designate a qualified person to monitor on-site compliance with all minimization measures. The USFWS-approved biologist shall ensure that this individual receives appropriate training as to the identification of frogs, potential hazards to the species, inappropriate and allowable work monitor on-site compliance with all minimization measures. The USFWS-approved biologist shall ensure that this individual receives appropriate training as to the identification of frogs, potential hazards to the species, inappropriate and allowable work activities, and appropriate contacts for immediate, professional biological support. During work activities, all trash that may attract predators shall be properly contained, removed from the work site and disposed of regularly. Following construction, all trash and construction debris shall be removed from work areas. All fueling and maintenance of vehicles and other equipment and staging areas shall occur a minimum of 100 feet from all open water, stream, wetland, and riparian habitat. The County shall ensure that contamination of habitat does not occur during such operations. Prior to the onset of work, the EPA shall ensure that the County has prepared a plan to allow a prompt and effective response to any accidental spills. A copy of this plan shall be provided to the Department of Planning and Building. Wet weather storage ponds shall be maintained as to not attract bullfrogs. This will include allowing the ponds to go dry during the summer to disrupt any breeding activity by bullfrogs. The County shall monitor wet weather storage ponds for bullfrog activity.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 65	**Monterey spineflower Surveys**	Prior to project construction and within all areas on the Broderson property that contain suitable habitat for the Monterey spineflower, a qualified biologist shall be retained to conduct botanical surveys for Monterey spineflower presence. Surveys shall be conducted during the local blooming period for the species, which typically occurs between April and June, and according to recommendations and guidelines prepared by the USFWS, CDFG, and CNPS. If positively identified, all specimens shall be clearly demarcated with flagging, and avoided to the maximum extent feasible during construction. A qualified monitoring biologist shall be retained to monitor all construction activities in the immediate vicinity (within 25 feet) of any flagged specimens that will not be removed as a result of construction activities. If specimens are positively identified within the leachfield impact area, the seeds of those specimens shall be collected and sown within suitable habitat located outside of the leachfield impact area and within the Broderson property. The County shall provide a written report to USFWS within 90 days following the completion of the project. The report shall document the number of Monterey spineflower specimens removed from project areas, the locations of areas seeded with Monterey spineflower seeds, and the number of Monterey spineflower specimens found to be dead or damaged as a result of construction activities. The report shall contain a brief discussion of any problems encountered in implementing minimization measures, results of biological surveys, observations, and any other pertinent information such as the acreages affected and restored, or undergoing restoration, of each habitat type.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 66	**Botanical Surveys**	The proposed project shall minimize to the maximum extent feasible any potential impacts to non-listed plant and lichen species designated as sensitive by the CNPS, including Blochman leafy daisy, saint's daisy, San Luis Obispo wallflower, curly-leafed monardella, dune almond, spiraled old man's beard, Los Osos black and white lichen, long-fringed parmotrema, and splitting yarn lichen. The County shall retain a qualified biologist to conduct botanical surveys within suitable habitat on the Broderson and Midtown properties to identify all sensitive plant and lichen species within and in the immediate vicinity of the impact areas. Surveys shall be conducted during the local blooming periods for each species, where applicable, and according to recommendations and guidelines prepared by the USFWS, CDFG, and CNPS. All specimens shall be clearly demarcated with flagging and avoided to the maximum extent feasible during construction.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 67	**"No Take" of MBKR**	Prior to construction, the County shall formalize a "no take agreement" with the CDFG for the Morro Bay kangaroo rat. The "no take agreement' shall outline a monitoring and contingency plan for the Broderson leachfield, as on-going maintenance of the leachfield may create suitable Morro Bay kangaroo rat habitat.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 68	**Worker Education Program**	A worker education program and clearly defined operations procedures shall be prepared prior to project construction. The worker education program and operations procedures shall be implemented by the County throughout the duration of construction. A biologist approved by the USFWS shall be retained to provide construction personnel specific instruction on general detection and avoidance of sensitive resources during construction. The worker education program shall include: descriptions and pictures of listed species; the provisions of the Endangered Species Act; those specific measures being implemented to avoid and minimize take or impacts to listed or otherwise sensitive species (e.g. conserve listed and sensitive species as they relate to the project); and the project boundaries within which the work will occur.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 69	**Nesting Bird Surveys**	If any construction activities are proposed during the general bird breeding season (February 1 through August 31), a pre-construction survey shall be conducted by a qualified biologist within 10 calendar days prior to the onset of construction activities to identity any active non-raptor bird nests within 250 feet of the proposed impact area. If an active nest is identified during the pre-construction survey, a minimum no-disturbance buffer of 250 feet shall be delineated around active nests until the breeding season has ended or until a qualified biologist has determined that the birds have fledged and are no longer reliant upon the nest or parental care for survival. Fore sensitive species, including Allen's hummingbird, yellow warbler, and loggerhead shrike, the distance and placement of the construction avoidance shall be a minimum of 250 feet unless otherwise determine through consultation with the CDFG.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 70	**Nesting Raptor Surveys**	If any construction activities are proposed during the general raptor breeding season (February 1 through August 31), a pre-construction survey shall be conducted by a qualified biologist within 10 calendar days prior to onset of construction to identify any active raptor nests within 500 feet of the proposed impact area. If an active raptor nest is identified during the pre-construction survey, a minimum no-disturbance buffer of 500 feet shall be delineated around active nests until the breeding season has ended or until a qualified biologist has determined that the birds have fledged and are no longer reliant upon the nest or parental care for survival. Pursuant to Section 2050 of the CFG Code, the CDFG will not permit any impacts to the California state fully protected white-tailed kite. If an active nest or breeding territory is detected during preconstruction surveys for nesting birds, no construction activities shall take place within 500 feet of the location of the active nest. The area shall be completely avoided and fenced to allow for an adequate buffer from construction activities. A qualified biologist shall be retained to monitor the activity of the nest during the breeding season until it is determined that the nest is no longer active (i.e., all young have fledged the nest and there are no individual kites that are dependent on the nest).	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.
Condition 71	**Burial MOA**	A draft Memorandum of Agreement has been prepared for the treatment and disposition of human remains and associated burial items. This document lays out the procedures agreed upon by interested local Native Americans and stipulated under State law, including proper and respectful handling of remains, identification of reburial areas, acceptable analyses, and resolution of conflicts. It includes a list of Most Likely Descendents approved by the Native American Heritage Commission; these individuals are signatories on the Agreement.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 72	**Archaeological Excavations**	For sites with known human remains or which have a potential for human remains, preconstruction excavations shall take place within the direct impact areas to insure that no human remains are present.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 73	**Discovery of Human Remains**	If human remains are encountered within the project area, the County shall be responsible for complying with provisions of Public Resources Code Sections 5097.98 and 5097.99, and 7050.5 of the California Health and Safety Code, as amended by Assembly Bill 2641. Restrictions or procedures for excavation, treatment, or handling of human remains shall be established in consultation with the individuals designated by the Native American Heritage Commission as the Most Likely Descendents.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 74	**Paleontological Resources**	Although unlikely, should any vertebrate fossils or potentially significant finds (e.g., numerous well-preserved invertebrate or plant fossils) be encountered by anyone working on the site, all activities in the immediate vicinity of the find are to cease until a qualified paleontologist evaluates the find for its scientific value. If deemed significant, the paleontological resource(s) shall be salvaged and deposited in an accredited and permanent scientific institution where they will be properly curated and preserved for the benefit of current and future generations.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 75	**APCD Equipment Requirements**	Prior to initiating grading activities, the proponent's contractor or engineer shall: a. Include the following specifications on all project plans: One catalyzed diesel particulate filter (CDPF) shall be used on the piece of equipment estimated to generate the greatest emissions. If a CDPF is unsuitable for the potential equipment to be controlled, five diesel oxidation catalysts (DOC) shall be used. b. Identify equipment to be operated during construction as early as possible in order to place the order for the appropriate filter and avoid any project delays. This is necessary so that contractors bidding on the project can include the purchase, proper installation, and maintenance costs in their bids. c. Contact the SLOAPCD Compliance Division to initiate implementation of this mitigation measure at least two months prior to start of construction.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 76	**Dust Control**	Project contract documents would include the following dust control measures: a. Reduce the amount of the disturbed area where possible, b. Use water trucks or sprinkler systems in sufficient quantities to prevent airborne dust from leaving the site. Increased watering frequency will be required whenever wind speeds exceed 15 mph. Reclaimed (nonpotable) water should be used whenever possible. c. All dirt stockpile areas will be sprayed daily as needed, d. Permanent dust control measures identified in the revegetation and landscape plans will be implemented as soon as possible following completion of any soil disturbing activities. e. Exposed ground areas that are planned to be reworked at dates greater than one month after initial grading will be sown with a fast germinating native grass seed and watered until vegetation is established. f. All disturbed soil areas not subject to revegetation will be stabilized using approved chemical soil binders, jute netting, or other methods approved in advance by the APCD. Any erosion and sedimentation control netting or other erosion and sedimentation control devises used for temporary or permanent erosion and sedimentation control, shall be limited to biodegradable mesh or other biodegradable products. g. All roadways, driveways, sidewalks, etc. to be paved will be completed as soon as possible. In addition, building pads will be laid as soon as possible after grading unless seeding or soil binders are used. h. Vehicle speed for all construction vehicles will not exceed 15 mph on any unpaved surface at the construction site. i. All trucks hauling dirt, sand, soil, or other loose materials are to be covered or will maintain at least two feet of freeboard (minimum vertical distance between top of load and top of trailer) in accordance with CVC Section 23114. j. Install wheel washers where vehicles enter and exit unpaved roads onto streets, or wash off trucks and equipment leaving the site. k. Sweep streets at the end of each day if visible soil material is carried onto adjacent paved roads. Water sweepers with reclaimed water should be used where feasible. l. If visible emissions of fugitive dust persist beyond a distance of 200 feet from the boundary of the construction site, all feasible measures shall be implemented to eliminate potential nuisance conditions at off-site receptors (e.g., increase frequency of watering or dust suppression, install temporary wind breaks where appropriate, suspend excavation and grading activity when winds exceed 25 mph). m. The contractor will designate a person or persons to monitor the dust control program and to order increased watering, as necessary, to prevent transport of dust offsite. Their duties will include holidays and weekend periods when work may not be in progress. The name and telephone number of such persons will be provided to the SLOAPCD prior to the start of construction.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 77	**Off-Site Mitigation for Emissions**	If the above mitigation measures do not bring the construction emissions below the thresholds, off-site mitigation funds can be used to secure emission reductions from projects located in close proximity to this construction site. In this instance, emissions in excess of construction phase thresholds are multiplied by the cost effectiveness value defined in the State's current Carl Moyer Incentive Program Guidelines to determine the off-site mitigation amount associated with the construction period. Examples of off-site emission reduction measures are contained in Section 5.9 of the 2003 CEQA Air Quality Handbook. The actual mix of mitigation measures that would be required to meet the reduction in NOX to less than a total of 185 lbs per day or 6.0 tons per quarter over the term of construction and would be finalized and mutually agreed to by the Applicant and appropriate staff of the SLOAPCD prior to commencement of construction of the project.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 78	**Noise Attenuation Requirements**	The project applicant shall require construction contractors to adhere to the following noise attenuation requirements: a. A construction noise control plan shall be developed for the project that identifies the nature and timing of operations designed to minimize noise exposure to noise sensitive receptors including natural resource areas. b. Generally, construction activities shall be limited to between the hours of 7 a.m. to 9 p.m. on any day except Saturday or Sunday or between the hours of 8 a.m. to 5 p.m. on Saturday or Sunday. c. Construction activities in the vicinity of schools should be scheduled for times when classes are not in session. d. All construction equipment shall use noise-reduction features (e.g., mufflers and engine shrouds) that are no less effective than those originally installed by the manufacturer. e. The noise produced by construction activities shall be monitored to insure that the noise produced by construction equipment is compliant with the emission standards listed in the project EIR (Appendix L, page 5.10-4 and in source document, FHWA Construction Noise Model, page 3). f. Measures to minimize back-up alarm issues shall be established including such techniques as: 1) use of self-adjusting ambient sensitive back-up alarms, 2) manual adjustable alarms on lower settings, 3) use of observers, 4) scheduling of activities so that alarm noise is minimized, and 5) construction site access designed such that deliveries and trucks move through the site in a forward manner without the need to back up. g. Construction staging and heavy equipment maintenance activities shall be performed a minimum distance of 300 feet from the nearest residence, unless safety or technical factors take precedence. h. Stationary combustion equipment such as pumps or generators operating near any noise sensitive receptor shall, if necessary, be shielded with a noise protection barrier. Leq values at the property line of receiver locations shall not exceed 65 dB.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 79	**Pile Driving Requirements**	The construction contractor shall notify all property owners and tenants adjacent to the proposed pile driving activities of the days and hours of operation. The construction contractor shall also require that a noise damper be utilized between the pile driver and the object that is being driven into the ground.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 80	**Pile Driving-Vibration**	Prior to initiation of construction of the collection system, the contractor/designer shall identify all areas where pile driving, or other construction methods that would result in severe ground vibrations, could occur. Deep pile foundation designs shall favor techniques that can be constructed with minimal vibration effects. Prior to construction, using technology and standards recommended in the Caltrans Transportation and Construction Induced Vibration Manual, the contractor shall calculate the vibration effects of pile driving and other high vibration activities using the Peak Particle Velocity (PPV) metric, and shall ensure that the PPV does not exceed the following thresholds at any affected building: 0.5 at modern industrial/commercial or residential buildings; 0.3 for any building composed of masonry, unreinforced concrete, lath & plaster interiors or of similar construction; and 0.25 for any building identified as particularly sensitive to vibration impacts. Alternative design and/or construction methods shall be used to meet these limits. In addition, the construction contractor shall notify all property owners and tenants adjacent to the proposed pile driving or other vibration inducing activities of the days and hours of operation. Prior to construction activities associated with this type of work, the construction contractor shall inspect all structures within the area predicted to experience vibration in excess of 0.25 PPV to document existing characteristics of the structures. During construction, vibration shall be monitored and recorded and adjustments made to operation or to the radius of concern if the level of vibration differs from estimates. If a post construction survey indicates that damages to structures (e.g., residences, pools) occurred during the work, the property owner shall be fairly compensated for the cost of remediating damages.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 81	**Invasive Plants**	Control Introduction of Invasive Exotic Plants. To control introduction of invasive exotic plants on site, implement the following measures during construction and incorporate into the design guidelines of the proposed percolation fields, as appropriate. a. Use only clean fill material (free of weed seeds) within the construction zone of the proposed project. b. Thoroughly clean all construction equipment prior to being moved onto and used at the site. c. Prohibit planting or seeding of disturbed areas with nonnative plant species; d. Control the establishment of invasive exotic weeds in all disturbed areas. Remove existing stands of invasive exotic plants, including but not limited to veldt grass, pampas grass and ice plants, in order to limit their spread.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 82	**Los Osos Creek Environmental Requirements**	All construction activities across Los Osos Creek shall be restricted to low-flow periods of June 15 through November 1. If the channel is dry, construction can occur as early as June 1. Restricting construction activities to this work window will minimize impacts to migrating adult and smolt steelhead, if present. Prior to construction, the County shall retain a qualified biological monitor to be on site during all stream crossing activities associated with Los Osos Creek. The biological monitor will be authorized to halt construction if impacts to steelhead are evident. Prior to construction, a spill prevention plan for potentially hazardous materials shall be prepared and implemented. The plan shall include the proper handling and storage of all potentially hazardous materials, as well as the proper procedures for cleaning up and reporting of any spills. If necessary, containment berms shall be constructed to prevent spilled materials from reaching the creek channel. Prior to construction, silt fencing shall be installed in all areas where construction occurs within 100 feet of known or potential steelhead habitat. All silt fencing, erosion control and landscaping specifications shall only include natural-fiber, biodegradable products for meshes and coir rolls to minimize impacts to species and the environment during use. During construction, spoil sites shall be restricted to upland locations so they do not drain directly into Los Osos Creek. If a spoil site drains into a water body, catch basins shall be constructed to intercept sediment before it reaches the channels. If required, spoil sites shall be graded to reduce the potential for erosion. During construction, equipment and materials shall be stored at least 50 feet from Los Osos Creek. No debris such as Immediately following construction, all construction work areas shall be restored to preconstruction channel conditions, including streambed composition, compaction, and gradient. If required, channel banks shall be returned to original grade slope and appropriate bank stabilization techniques shall be implemented to reduce the potential for erosion and sedimentation. A plan describing pre-project conditions and restoration methods shall be prepared prior to construction. Immediately following construction, all appropriate construction work areas will be revegetated with an appropriate assemblage of native upland vegetation, and if necessary, riparian vegetation, suitable for the area. A plan describing pre-project conditions, restoration and monitoring success criteria shall be prepared prior to construction.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Condition 83	**Trenchless Technologies**	Implementation of trenchless technologies shall be considered as a feasible option for the installation of conveyance pipelines within and adjacent to areas containing wetlands, streams, and riparian vegetation. Trenchless technologies that are feasible for all Proposed Projects include microtunneling and horizontal directional drilling (HDD) within all areas along the proposed conveyance routes, and pipe suspension at areas supporting existing bridge crossings along the proposed conveyance routes (at the Los Osos Creek crossing). Microtunneling and HDD entrance and exit locations shall be set back as far away from wetlands, streams, and riparian vegetation as feasible and consistent with the setback requirements of the CZLUO and Estero Area Plan. Implementation of microtunneling and HDD methodologies shall incorporate a frac-out contingency plan and all relevant Best Management Practices during construction. Maintenance activities associated with pipe suspension that may result in activity within the streambed of Los Osos Creek shall be restricted to periods when the streambed is dry and does not support any flowing water or pooling water in the proposed maintenance area.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 84	**Final Inspections**	Prior to operation of the wastewater treatment system, the applicant shall: a) Obtain final inspection approval of all required fire/life safety measures. b) Prior to operation of the wastewater treatment system, all Public Works Encroachment permit provisions shall be completed to the satisfaction of the Department.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 85	**Rotate Rehabilitation of Percolation Fields**	Rehabilitation of disposal percolation fields shall be rotated so that no more than one field is under re-construction at a time.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 86	**No Service to Undeveloped Properties**	Consistent with condition of approval # 34 is for Coastal Development Permit (CDP A-3-SLO-03-113 / D020283).To prevent the wastewater treatment system from inducing growth that cannot be safely sustained by available water supplies, the sewer authority is prohibited from providing service to existing undeveloped parcels within the service area, unless and until the Estero Area Plan is amended to incorporate a sustainable buildout target that indicates that there is water available to support such development without impacts to wetlands and habitats.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 87	**Groundwater Level Monitoring and Mgmt Plan**	Concurrent with the operation of the facility, the County shall implement the Groundwater Level Monitoring and Management Plan that details methods for measuring and responding to changes in groundwater levels that could affect wetland hydrology and habitat values. The Plan includes provisions for monitoring groundwater levels, surveys for wetland plant and animals, monitoring wetland hydrology and water quality, appropriate response procedures should impacts be identified, annual reporting, and an education program to encourage property owners to convert septic systems into areas capable of groundwater recharge.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 88	**Septic Tank Re-Use**	In order to maintain existing levels of groundwater recharge and protect coastal water quality, the County shall evaluate and, where appropriate, assist property owners in the implementation of opportunities to re-use existing septic tank effluent disposal systems (e.g., leach fields) to filter and percolate stormwater runoff. Prior to the connection of individual properties the County shall, at the consent of the landowner, evaluate whether existing on site wastewater disposal facilities have adequate capacity and depth to groundwater to accommodate and percolate stormwater runoff, and if so, provide sitespecific recommendations on how to connect such a system.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 89	**Odors During Operation**	The Los Osos wastewater project (including collection, treatment and disposal) shall be operated in a manner that prevents the emission of nuisance odors that are perceptible at or beyond the property lines of the project site, consistent with the requirements of Health and Safety Code Section 41700. Nuisance odors, problems with the operation of the wastewater treatment plant or dust complaints shall be directed to the operators of the wastewater treatment plant. The San Luis Obispo County Air Pollution Control District (SLOAPCD) will also respond to complaints and communicate immediately with the operators of the wastewater treatment plant. All complaints, breakdowns, or parameter exceedence shall be reported to the SLOAPCD within four (4) hours of receipt or event.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 90	**Condition Eliminated**	None	N/A

Condition 91	**Screen Planting**	Screen Planting - Trees and shrubs shall be planted along the perimeter of the wastewater treatment facility prior to facility operation or at the earliest time feasible after completion grading activities. To provide effective screening, the size and variety of evergreen trees shall be planted which will reach a minimum height of 25 feet within five years. Large shrubs shall be included to provide lower height screening. Italian Cypress and other distinctly-shaped non-native plants shall not be used. The screen planting shall be designed to appear as a naturally appearing swath of vegetation. Evidence shall be submitted to the Department of Planning and Building to show that 75% screening has been achieved within 5 years. Landscape must be maintained to provide the required or better screening in perpetuity.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 92	**Habitat Conservation Plan (HCP)**	Prior to providing wastewater treatment service to undeveloped parcels, the County, in coordination with the California Department of Fish and Game (CDFG), the US Fish and Wildlife Service (USF&WS), San Luis Obispo County and the California Coastal Commission shall prepare and implement a Habitat Conservation Plan (HCP) for the long-term preservation of habitat remaining within the Los Osos Greenbelt, including habitat remaining on individual vacant lots. The HCP shall: a. identify the habitat resources and the quality of those resources on the remaining vacant properties within the South Bay Urban Area and Los Osos Greenbelt; b. specify measures to avoid and minimize impacts to ESHA from buildout of the Service area, and to mitigate unavoidable impacts through acquisition, protection, and/or restoration of equivalent habitat within the planning area; and c. implement such measures through an amendment to the Estero Area Plan that integrates the HCP, as approved by the US Fish and Wildlife Service and Department and Fish and Game, with LCP standards for development in the South Bay Urban Area. This LCP amendment must become fully effective, and all permits required by state and federal Endangered Species Acts shall be issued, before County makes any final commitment to provide wastewater treatment service to undeveloped properties. The range of potential conservation programs to be considered in the HCP shall include, but not be limited to the following: a. New development programs and standards that maximize preservation of sensitive biological resources in the Los Osos area, such as: i. Transfer of development credits ii. Clustering iii. Avoidance of sensitive resources in site design iv. Changes in density and land use v. Incorporation of open space into the design of new development b. Programs aimed at facilitating coordination among agencies and organizations involved in management and conservation/preservation of sensitive resources, including USF&WS, CDFG, California Coastal Commission, San Luis Obispo County, MBNEP, Land Conservancy of San Luis Obispo County, and others; c. The creation of a land bank program to facilitate the purchase of properties with high quality habitat within the Greenbelt, to be repaid over time from fees on new building permits; and d. Programs for the acquisition of properties within the Greenbelt that contain significant habitat resources. The County may apply for amendment to this permit condition at, or prior to the time that the treatment plant is operational, to authorize the County to issue Will Serve letters to properties that would otherwise qualify.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 93	**Condition Eliminated**	None	N/A

Condition 94	**Laterals-Biology**	Installation of lateral lines will conform to the mitigation procedures contained in the “Lateral Line Installation — Biological Resources & Mitigation” report dated 10-16-02.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 95	**Farmland Conservation Easement**	Prior to operation of the wastewater treatment system, the County Department of Public Works shall provide evidence to the County Planning and Building Department that a farmland conservation easement, a farmland deed restriction, or other farmland conservation mechanism burdening an off-site agricultural mitigation parcel has been granted in perpetuity to the County or a qualifying entity approved by the County Agricultural Commissioner (or designee). The easement shall provide conservation acreage at a ratio of not less than 2:1 for the loss of agricultural land. Additionally, the project proponent shall provide appropriate funds (as determined by the County Planning Department) to compensate for reasonable administrative costs incurred by the easement holder. The area conserved shall be at least 32 acres (to offset direct impacts from the treatment plant facility), and shall be of a quality that is reasonably (as determined by the County Agricultural Commissioner or designee) similar to that of the farmland within the project limits. The area to be conserved shall be located within San Luis Obispo County within reasonable proximity to the project site.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 96	**Site Management Plan**	Site Management Plan. Prior to operation of the facility, the County, in consultation with resource agencies, will develop a Site Management Plan for the remainder of the new public lot to be created out of the Giacomazzi property. The Site Management Plan will provide for the continued operation of agricultural activities on those portions of the property not used for the project and/or associated mitigation consistent with the affirmative agricultural easement requirements described herein. Implementation of the Plan will ensure that uses or land stewardship practices do not impede adjacent agricultural uses and practices and may include, but not be limited to: (a) Maintenance of fences sufficient to clearly delineate property lines, contain livestock, prevent trespass, and manage non-native invasive species. (b) Prevention and management actions to avoid the proliferation of weeds and noxious plants that are incompatible with adjacent agricultural practices. (c) Management of all on-site water features, including springs, streams, and ponds in a manner that does not result in erosion or sedimentation impacts on downstream properties. The Site management will be reviewed and approved by the Director of Planning and Building in consultation with the Agricultural Commissioner prior to implementation.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 97	**Treated Effluent Re-Use Sites**	Disposal of treated effluent shall be reserved for the following sites/uses in the Los Osos Groundwater Basin: a. Broderson (not to exceed 448 AFY on an average annual basis), b. Urban re-use within the urban reserve line (as identified in the Effluent Re-Use and Disposal Tech Memo, July 2008), c. Agricultural re-use overlying the Los Osos Groundwater Basin, d. Environmental reservations (not less than 10% of the total volume of treated effluent). Total agricultural re-use shall not be less than 10% of the total treated effluent. Disposal shall be prioritized to reduce seawater intrusion and return/retain water to/in the Los Osos groundwater basin. Highest priority shall be given to replacing potable water uses with tertiary treated effluent consistent with Water Code Section 13550. No amount of treated effluent may be used to satisfy or offset water needs that result from non-agricultural development outside the Urban Reserve Line of the community of Los Osos.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 98	**Welded or Sealed Pipes**	Where the collection system pipes will be located in areas of high groundwater, or areas subject to future 5 foot sea level rise, as shown on the June 29 and 30, 2009 PC Memo – page: 1-16 (see Attachment 3), and as identified in the field during construction; the applicant shall utilize fusion welded pipes or chemically sealed pipes. In areas of high groundwater, additional inspections to ensure proper installation shall be completed prior to backfilling the trenches. All laterals to individual residences shall utilize fusion welded pipes or chemically sealed pipes. Lateral connections at the property line shall utilize fusion welded pipes, chemically sealed pipes, or collars.	The Wastewater Collection System design proposes to adhere to these requirements through use of AWWA C900/C905 water transmission pressure pipe.

Condition 99	**Water Conservation Program**	Within one year of adoption of a due diligence resolution by the Board of Supervisors, electing to proceed with a wastewater project, a water conservation program shall be developed by the applicant in consultation with the local water purveyors within the prohibition zone for the community of Los Osos, that meets the goal of 50 gallons per day / per person for indoor use. The applicant shall provide 5 (five) million dollars of funding towards a water conservation program for indoor water conservation. Incentives shall be provided to homeowners and other property owners who install conservation measures within the first year.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 100	**New Well at Treatment Plant**	Prior to operation of the wastewater treatment system, the applicant shall provide a new on-site well for facility operations in accordance with California Well Standards and County Ordinances and to the satisfaction of the Environmental Health Department.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 101	**Bayridge Leachfield**	The applicant shall utilize the existing Bayridge leach field (APN 074-491-033) to dispose of approximately 33 acre feet per year of treated effluent upon decommissioning of the existing leach field and connection to the community sewer system. The applicant shall consult with the Los Osos Community Services District (LOCSD) prior to the design phase of the project regarding use of said facilities to ensure all their concerns are addressed.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Condition 102	**Maximize Solar Orientation**	The applicant shall design the layout of the proposed sewer treatment facility to allow for structures to have roofs with "due south orientation" to maximize solar orientation for future solar photovoltaic and / or solar water panel installation, as feasible. No evergreen trees (with mature heights over 12 feet) shall be planted near structure that could potentially block the sun to these portions of the roofs unless necessary for visual screening. This shall be reflected in any landscape plans prepared / required. As a part of roof design / construction, these portions of the roofs shall be designed to be able to handle the "dead" loads associated with the weight of these panels. To further maximize solar efficiency, where possible, roof pitch of this portion of roof shall be as close to 20 degrees as practical. The applicant shall provide verification to the satisfaction of the County Planning and Building Department that the above measures have been incorporated into the project.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 103	**Verification of Retrofits**	Prior to individual property connections to the waste water system, each property owner shall provide verification to the satisfaction of the Planning Director that all toilets, showerheads and faucets have been replaced with high efficiency versions of the same.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 104	**Requirements for Agricultural Re-Use and Disposal Lines**	Agriculture irrigation lines and other wastewater effluent disposal lines shall be located within existing right-of-ways (including agricultural field access ways) and other areas known to not include, or that can be demonstrated to not include, cultural or biological resources. Use of the effluent shall be consistent with all other local, State, and Federal regulatory requirements including but not limited to the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands requirement of the Central Coast Regional Water Quality Control Board.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Condition 105	**Bio-Solids Disposal**	Bio-solids shall be disposed of at the closest approved facility within the San Luis Obispo County region. The San Luis Obispo County region shall be limited to the northern San Luis Obispo county line and south to the Santa Maria area within Santa Barbara County. If an approved facility is not available within the San Luis Obispo County region at the time of project start-up, then the closest approved facility shall be utilized. If an approved facility becomes available for disposal of bio-solids within the San Luis Obispo County region, that facility shall be utilized for disposal of bio-solids.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 106	**Surplus Land**	If the County acquires more land area than is necessary to site the treatment facility and appurtenant facilities, then prior to transferring title of the surplus area, the County shall record an affirmative agricultural easement over such surplus land. This easement shall take into consideration biological, cultural, sedimentation and erosion constraints on the project site. Agricultural activities chosen to take place on the remainder of the wastewater treatment facility site shall be consistent with the long term protection of the identified resources.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 107	**Public Lot at Treatment Plant Site**	The applicant shall apply for and record a public lot prior to commencement of construction activities at the wastewater treatment site.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Condition 108	**Water Meters**	Prior to individual property connections to the wastewater treatment project, each property owner shall provide verification to the satisfaction of the Public Works Department (in consultation with the Planning Director) that a water meter meeting American Water Works Association (AWWA) standards, and approved by the water company serving the individual property, has been installed or is existing on the connection site. A water meter shall be installed on each legally established residential / commercial unit prior to connection to the wastewater treatment project. Water usage information shall be made available to the sewer authority on a quarterly basis or on a schedule agreed to by the water purveyors and the County to verify the water savings derived from the water conservation program.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 109	**Roadway Safety Analysis**	Prior to commencing construction activities at the Giacomazzi site, the applicant shall submit to the Department of Public Works for review and approval a Roadway Safety Analysis (RSA) for the intersection of the treatment plant access road with Los Osos Valley Road. The RSA shall be prepared by a registered civil engineer with expertise in transportation design and familiarity with the Los Osos Valley Road corridor, and shall include but not be limited to the following: a) Evaluate the proximity of the cemetery access road with the project access road and discuss corrective options including realignment, road mergers (sharing) and alternative project access road locations; b) Analyze the project access road sight distance with respect to Los Osos Valley Road and recommend improvements, if required; c) Analyze Los Osos Valley Road left turn lane warrants and traffic queuing at the project access road and recommend improvements, if required; d) Evaluate Los Osos Valley Road traffic safety a minimum of 1-mile either side of the treatment plant access road and provide recommendations for improvements, if required; e) Evaluate erosion control measures such as gravel pads, rumble strips and wheel washers to avoid the tracking of dirt and sediment onto adjacent private and public roadways during construction, and recommend best management practices to be implement; and f) Evaluate onsite circulation with specific emphasis on truck maneuvering, access for emergency vehicles, onsite parking, and all-weather roadbed materials, provide recommendations and an implementation plan. All RSA recommendations shall be implemented prior to commencing construction activities.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Condition 110	**Midtown Pump Station**	The aboveground facilities for the mid-town pump station shall be re-located to Palisades Avenue (south of the Library) on APN 074-229-017.	This condition only affects the Standby Generator for the Mid Town Pump Station and will be addressed by CDM with support of the County of San Luis Obispo.

Condition 111	**Routine Flushing to Use Recycled Water**	Routine flushing of sewer system lines shall utilize recycled water. In the event of an emergency situation, potable water may be used to flush the sewer system if nonpotable water is determined to be infeasible.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Coastal 1	**Approved Development**	Final Project Plans. PRIOR TO CONSTRUCTION, the Permittee shall submit two copies of Final Project Plans to the Executive Director for review and approval. The Final Project Plans shall include and shall be substantially in conformance with the plans associated with the proposed project description (see Section B.3. of this report) except that they shall be revised and supplemented to comply with the following requirements:	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Coastal 1a	**Approved Development-Treatment Plant Site**	a. Treatment Plant Site Approved Development Envelope. All development (including but not limited to buildings, tanks, infrastructure, parking, walkways, fences, etc.) shall be located within the development envelope and in the general configuration shown on Exhibit 2 (Exhibit 1-3, Treatment Plant Site Plan; last dated revised on April 13, 2010, and dated received in the Commission's Central Coast District Office on April 19, 2010). Development shall be prohibited outside of the approved development envelope except for habitat restoration and enhancement related development (see special condition 3(b) below) and access road related development (see special condition 1(b) below). Development shall be arranged so that activity and direct light that may be visible from outside of the development envelope is limited to the maximum extent feasible, and so that any activity that is unavoidably visible is minimized in its intensity. All development shall be identified on the Final Project Plans.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Coastal 1b	**Approved Development-Access Road**	b. Treatment Plant Site Access Road. The access road shall be located along the existing unpaved access road alignment extending from Los Osos Valley Road to the approved development envelope along the eastern property line of the Los Osos Mortuary and Memorial Park site and the western property line of the Andre site in such a manner as to limit its width and overall length as much as possible. The access road shall include measures to effectively screen noise and activity associated with access road traffic and activity from adjacent properties so long as such screen does not itself degrade public views from along Los Osos Valley Road. If the Permittee conclusively demonstrates that the above access road location is infeasible, then the access road shall be located as shown on Exhibit 2 (Exhibit 1-2 Overall Project Site Plan, New Access Road, last dated revised on April 13, 2010, and dated received in the Commission's Central Coast District Office on April 19, 2010) subject to all the same siting and design criteria, and subject to the additional requirement that a mitigation plan for impacts to the agricultural use and development of the property located between the access road, Los Osos Valley Road, and the Los Osos Mortuary and Memorial Park site shall be submitted for Executive Director review and approval.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Coastal 1c	**Approved Development-Treatment Plant Design**	c. Treatment Plant Site Design. The design and appearance of all development shall reflect a rural agricultural theme (i.e., simple and utilitarian lines and materials, including use of board and bats, corrugated metal, muted earth tone colors, etc.). The plans shall clearly identify all measures that will be applied to ensure such design aesthetic is achieved, including with respect to all structures and all other project elements within view of Los Osos Valley Road (including the access road itself, all drainage facilities, curbs, landscaping, screens, signs, etc.). Development shall be sited and designed so as to reduce its visibility from Los Osos Valley Road to the maximum extent feasible. At a minimum, the plans shall clearly identify all structural elements, materials, and finishes (including through site plans and elevations, materials palettes and representative photos, product brochures, etc.).	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Coastal 1d	**Approved Development-Pump Stations**	d. Pump Station and Related Development. 1. Pump Station Design. All pump stations and all related development, including all power boxes and buildings, shall be sited and designed to limit impacts on habitat areas and public views, including through limiting their footprint and proximity to habitat areas as much as possible, siting elements below ground where feasible, minimizing the scale of above ground elements as much as possible, limiting above-ground access components (including manhole/hatch entries) as much as possible, using surface treatment and structural design consistent with and compatible with the immediately surrounding environment, limiting lighting to that necessary for public safety, and removing non-native invasive plant species on each site and landscaping with appropriate native plant materials (see also special condition 3(d)) including so that landscaping can help soften the appearance of any elements that are unavoidably above ground and to ensure seamless connectivity to surrounding habitat and vegetation as much as possible. 2. Midtown Pump Station. The Midtown pump station shall be sited and designed to limit its footprint and depth (from the road). The Midtown pump station power building shall be relocated across Palisades Avenue to an already disturbed area of Los Osos Community Park in a location where it will have the least impact on Park use and aesthetics.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Coastal 1e	**Approved Development-Lupine Street Force Main**	e. Lupine Street Force Main. The force main that conveys sewage from the Lupine Street Pump Station towards the treatment plant shall be routed from the Lupine Street Pump Station east on Lupine Street, then south on Fearn Avenue, then east on Binscarth Road, and then south on Pine Avenue, terminating at Los Osos Valley Road.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Coastal 1f	**Approved Development-Recycled Water Infrastructure**	f. Recycled Water Re-use Infrastructure. All recycled water reuse pipelines and related development shall be clearly identified, including all such development noted on the overall project site plan submitted to the Commission (titled Exhibit 1-2, Overall Project Site Plan, last dated revised April 13, 2010; dated received in the Commission's Central Coast District Office April 19, 2010) and also including connecting segments to each of the receiver sites identified there.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Coastal 1g	**Approved Development-Lighting**	g. Lighting. All interior lighting shall be located so as to minimize the potential for light and glare to be visible from within adjacent habitat areas, including adjacent restoration and enhancement areas. All exterior lighting shall be shielded and be of the lowest intensity feasible in order to avoid artificial light pollution from project facilities into adjacent areas and the night sky. All exterior lighting elements adjacent to habitat areas, including adjacent to restoration and enhancement areas, shall be avoided where possible and where unavoidable for safety purposes shall be the minimum necessary to meet safety requirements, shall be shielded, and shall be directed downward and away from such habitat areas.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Coastal 1h	**Approved Development-Landscaping**	h. Landscaping. Final Plans shall include landscape and irrigation parameters that shall identify all plant materials (size, species, quantity), all irrigation systems, and all proposed maintenance for landscaping at both the treatment plant site (including along the access road) and at all pump station locations. All plant materials shall be native and non-invasive species selected to be complimentary with the mix of native habitats in the project vicinity, prevent the spread of exotic invasive plant species, and avoid contamination of the local native plant community gene pool. The landscape and irrigation plans shall be designed to protect and enhance native plant communities on and adjacent to the development locations, including required restoration and enhancement areas, and to provide a transitional buffer between native habitat areas and authorized development. Landscaping (at maturity) shall also be capable of partial/mottled screening and softening the appearance of new development as seen from public viewing areas as much as possible. All landscaped areas shall be continuously maintained by the Permittee in a litter-free, weed-free, and healthy growing condition. No plant species listed as problematic and/or invasive by the California Native Plant Society, the California Invasive Plant Council, or as may be so identified from time to time by the State of California, and no plant species listed as a 'noxious weed' by the State of California or the U.S. Federal Government shall be planted or allowed to naturalize or persist at the treatment plant site (including along the access road) and at all pump station locations.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Coastal 1i	**Sign Plan**	i. Sign Plan. All signs associated with the approved project and identifying any component of it as seen from public viewing areas shall be identified and details showing the location, materials, design, and text of all signs shall be provided. The signs shall be sited and designed so as to provide clear information without adversely impacting public views and/or the character of the area in which the sign is located. At least three public education/interpretation signs and/or displays related to the project shall be installed at appropriate locations (e.g., at the Broderson site, at the Midtown site, and at the Giacomazzi site) easily accessible by the public, including in relation to the treatment plant site and at individual pump stations with significant above ground features.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Coastal 1j	**Approved Development-Street Reconstruction LID**	j. Street Reconstruction. The Plans shall require that all public roadway work, including and up to complete roadway reconstruction, following installation/construction of approved project elements that impact public roadways shall be conducted in a manner that incorporates low impact development (LID) techniques and water quality protection systems to the maximum amount feasible.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Coastal 1k	**Approved Development-Walker Site**	k. Walker Site. The 6-acre Walker site (see Exhibit 2), although restoration of this area is not required until after it is no longer being used as the primary construction staging site for the approved project, shall be returned to its pre-project condition, or better (from a habitat perspective).	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.

Coastal 1l	**Approved Development-Construction**	l. Construction. All construction staging and related areas shall be identified, and all development associated with such areas shown on a site plan. All such areas within which construction staging are to take place shall be minimized to the maximum extent feasible in order to minimize impacts on resources (e.g., terrestrial habitat, wetlands, creeks, riparian areas, or other sensitive resource areas, etc.). All measures to be taken to minimize impacts associated with construction staging and related areas shall be identified, including but not limited to screening, fencing, landscaping, signage, and designation of various activity and storage areas on the site. If additional construction staging and related areas are needed following approval of Final Plans, such areas shall be identified in a plan and submitted for Executive Director review and approval. The Final Plans shall require that copies of the signed CDP be maintained in a conspicuous location at the construction staging area at all times, and that such copies be available for public review on request. All persons involved with the construction shall be briefed on the content and meaning of the CDP, and the public review requirements applicable to them, prior to commencement of construction. The Final Plans shall also require that a primary construction coordinator be designated for public inquiries regarding the construction, and that their contact information (i.e., address, phone numbers, etc.) including, at a minimum, a telephone number available 24 hours a day for the duration of construction, be conspicuously posted at the construction staging area and at individual construction sites where such contact information is readily visible from public viewing areas, along with indication that the construction coordinator should be contacted in the case of questions regarding the construction (in case of both regular inquiries and emergencies). The construction coordinator shall record the name, phone number, and nature of all complaints received regarding the construction, and shall investigate complaints and take remedial action, if necessary, within 24 hours of receipt of the complaint or inquiry. The Permittee shall undertake development in accordance with the approved Final Project Plans.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications, with support from the County of San Luis Obispo during construction.

Coastal 2	**Septic System Decommissioning Plan**	Septic System Decommissioning Plan. PRIOR TO ANY CONNECTION TO THE APPROVED WASTEWATER PROJECT, the Permittee shall submit two copies of a Septic System Decommissioning Plan to the Executive Director for review and approval. The Septic System Decommissioning Plan shall clearly identify all measures to be taken to appropriately decommission existing septic tank systems and to connect such users to the approved project. The Plan shall provide a process for evaluating septic systems for possible on-site reuse, including for on-site filtration and percolation of stormwater to the degree feasible and appropriate, and a process for implementing such conversion or for implementing appropriate abandonment measures depending on which measure property owners choose. The Permittee shall undertake development in accordance with the approved Septic System Decommissioning Plan.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Coastal 3	**Habitat Management Plan**	Habitat Management Plan. PRIOR TO CONSTRUCTION, the Permittee shall submit two copies of a Habitat Management Plan to the Executive Director for review and approval. The Habitat Management Plan shall provide for restoration and enhancement of the following areas to self-sustaining natural habitat states, and for management and protection of such areas as habitat areas in perpetuity: a. Broderson Site. The 80-acre Broderson site, of which up to 8 acres is allowed to be used for the project leach field provided this area too is subject to Plan requirements designed to ensure habitat value in this 8-acre area as much as possible while recognizing the underlying leach field infrastructure and its ongoing use and maintenance requirements. b. Giacomazzi Site. The 8.3 acres of the Giacomazzi site that is located outside of the approved development envelope and that includes identified wetland and related resources and their buffer (see Exhibit 8). c. Midtown Site. The 12.24-acre Midtown site (see Exhibit 2), of which a small area (approximately 0.10 acres, subject to special condition 1 requirements) is allowed to be used for the Midtown pump station and related development, provided this area, too, is subject to Plan requirements designed to ensure habitat value at the pump station location as much as possible while recognizing the underlying pump station infrastructure and its ongoing use and maintenance requirements. d. Pump Station Sites. The roughly 0.1-acre Sunny Oaks site, the 0.4-acre Solano site, and the 0.3-acre East Ysabel site (see Exhibit 2), a total of almost one acre, of which a small area at each site (approximately 0.32 total acres, subject to special condition 1 requirements) is allowed to be used for pump station and related development, provided these areas, too, are subject to Plan requirements designed to ensure habitat value at the pump station locations as much as possible while recognizing the underlying pump station infrastructure and its ongoing use and maintenance requirements.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications. The County will lead the permitting effort.

Coastal 3a	**Habitat Management Plan-Deed Restrictions**	The Habitat Management Plan shall require and provide for the Broderson site to be acquired prior to construction and granted by June 10, 2012 to an appropriate agency or conservation organization approved by the Executive Director, where such grant shall include funding adequate to implement the Habitat Management Plan over time. The Habitat Management Plan shall require and provide for the use of the Broderson, Giacomazzi, Midtown, and Pump Station sites each to be restricted through recordation of a deed restriction, prohibiting all non resource-dependent development on each site, other than that associated with the approved project and consistent with the approved Habitat Management Plan. The required deed restriction shall be in a form and content acceptable to the Executive Director and recorded free of prior liens and any other encumbrances that the Executive Director determines may affect the enforcement of the deed restriction.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Coastal 3b	**Habitat Management Plan-Requirements**	The Habitat Management Plan shall be prepared by qualified restoration ecologists, shall be submitted with evidence of USFWS and CDFG review (or evidence that no review is required), and shall take into account the specific condition of each restoration and enhancement site (including soil, exposure, water flows, temperature, moisture, wind, etc.), as well as restoration and enhancement goals and success criteria. The Habitat Management Plan shall explicitly allow for potential public access interpretive facilities (including trails, signs/displays, etc.) even if such facilities are not part of initial Habitat Management Plan implementation activities, but rather will be a part of subsequent Plan implementation. At a minimum, the Plan shall provide for the following: a. Baseline. A baseline assessment, including photographs, of the current physical and ecological condition of the restoration and enhancement areas. All existing topography, habitat types, and vegetation shall be depicted on a map. b. Goals. A description of the goals of the plan, including in terms of topography, hydrology, vegetation, sensitive species, wildlife usage, and potential public interpretive access. c. Planting and Invasive/Non-Native Plant Provisions. Except that the mature eucalyptus trees, and the mature cypress trees on the Broderson site shall remain and be managed as part of the Plan, all invasive and/or non-native plant species shall be removed from all restoration and enhancement areas, and native species of local stock appropriate to the habitats and the Los Osos area shall be planted. A planting plan including the planting palette (seed mix and container plants), planting design, source of plant material, plant installation, erosion control, irrigation, and remediation shall be included. The planting palette shall be made up exclusively of native taxa that are appropriate to the habitats and the Los Osos region. Seed and/or vegetative propagules shall be obtained from local natural habitats so as to protect the genetic makeup of natural populations. Horticultural varieties shall not be used. Non-native and/or invasive plant species shall be prohibited. No plant species listed as problematic and/or invasive by the California Native Plant Society, the California Invasive Plant Council, or as may be so identified from time to time by the State of California, and no plant species listed as a 'noxious weed' by the State of California or the U.S. Federal Government shall be planted or allowed to naturalize or persist in the restoration and enhancement areas. d. Hydrology. Ensuring that existing hydrological inputs, if applicable (e.g. for wetland areas at the Giacomazzi site), are maintained and if possible improved in favor of enhanced habitat value. To the extent there may be hydrological issues related to the habitat that is being restored and monitored over time, these issues shall be considered and dealt with appropriately. e. Success Criteria. A description of the measurable success criteria of the plan, including, at a minimum, the requirement that success be determined after a period of at least three years in which the sites have been subject to no remediation or maintenance activities other than weeding, and that this condition be maintained in perpetuity. Success criteria shall be defined for each habitat type, including in terms of species diversity, percent cover, invasive control, wildlife usage, and hydrology, and for potential public interpretive access. Interim and long-term success criteria shall be identified, with final success criteria required to be maintained in perpetuity. f. Monitoring. Monitoring and maintenance provisions including a schedule of the proposed monitoring and maintenance activities to ensure that interim and long-term success criteria are achieved, and including a plan for documenting and reporting the physical and biological "as built" condition of the restoration and enhancement areas within 30 days of completion of the initial Habitat Management Plan implementation activities (i.e., a simple report to describe field implementation of the approved plan in narrative and photographs, and to report any implementation problems and their resolution). Monitoring shall be appropriate to habitat type, and shall at a minimum include identification of field sampling protocols (including specific field sampling techniques to be employed), study sites (including experimental/revegetation sites and reference sites), data analysis methods (including descriptive and inferential statistics with specified acceptable variance and significance levels to examine sample size, univariate and multivariate comparisons, and/or other parameters as appropriate and necessary to assess progress toward and meeting of success criteria), and assessment of progress toward meeting identified success criteria.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Coastal 3b (Cont.)	**Habitat Management Plan-Requirements**	g. Reporting. Provision for submission of annual monitoring reports (two copies each time) to the Executive Director for review and approval beginning the first year after completion of initial Habitat Management Plan implementation activities and shifting to an every five-year reporting cycle once long-term success criteria have been achieved. Each report shall document the condition of each restoration and enhancement area based on monitoring data (including with photographs taken from the same fixed points in the same directions), shall describe the progress towards reaching and/or maintaining the success criteria of the plan, and shall make recommendations, if any, on changes necessary to achieve success. Necessary changes, including identified remediation steps, shall be completed per the timetable identified in any approved report, or within 30 days of report approval where no such timetable is specified. The Habitat Management Plan shall be implemented concurrent with construction of the approved project, shall be directed by qualified restoration ecologists, and initial Habitat Management Plan implementation activities (including at a minimum initial planting and non-native/invasive plant removal pursuant to the Plan) shall be completed prior to commencement of operation of the approved project. The Permittee shall undertake development in accordance with the approved Habitat Management Plan.	

Coastal 4	**Agricultural Conservation Easement**	Agricultural Property Protection. PRIOR TO CONSTRUCTION OF THE TREATMENT PLANT, the Permittee shall submit evidence to the Executive Director for review and approval indicating that an agricultural conservation easement(s) burdening off-site agricultural property have been granted in perpetuity to the County or another qualifying entity approved by the Executive Director along with adequate funding to compensate for reasonable administrative costs incurred by the easement holder. The easement shall provide agricultural conservation acreage at a ratio of at least 2:1 for the loss of agricultural land associated with the approved project, shall apply to agricultural land within reasonable proximity of the project site that is of a quality that is reasonably similar to that of the agricultural land lost, and shall be submitted with evidence clearly showing and calculating the amount of agricultural land lost due to the project in closed polygons on site plans and all supporting documentation demonstrating compliance with the requirements of this condition.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Coastal 5	**Basin Recycled Water Management Plan**	Los Osos Basin Recycled Water Management Plan. PRIOR TO CONSTRUCTION, the Permittee shall submit two copies of a Los Osos Basin Recycled Water Management Plan (Basin Plan) to the Executive Director for review and approval. The objective of the Basin Plan shall be to ensure that implementation of the project, including the sites designated for disposal of the treated effluent, is accomplished in a manner designed to maximize long-term ground and surface water and related resource (including wetlands, streams, creeks, lakes, riparian corridors, marshes, etc.) health and sustainability, including with respect to offsetting seawater intrusion as much as possible, within the Los Osos Groundwater Basin. The Basin Plan shall be structured so as to allow its programs to be developed, and any physical development underlying the implementation of such programs constructed, concurrent with construction of the approved project, and for it to be implemented concurrent with commencement of operation of the approved project. The Basin Plan may be structured to allow phasing if necessary to better achieve Basin Plan objectives. The Basin Plan shall include the following main components:	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Coastal 5a	**Basin Recycled Water Management Plan-Recycled Water Re-Use Program**	a. Recycled Water Reuse Program. As reflected in County condition 97, the Recycled Water Reuse Program shall ensure that all tertiary treated recycled water is disposed of in locations within the Los Osos Groundwater Basin that will maximize its ability to meet Basin Plan objectives, where the highest priority for reuse shall be replacing existing potable water use with recycled water use where feasible and appropriate, including with respect to both urban and agricultural reuse. The Reuse Program may include recycled water application at the Broderson leach field (not to exceed 448 afy on an average annual basis) and at the Bayridge leach field (approximately 33 afy or the amount shown to be necessary for maintaining Willow Creek and downstream resources in their preproject state or better), but it shall prioritize beneficial reuse through (a) developing and installing recycled water connections and entering into delivery/use agreements with urban and agricultural property owners as much as possible, and (b) developing and installing other recycled water delivery systems, in both cases with a priority for locations where such beneficial reuse will go the furthest toward meeting Basin Plan goals. The Reuse Program may include other areas that may be beneficial to the Los Osos Groundwater Basin.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Coastal 5b	**Basin Recycled Water Management Plan-Water Conservation Program**	b. Water Conservation Program. The Water Conservation Program required by the County project, which limits indoor water use to no more than 50 gallons per person per day on average within the Basin, shall be incorporated into the Recycled Water Management Plan. The Program shall be designed to help Basin residents to reduce their potable water use as much as possible through measures including but not limited to retrofit and installation of low water use fixtures, and grey water systems. The Program shall include enforceable mechanisms designed to achieve its identified goals, including the 50 gallons per person per day target, and shall include provisions for use of the $5 million committed by the Permittee to initiate water conservation measures pursuant to the Basin Plan as soon as possible following CDP approval. The Permittee shall coordinate with water purveyors to the maximum extent feasible to integrate this conservation program with purveyor implemented outdoor water use reduction measures.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Coastal 5c	**Basin Recycled Water Management Plan-Monitoring Program**	c. Monitoring Program. The Monitoring Program shall be designed to quantitatively and qualitatively assess the effectiveness of the Basin Plan over time to ensure its objectives are achieved, and shall include: a baseline physical and ecological assessment of ground and surface water and related resources to be monitored; measurable goals and interim and long-term success criteria for those resources, including at a minimum clear criteria that demonstrate that the health and sustainability of Plan area resources are steadily improving over time, including with respect to seawater intrusion; monitoring provisions, including identification of appropriate representative resource monitoring locations and data types (e.g., groundwater levels and quality; wetland, stream, creek, riparian, and marsh plant and animal abundance, hydrology, and water quality; etc.) and a schedule for proposed monitoring activities. The Monitoring Program shall also include measures to clearly document the manner in which recycled water is being reused and water is being conserved pursuant to the Recycled Water Reuse and Water Conservation Programs.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

Coastal 5d	**Basin Recycled Water Management Plan-Reporting and Adaptive Management Program**	d. Reporting and Adaptive Management Program. Annual reports (two copies) documenting implementation and effectiveness of the Basin Plan shall be submitted to the Executive Director for review and approval by December 31st of each year that the project operates. Each report shall include all monitoring data (including documenting all recycled water reuse for the preceding year, all water conservation efforts and effects, and all resource changes identified), shall describe the progress towards achieving the success criteria of the plan, and shall make recommendations, if any, on changes necessary to better meet Basin Plan objectives and achieve success. On the latter, the annual reports shall be premised upon the concept of adaptive management that responds to information developed and effects better understood over time in association with the project, and is intended to allow for project changes covered by this CDP, unless the Executive Director determines that a CDP amendment is necessary, through the annual report approval process provided that such changes result in better resource protection and better means to achieve Basin Plan objectives over the longterm. Changes, including identified remediation steps, shall be completed per the timetable identified in any approved annual report, or within 30 days of report approval where no such timetable is specified. The Permittee shall undertake development in accordance with the approved Los Osos Basin Water Recycling Management Plan.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Coastal 6	**Wastewater Service to Undeveloped Properties**	Wastewater Service to Undeveloped Properties. Wastewater service to undeveloped properties within the service area shall be prohibited unless and until the Estero Area Plan is amended to identify appropriate and sustainable buildout limits, and any appropriate mechanisms to stay within such limits, based on conclusive evidence indicating that adequate water is available to support development of such properties without adverse impacts to ground and surface waters, including wetlands and all related habitats.	The Wastewater Collection System design will adhere to these requirements in the plans and specifications.
Coastal 7	**Amendments to CDP**	Amendment. All future changes to the approved project, including changes in service area, shall be processed as amendments to this CDP. Any such amendment shall clearly demonstrate the manner in which the amendment would lead to better coastal resource protection, including at a minimum the manner in which it would help to better achieve the goals and meet the success criteria of the approved Los Osos Basin Resource Management Plan (see special condition 5).	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Coastal 8	**Conflict Resolution**	Conflict Resolution. Any differences, conflicts, and/or questions of interpretation between elements of the proposed project description and these conditions shall be resolved in favor of these conditions and in the manner most protective of coastal resources as determined by the Executive Director.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.
Coastal 9	**Liability for Costs and Attorneys Fees**	Liability for Costs and Attorneys Fees. The Permittee shall reimburse the Coastal Commission in full for all Coastal Commission costs and attorneys fees (including but not limited to such costs/fees that are: (1) charged by the Office of the Attorney General; and (2) required by a court) that the Coastal Commission incurs in connection with the defense of any action brought by a party other than the Permittee against the Coastal Commission, its officers, employees, agents, successors and assigns challenging the approval or issuance of this permit, the interpretation and/or enforcement of permit conditions, or any other matter related to this permit. The Permittee shall reimburse the Coastal Commission within 60 days of being informed by the Executive Director of the amount of such costs/fees. The Coastal Commission retains complete authority to conduct and direct the defense of any such action against the Coastal Commission.	This condition does not affect the Wastewater Collection System design and will be addressed by the County of San Luis Obispo.

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APPENDIX D
Soil Corrosion Report

CONSULTING ENGINEERS, INC.
Civil Infrastructure Preservation

TECHNICAL MEMORANDUM

Soils Corrosivity Investigation for the Los Osos Community Services District Wastewater Collection, Treatment, and Disposal Project

Prepared for: Steve Hyland, Montgomery Watson Harza

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Doug Hackley, V&A Consulting Engineers

Copies: File 02-090

Date: January 24, 2003

Introduction

V&A Consulting Engineers (V&A) was retained by Montgomery Watson Harza to perform a soil corrosion investigation of the future site of the Wastewater Treatment Facility (WWTF) as part of the original Los Osos Community Services District Wastewater Collection, Treatment, and Disposal Project. The objective of the investigation was to perform field soil resistivity testing, review existing corrosion data, and perform chemical analysis of selected soil samples. These results were evaluated with respect to the possible levels of corrosion of reinforced concrete structures and buried steel, and a discussion was provided about the suitability of stainless steels in a wastewater treatment plant environment.

Chemical analysis was not performed as part of this survey. Corrosion data provided by Fugro West, Inc. included some chemical analysis data around the Los Osos community. Further chemical analysis of soil borings can be performed in the future if soil borings become available.

Recommendations for buried metallic structures, buried reinforced concrete structures, and stainless steel are at the end of this report. Based on chemical analysis and resistivity data, the soil appears to be negligibly corrosive to these structures.

TEST METHODS

In attempting to predict corrosion problems associated with a particular type of structure prior to installation, it is necessary to investigate the soil conditions the structure will encounter. Since corrosion is an electrochemical process which is accompanied by current flow, the electrochemical characteristics of a soil are of primary importance when evaluating corrosivity. Test methods utilized during this investigation reflect the most practical methods of evaluating corrosivity.

Field Determination of Soil Resistivity

Soil resistivity measurements were conducted at four locations at the proposed project site per ASTM G57 *"Field Measurement* 0/ *Soil Resistivity Using the Wenner Four-Electrode Method."* The Wenner Four-Electrode method involves the use of four metal electrodes, driven into the ground along a straight line, equidistant from each other, as shown in Figure 1. A soil resistance meter is used to generate an alternating current across the outer two electrodes, C1 and C2. The voltage drop is then measured across the inner two electrodes, P1 and P2. Due to the resistance of the soil, the current creates a voltage gradient, which is proportional to the average resistance of the soil mass to a depth equal to the distance between electrodes. Then soil resistivity is computed from the instrument reading according to the following formula:

$$\rho = 2 \cdot \pi \cdot A \cdot R$$

Where:

ρ	=	soil resistivity (ohm-cm)
A	=	distance between electrodes (cm)
R	=	soil resistance, instrument reading (ohms)
π	=	3.14 (approx.)

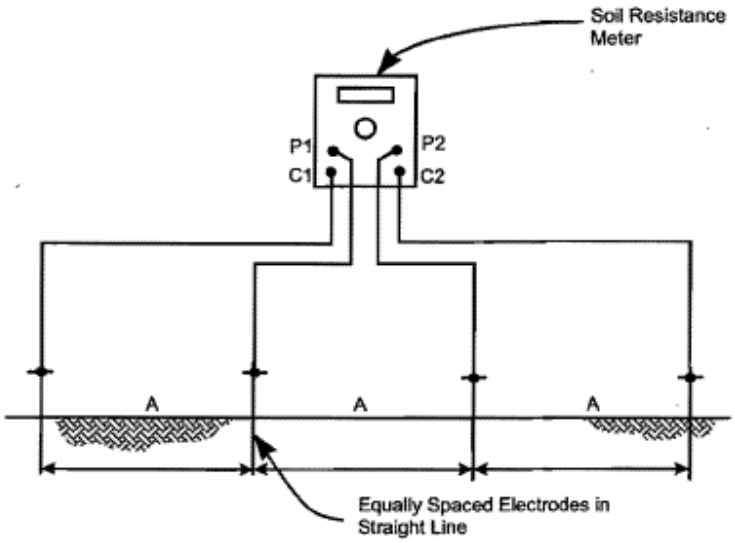


Figure 1 Soil Resistivity Measurement using the Wenner 4-Pin Method

The layer resistivity is a calculation using the measured data to estimate the resistivity for only that 5-foot layer. Soil resistivity was measured approximately every 1,000 feet along the proposed alignments. Consideration for adjusting the measurement location is necessary when foreign utilities are near enough to influence the measurement results. The soil resistivity measurements were conducted with several electrode spacings at 5, 10, 15 and 20 feet.

Chemical Analysis

To supplement the resistivity data obtained during field testing, corrosion test results from Fugro West, Inc. were analyzed. The test results include: minimum resistivity, pH, concentrations of water soluble chloride, and water soluble sulfate for ten locations near the project site and the community of Los Osos at varying depths.

TEST RESULTS

Data obtained during this investigation has been summarized in Tables 1, 2, and 3 for analysis and presentation.

Table 1 lists the results of the soil resistivity measurements conducted at the site. Table 2 summarizes the results of the field soil resistivity measurements. Table 3 lists a summary of data provided by Fugro West, Inc.

Table 1 Field Soil Resistivity Data

Site No.	Depth (feet)	Resistivity (ohm-cm)	Layer (feet)	Layer Resistivity (ohm-cm)
1	5	958,000	0-5	958,000
	10	785,000	5-10	665,000
	15	284,000	10-15	125,000
	20	613,000	15-20	249,000
2	5	1,150,000	0-5	1,150,000
	10	1,360,000	5-10	1,660,000
	15	1,150,000	10-15	877,000
	20	536,000	15-20	206,000
3	5	9,480,000	0-5	9,480,000
	10	8,230,000	5-10	7,280,000
	15	6,030,000	10-15	3,930,000
	20	2,300,000	15-20	804,000
4	5	2,300,000	0-5	2,300,000
	10	1,900,000	5-10	1,610,000
	15	1,210,000	10-15	699,000
	20	881,000	15-20	487,000

Table 2 Summary of Field Soil Resistivity Data

	At Depth (ohm-cm)					Layer (ohm-cm)		
Depth	Total	5'	10'	15'	20'	5-10'	10-15'	15-20'
Minimum	284,000	958,000	785,000	284,000	536,000	665,000	125,000	206,000
Average	2,450,000	3,470,000	3,070,000	2,170,000	1,080,000	2,810,000	1,410,000	431,000
Maximum	9,480,000	9,480,000	8,230,000	6,030,000	2,300,000	7,280,000	3,930,000	804,000

Table 3 Laboratory Soil Analysis Data[1]

Item No.	Boring No.	Approx. Depth (ft)	Soil Resistivity (ohm-cm)	Chemical Data		
				pH	Sulfate (ppm)	Chloride (ppm)
1	DH-103	11.0	11,979	6.98	18	7
2	DH-104	25.0	26,136	7.50	0.1	0.1
3	DH-101	2.0	3,393	6.33	19	9
4	DH-108	4.5	26,136	5.56	69	7
5	DH-109	10.0	11,979	6.89	18	9
6	DH-111	2.0	27,951	7.82	10	1.0
7	DH-112	9.0	9,801	5.50	14	19
8	DH-113	2.0	7,986	6.50	16	8
9	DH-115	2.0	3,230	5.71	46	347
10	DH-301	3.0	79,860	5.39	0.5	0.5

Interpretation of Soil Resistivity Data

Soil resistivity is inversely proportional to the soil's ability to conduct current (conductivity). Corrosion of a metal in soil is a function of current flow to and from a metal through the adjacent medium. Therefore, corrosion activity of metal in soil normally increases as soil resistivity decreases.

Field measured soil resistivity values give the average soil resistivity to a particular depth. Layer resistivity values are calculated using a· mathematical formula to determine the approximate resistivity for soil at a particular depth range.

The laboratory determined minimum (or saturated) soil resistivity represents the resistivity in wet weather or high groundwater conditions. Soil resistivity values from laboratory results are typically minimum (or saturated) values, therefore it is assumed that Fugro's laboratory determined soil resistivity values are minimum (or saturated) values. Table 4 correlates resistivity values with corrosivity of the soil. The interpretation of corrosivity varies among corrosion engineers. However, this table is a generally accepted guide.

[1] Data from Fugro West, Inc.

Table 4 Soil Corrosivity [2]

Soil Resistivity (ohm-cm)	Degree of Corrosivity
0 - 500	Very High
500 - 1,000	High
1,000 - 2,000	Moderate
2,000 - 10,000	Mild
Above 10,000	Negligible

Based upon analysis of the average field soil resistivities, shown in Table 2, the soils at the 5, 10, 15, and 20-foot levels are negligibly corrosive. Soil resistivities shown in Table 3 indicate that the soils are negligibly to mildly corrosive in wet weather or high groundwater conditions.

Interpretation of Chemical Constituent Data

V&A has developed Tables 5, 6, and 7 to facilitate classification of the corrosivity of the soil environment based on the relative amounts of chemical constituents.

Water-soluble Chloride

Chloride ions found in soils tend to break down otherwise protective surface deposits, and can result in corrosion of buried metallic structures and reinforcing steel in concrete structures. Table 5 shows the effect of chloride ions on the corrosivity of the soil.

[2] Peabody, A. W. and Parker, M. E., "*Corrosion Basics, an Introduction*", Ed by Brasunas, A. deS., NACE International, p. 191 (1984)

Table 5 Effects of Chloride Ions on the Corrosivity of Soil[3].

Water-soluble Chloride Concentration (ppm)	Degree Of Corrosivity
Over 5,000	High
1,500 - 5,000	Moderate
500 - 1,500	Mild
100 - 500	Threshold
Below 100	Negligible

The water soluble chloride levels, shown in Table 3, ranged from 0.1 ppm to 347 ppm. This range is considered negligibly corrosive.

Acidity

Acidity, as indicated by the pH value, is another important factor of soil with respect to corrosivity. Lower pH (more acidic) will result in a greater degree of corrosivity with respect to buried metallic and concrete structures. When pH increases above 7.0 (the neutral value) the conditions become increasingly more alkaline. In alkaline environments, steel forms a protective layer on its surface. This is referred to as passivation. V&A developed Table 6, which correlates the effect of pH on the rate of corrosion for buried steel or concrete structures.

[3] Schiff, M. J., "What is a Corrosive Soil?", Proceedings from Western States Corrosion Seminar, California State Polytechnic State University, Pomona (1993); Romanoff, M., "*Underground Corrosion*", NACE

Table 6 Effects of pH on the Corrosivity of Soil[4, 5]

pH	Degree Of Corrosivity
< 5.5	High
5.5 - 6.5	Moderate
6.5 - 7.5	Neutral
> 7.5	Negligible

The pH of the tested boring samples, shown in Table 3, ranged from 5.39 to 7.82. These levels are considered moderately corrosive to negligibly corrosive. Most of the samples had a pH above 5.5, but one sample was below 5.5. This indicates that there may be "hot spots" of low pH soils in the community. The samples were taken from the community surrounding the site; therefore it is possible the low pH values are not representative of the soil on the site. Further chemical analysis of soil borings at the WWTF site may be necessary to determine if high acidic conditions exist.

Water-soluble Sulfates

Soil with high levels of sulfates can chemically attack concrete structures. Table 7 correlates the effect of sulfates on the corrosivity of soil for concrete structures.

International, p. 11 (1957) ;V&A Consulting Engineers' Experience

[4] Romanoff, M., "*Underground Corrosion*", NACE International, p. 8 (1989)

[5] Uhlig H. H., "*Corrosion and Corrosion Control*", 2nd Edition, John Wiley & Sons Inc., pp.98-106 (1971); V&A's experience.

Table 7 Effects of Sulfate Ions on the Corrosivity of Soil [6]

Water-soluble Sulfate Concentration (ppm)	Degree Of Corrosivity
> 2,000	Severe
1,000 - 2,000	Moderate
< 1,000	Negligible

The water soluble sulfate levels, shown in Table 3, ranged from 0.1 ppm to 69 ppm. This range is considered negligibly corrosive.

RECOMMENDATIONS

Buried Metallic Structures

The soil at the WWTF appears to be non-corrosive to buried metallic structures. However, it is recommended that buried metallic piping systems, such as steel and ductile iron, be coated with a bonded dielectric or mortar coating. Due to some low pH levels in the surrounding community, V&A recommends additional sampling in the project area. Buried metallic piping should be electrically isolated from other metallic structures, such as reinforced concrete, or where a change in piping or coating material occurs.

The following coatings are recommended for buried applications:

- 100% Solids Polyurethane
- Fusion Bonded Epoxy
- Coal-tar Epoxy
- Tape Wrap conforming to Standard A WWA C209 (excluding use with ductile iron)

[6] V&A Consulting Engineers' Interpretation of Table 8.22.2, Bridge Design Specifications, California Department of Transportation (2000).

Buried Reinforced Concrete Structures The soil at the WWTF appears to be negligibly corrosive to reinforced concrete structures. However, V&A recommends that buried reinforced concrete structures be constructed of durable concrete such as described in ACI Standards 201.2R and 222R.

V &A recommends the following:

- A minimum of 2 inches concrete cover over reinforcing steel.
- Salt-free sand and potable water should be used in the concrete mixture.

Stainless Steel

The WWTF pipelines will transport wastewater, creating the potential for hydrogen sulfide to develop. Hydrogen sulfide is corrosive to steel. For all non-structural applications V&A recommends that fiberglass components be used when available. Some manufacturers and suppliers of fiberglass equipment are: Plasti-Fab, Inc., A.O. Smith, Inc., FRP Supply Company, and Strongwell (www.strongwell.com).

For applications where fiberglass components are not available, or where fiberglass is not practicable, V&A recommends that stainless steel be utilized. Type 316L stainless steel has a higher resistance to pitting in wastewater treatment plant environments than type 316 or type 304. The cost of type 316L stainless steel is approximately 5% higher than type 316 stainless steel; however, the initial higher cost of 316L is offset by the potentially lower cost of maintenance and repair on type 316L stainless steel. Type 316L stainless steel is recommended for all immersed applications or where welding of the stainless steel is required. Type 316 stainless steel can be used for all non-immersed and non-welded applications, although it is V&A's experience that type 316L has better corrosion resistance in wastewater treatment plant environments.

The WWTF is located approximately *1/2* mile from the Pacific Ocean. Atmospheric corrosion from the marine atmosphere may cause corrosion to stainless steel. V&A's research has determined that in stainless steel exposed to the atmosphere more than 800 feet from the ocean, surface pitting was insignificant after 26 years of exposure[7] Type 316 stainless steel is recommended for architectural applications. When cost is a major factor, type 304 stainless steel can be used for architectural applications; however some surface corrosion may result. This is especially true if hydrogen sulfide gas is present.

[7]Baker, E. A. and Lee, T. S., "Long-Term Atmospheric Corrosion Behavior of Various Grades of Stainless Steel" from Dean, Sheldon W. and Lee, T. S. "Degradation of Metals in the Atmosphere"

APPENDIX E
Acoustical Report

ENVIRONMENTAL NOISE ASSESSMENT

LOS OSOS WASTEWATER PROJECT
SAN LUIS OBISPO COUNTY, CALIFORNIA

PREPARED FOR

MONTGOMERY WATSON HARZA
130 TREAT BOULEVARD, SUITE 300
WALNUT CREEK, CALIFORNIA 94597-7966

PREPARED BY

BROWN-BUNTIN ASSOCIATES, INC.
VISALIA, CALIFORNIA

MARCH 5, 2003

ACOUSTICAL TERMINOLOGY

AMBIENT NOISE LEVEL:	The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.
CNEL:	Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.
DECIBEL, db:	A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
DNL/L_{dn}:	Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.
L_{eq}:	Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1, 8 and 24-hour sample periods.
NOTE:	The CNEL and DNL represent daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.
L_{max}:	The maximum noise level recorded during a noise event.
L_n:	The sound level exceeded "n" percent of the time during a sample interval (L_{90}, L_{50}, L_{10}, etc.). For example, L_{10} equals the level exceeded 10 percent of the time.
NOISE EXPOSURE CONTOURS:	Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.

NOISE LEVEL REDUCTION (NLR):	The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. A measurement of a noise level reduction combines the effect of the transmission loss performance of the structure plus the effect of acoustic absorption present in the receiving room.
SEL or SENEL:	Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.
SOUND LEVEL:	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.
SOUND TRANSMISSION CLASS (STC):	The single-number rating of sound transmission loss for a construction element (window, door, etc.) over a frequency range where speech intelligibility largely occurs.

1. INTRODUCTION

1A. Purpose

The purpose of this analysis is to prepare an environmental noise assessment for the proposed Los Osos Wastewater Project. The assessment reviews Federal, State, and local noise level standards and presents the results of existing noise environment measurements. The potential noise impacts of the project are also discussed.

Appendix A provides definitions of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported in this analysis are A-weighted sound pressure levels in decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighted sound levels, as they correlate well with public reaction to noise.

1B. Summary of Project Description

The project consists of a wastewater collection and disposal system to be located in the unincorporated community of Los Osos in San Luis Obispo County, California. Los Osos is located along the central coast of California south of the City of Morro Bay. The proposed project would replace existing individual septic systems with a community waste water collection, treatment and disposal system.

2. NOISE LEVEL STANDARDS

Appendix G (Environmental Checklist Form) of the CEQA Guidelines indicates that significant noise impacts occur when the project exposes people to noise levels in excess of standards established in local noise ordinances or general plan noise elements, or causes a substantial permanent or temporary increase in noise levels above levels existing without the project.

2A. Federal Noise Level Standards

Under the Occupational Safety and Health Act of 1970 (OSHA) (29 U.S.C. § 651 et seq.), the Department of Labor, Occupational Safety and Health Administration (OSHA) has adopted regulations (29 C.F.R. § 1910.95) designed to protect workers against the effects of occupational noise exposure. Table I lists permissible noise level exposure as a function of the amount of time during which the worker is exposed. The regulations further specify a hearing conservation program that involves monitoring the noise to which workers are exposed; assuring that workers are made aware of overexposure to noise; and periodically testing the workers' hearing to detect any degradation. There are no federal laws governing offsite (community) noise.

TABLE I OSHA WORKER NOISE EXPOSURE STANDARDS	
Duration of Noise (Hrs./day)	**A-Weighted Noise Level (dBA)**
8.0	90
6.0	92
4.0	95
3.0	97
2.0	100
1.5	102
1.0	105
0.5	110
0.25	115
Source: OSH Regulation	

2B. State and Local Noise Level Standards

The applicable standards for noise levels that apply to this project are those within the San Luis Obispo County Noise Element of the General Plan. For non-transportation noise sources (e.g., mechanical equipment), the Noise Element applies hourly noise levels performance standards at residential and other noise-sensitive uses. Noise-sensitive land uses include:

a. Residential uses listed in Table 0, Framework for Planning of the Land Use Element, except temporary dwellings and residential accessory uses.

b. Schools-preschool to secondary, college and university; specialized education and training

c. Health care services (hospitals)

d. Nursing and personal care

e. Churches

f. Public assembly and entertainment

g. Libraries and museums

h. Hotels and motels

i. Bed and breakfast facilities

j. Outdoor sports and recreation

k. Offices

Table II summarizes the hourly County Noise Element standards. San Luis Obispo County has also adopted an ordinance that prohibits excessive noise levels at noise-sensitive receivers. The standards of the ordinance are the same as shown in Table II.

TABLE II

HOURLY NOISE LEVEL PERFORMANCE STANDARDS FOR NON-TRANSPORTATION NOISE SOURCES[1] SAN LUIS OBISPO COUNTY NOISE ELEMENT

	Day (7a-10p)	Night (10p-7a)[2]
Hourly, L_{eq}, dB	50	45
Maximum Level, dB	70	65
Maximum Level, dB Impulsive Noise	65	60

[1]As determined at the property line of receiving land uses.

[2] Applies only where the receiving land use operates or is occupied during nighttime hours.

2C. Substantial Noise Increases

CEQA does not define what constitutes a "substantial" increase in noise levels or advise when a substantial increase in noise levels becomes significant.

Federal agencies[1] have found that, in noisy environments where the noise exposure would normally be considered unacceptable, an increase of 1 ~ dBA may be a significant impact, whereas in quieter environments, such as suburban areas, an increase is usually not significant unless it is greater than 5 dBA[2]. It is therefore reasonable to assume that an increase of more than 10 dBA is clearly significant. An increase between 5 and 10 dBA should be considered adverse, but may be either significant or insignificant, depending on the particular circumstances of a case.

Factors to be considered in determining the significance of an adverse impact as defined above include:

1. the resulting noise level[3];
2. the duration and frequency of the noise;
3. the number of people affected;
4. the land use designation of the affected receptor sites;
5. public reactions or controversy as demonstrated at workshops or hearings, or by correspondence;
6. prior CEQA determinations by other agencies specific to the project.

[1]Federal Agency Review of Selected Airport Noise Analysis Issues, Federal Interagency Committee on Noise (FICON), August 1992.

[2]An increase of 1½ dBA in a noisy environment entails a greater increase in sound energy than a 5 dBA increase in a much quieter environment.

[3]For example, a noise level of 40 dBA would be considered quiet in many locations. A noise limit of 40 dBA would be consistent with the recommendations of the California Model Community Noise Control Ordinance for rural/suburban environments. If the project would create an increase in ambient noise no greater than 10 dBA at nearby sensitive receptors, and the resulting noise level would be 40 dBA or less, the project noise level would likely be insignificant.

3. EXISTING NOISE ENVIRONMENT

The existing noise environment near the proposed treatment plant and near pump stations and their standby power facilities was evaluated on February 26-27, 2003. Ambient noise levels at two locations near the treatment plant were measured continuously for 24 hours. Short-term measurements (15 minutes) were conducted at the five pump stations/standby power locations. The measurement locations are shown in Figure 1. Noise measurement equipment consisted of Larson-Davis model 820 sound level meters equipped with Bruel & Kjaer (B&K) Type 4176 ½" microphones. The meters were calibrated before use with a B&K Type 4230 acoustical calibrator.

Land uses near the proposed treatment plant are a library and community center to the east, chamber of commerce office and residences to the south, and proposed residential developments to the west and north. All of these uses are considered to be noise-sensitive according to the County Noise Element. Residential uses are located near each of the pump station/standby power locations, except the East Paso location, which is adjacent to commercial uses.

Figures 2 and 3 show the hourly noise levels through a 24-hour period for the two long-term ambient noise monitoring locations near the proposed plant. Site LT-l was located near the southwest corner of the County Library on Palisades Avenue and Site LT-2 was located in the backyard of the residence at 764 Woodland Drive.

At Site LT-l, the lowest noise levels occurred from 12:00 a.m. to 1:00 p.m. The hourly L_{eq} (energy average) was approximately 41 dBA, the hourly L_{50} (level exceed 50% of the time or median) was 36 dBA, and the L_{90} (level exceeded 90% of the time) was 33 dBA. During the hours of 2:00 a.m. and 3:00 a.m. there was a rain storm that increased background noise levels. By about 6:00 a.m., commute traffic and other human activity had begun which raised background noise levels.

At Site LT-2, a pattern similar to LT-l is apparent, except hourly noise levels at LT-2 are more variable. This is probably due to a dog in the backyard that barked occasionally. The lowest hourly noise levels at LT-2 occurred from 1:00 a.m.-2:00 a.m. The hourly L_{eq}, L_{50}, and L_{90} were 39, 31 and 28 dBA, respectively.

Table III shows the results of the ambient measurements at the five pump station/standby power locations.

Figure 1
Ambient Noise Measurement Locations

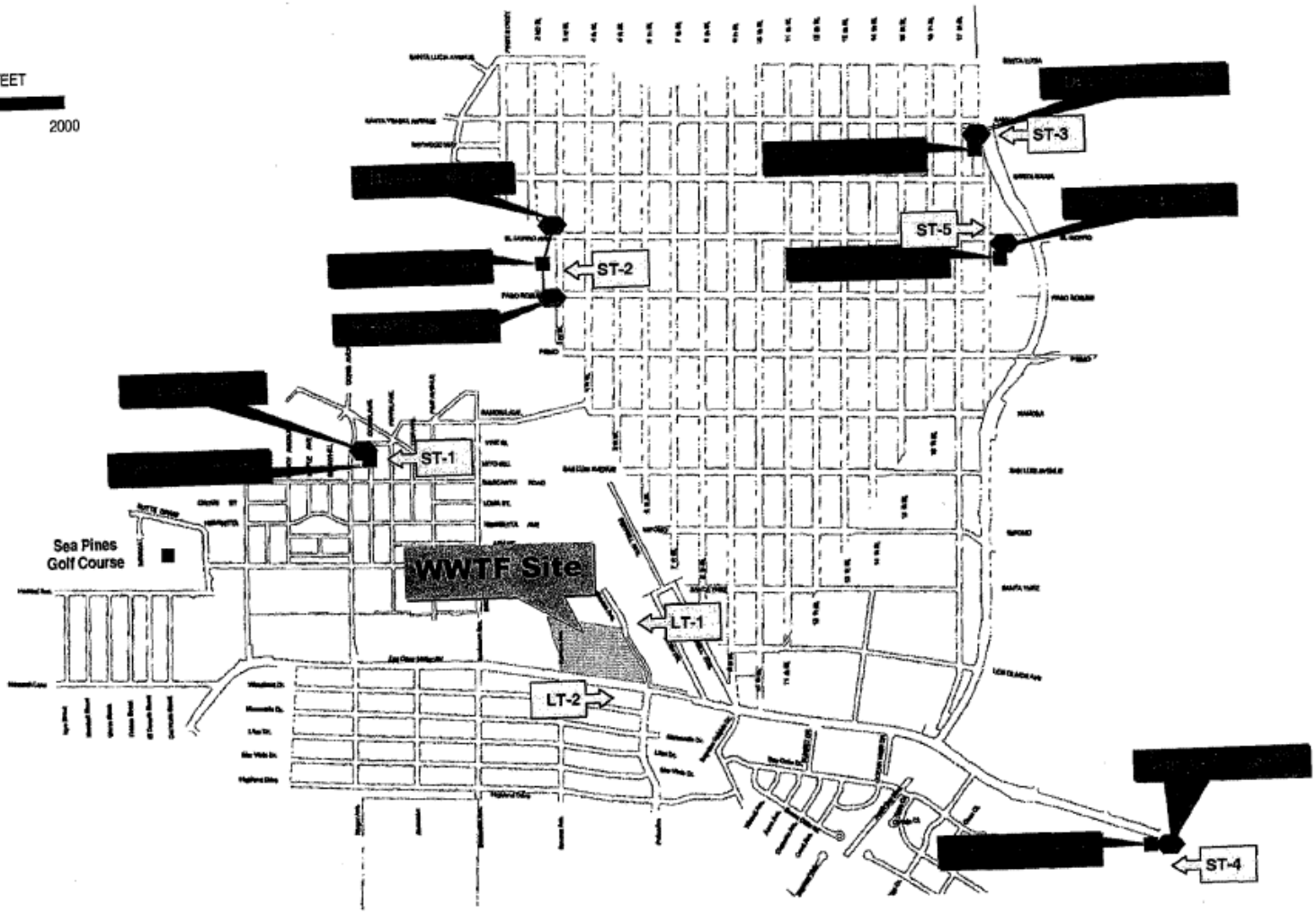


Figure 2
Ambient Noise Levels
Public Library, February 26-27, 2003

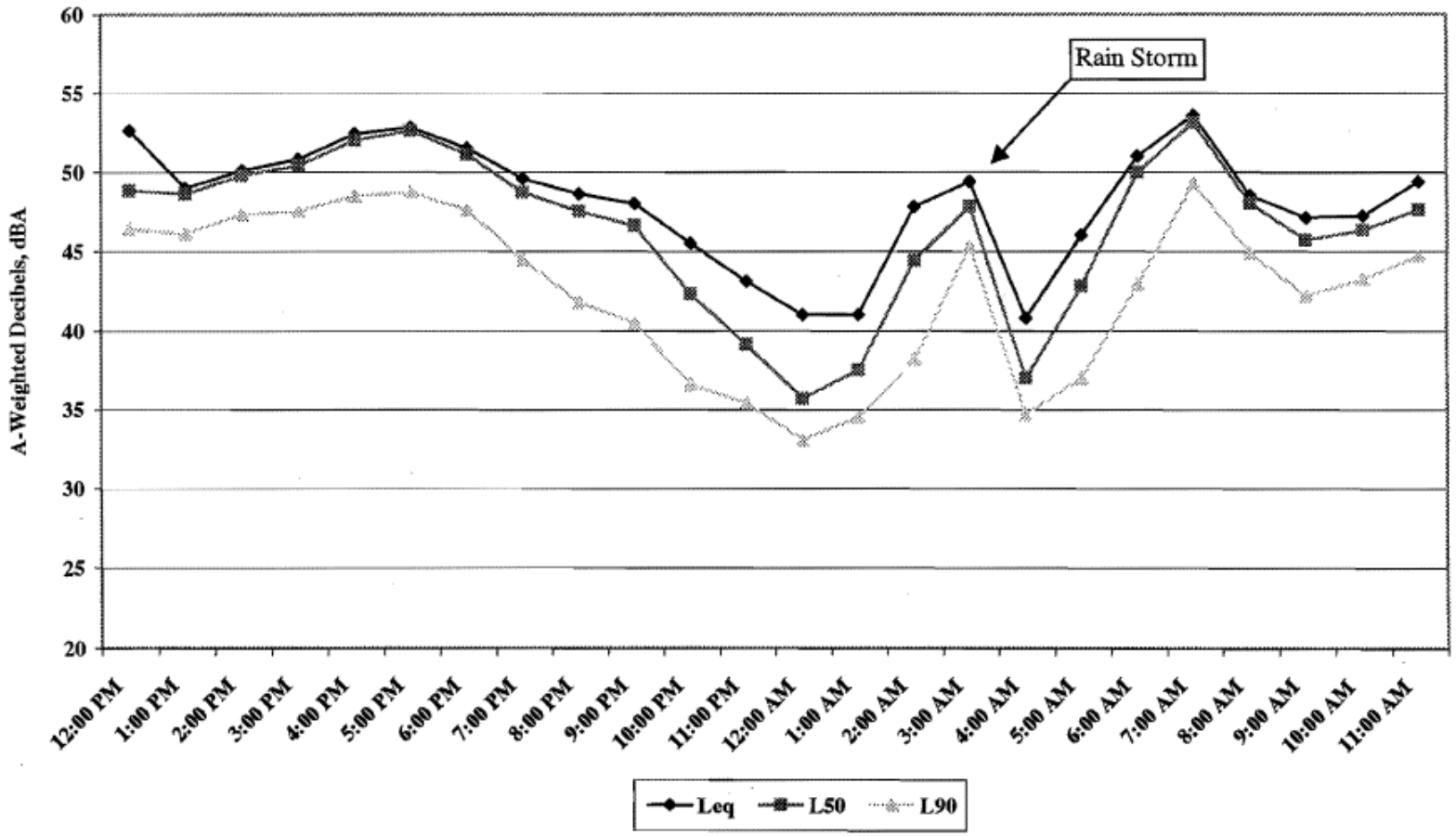


Figure 3
Ambient Noise Levels
764 Woodland Avenue, February 26-27, 2003

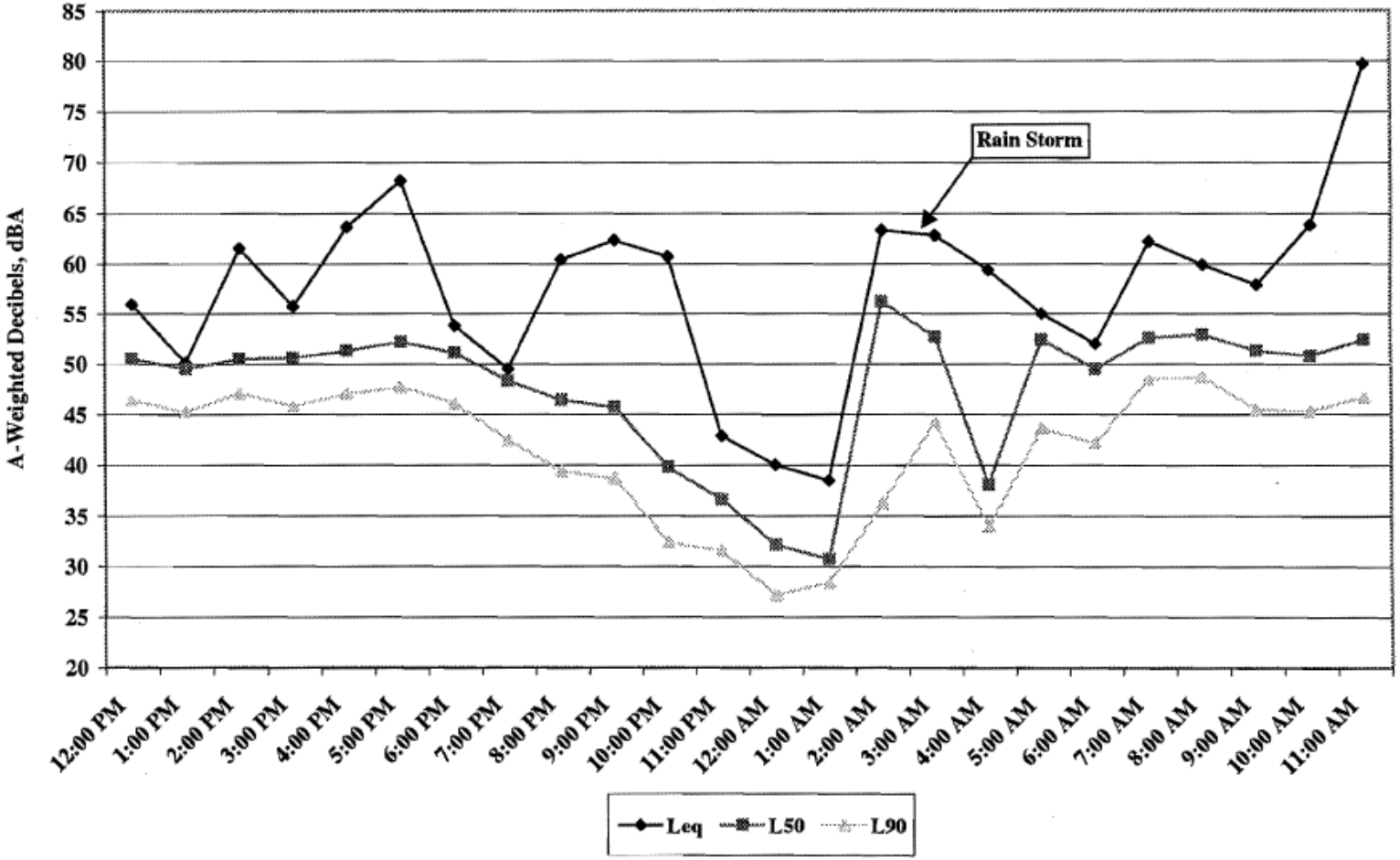


Table III shows that ambient noise levels near the pump stations/standby power facilities was generally 44-54 dBA in terms of the energy average (L_{eq}) and 39-50 dBA in terms of median noise level (L_{50}) , and 36-46 dBA in terms of the L_{90}. These levels are typical of suburban settings in small communities with no dominant source of noise other than local traffic. We would expect nighttime noise levels to range from 35-45 dBA, L_{eq} at these locations when most human activity (e.g., traffic) had ceased.

TABLE III

AMBIENT NOISE LEVELS AT PUMP STATION/STANDBY POWER SITES

Site Name	Meas. No.	Date	Time	Noise Level, dBA			Comments
				L_{eq}	L_{50}	L_{90}	
Lupine	ST-1	2/26/03	1:30 p.m.	46	43	41	local traffic
Lupine	ST-1	2/27/03	10:25 a.m.	44	43	39	local traffic
West Paso/Baywood	ST-2	2/26/03	1:50 p.m.	54	44	42	local traffic
West Paso/Baywood	ST-2	2/2703	9:50 a.m.	51	39	36	local traffic
East Ysabel	ST-3	2/26/03	2:10 p.m.	54	53	49	traffic & wind
East Ysabel	ST-3	2/2703	9:10 a.m.	47	46	41	local traffic
Sunny Oaks	ST-4	2/26/03	2:30 p.m.	52	50	46	traffic & birds
Sunny Oaks	ST-4	2/2703	8:50 a.m.	51	50	46	traffic & birds
East Paso	ST-5	2/2703	9:30 a.m.	48	40	34	local traffic
East Paso	ST-5	2/2703	11:30 a.m.	50	46	40	local traffic, siren

4. PROJECT NOISE IMPACTS

4A. Construction Noise

During the construction phases of the project, noise from construction activities would dominate the noise environment in the immediate area. Activities involved in construction would generate noise levels, as indicated in Table IV ranging from 85 to 88 dBA at a distance of 50 feet. Construction activities would be temporary in nature, typically occurring during normal working hours. Construction noise impacts could be significant, if nighttime operations or use of unusually noisy equipment resulted in annoyance or sleep disruption for nearby residences.

During construction, traffic noise generated by approaching traffic would be reduced due to a reduction in speed required by working road crews. Conversely, traffic noise levels of vehicles leaving the construction area would be slightly higher than normal due to acceleration. The net effect of the accelerating and decelerating traffic upon noise would not be appreciable. The most important project-generated noise source would be truck traffic associated with transport of heavy materials and equipment. This noise increase would be of short duration and limited primarily to daytime hours.

TABLE IV CONSTRUCTION EQUIPMENT NOISE	
Type of Equipment	**Maximum Level, dBA at 50 Ft.**
Scrapers	88
Bulldozers	87
Heavy Trucks	88
Backhoe	85
Pneumatic Tools	85
Source: *Environmental Noise Pollution, Patrick R. Cunniff*, 1997.	

4B. Operational Noise

The project components can be described as the collection system, treatment plant, and effluent disposal system. As specific information about the components of the project are developed, noise level projections and determinations of significance will be made.

Collection System

The noise sources associated with the collection system include electric submersible pumps and standby power units. The submersible pumps will operate periodically depending on demand, more during the day than the night. The standby power units will be powered by diesel or gas engines and will be enclosed. If electrical power fails, they will turn on. They will be tested once a month for a few hours during the daytime hours.

Effluent Disposal

There are no noise sources associated with this component that could produce significant noise impacts.

APPENDIX F

CAD Drafting Guidelines

Appendix F
Los Osos Collection System Project
CAD Drafting Guidelines

Preface

The CAD Drafting Guidelines presented herein are intended to provide guidance and information for the preparation of contract drawings for the Los Osos Wastewater Project. The design consultants must exercise professional judgement in the application of the CAD Drafting Guidelines to meet Project objectives. The Guidelines are not intended to be strictly prescriptive requirements that are universally applied in all situations. Furthermore, the Guidelines are not intended to preclude the use of alternative or supplemental approaches. Changes to the Guidelines will be expected to meet Project goals and requirements.

Any proposed additions, revisions, and/or deletions to the Guidelines must be submitted to Bruce Corwin and Mike Middleton with CDM. Proposed changes will be reviewed and evaluated in conjunction with the design consultant input. All changes are subject to review and acceptance by San Luis Obispo County. The Guidelines will be periodically updated and reissued as changes and additions are adopted.

Table of Contents

Section 1
Guidelines

Section 2
Drawing Numbering Convention

Section 3
Layer Names

Section 1
CAD Drafting Guidelines for the Los Osos Collection System Design Project

Introduction

The purpose of this document is to ensure that the drawings produced during design and the electronic files delivered upon completion of the project meet the requirements of San Luis Obispo County (County). Terminology herein refers to AutoCAD.

Drawing Platform

Design files will be generated using AutoCAD delivered in AutoCAD 2008 compatibility.

Job Specific Standards

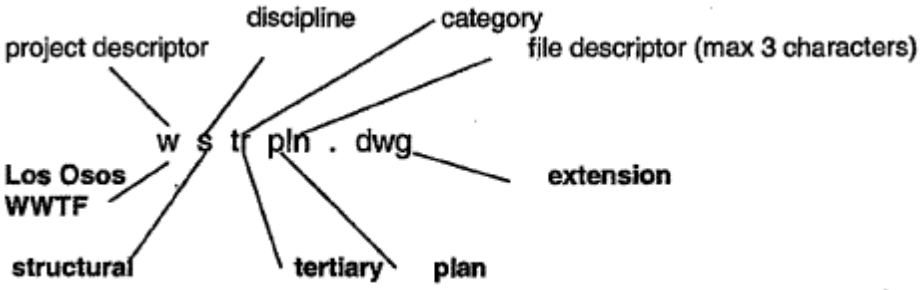
Directory Structure

Directory structure shall be consistent for all consultants. Follow the E-room directory structure.

File Naming Conventions

Model Files

Names for master/model files shall include PROJECT DESCRIPTOR, DISCIPLINE, DRAWING FILE DESCRIPTOR, and EXTENSION.



Filenames shall try to conform to 8.3 filenames with no dashes. Below is a listing of disciplines, areas, and file descriptors.

	DISCIPLINE
a	architectural
c	civil
d	demo
e	electrical
g	general
h	hvac
i	instrumentation
l	landscaping
m	mechanical
pp	plan and profile
s	structural

	CATEGORY
ar	Aeration
oc	Odor Control
op	Operations Building
rs	Residual
sc	Secondary
st	Site
tr	Tertiary

	FILE DESCRIPTOR
bs	base map or site plan
cn	conduit plan
ele	elevation of new facilities
ep	existing yard piping
ex	existing
fac	facilities plan
flr	floor plan
grd	grading and drainage plan
hc	horizontal control and paving
ltp	lighting plan
md	general model file
pln	plan
pro	profile
pw	power plan
rfp	roof plan
sec	section
yp	yard piping

Areas and File Descriptors not indicated can be inserted and used. Length and acronym descriptions are to be consistent with labels as shown.

Paper Space/Sheet Files/Composition Files

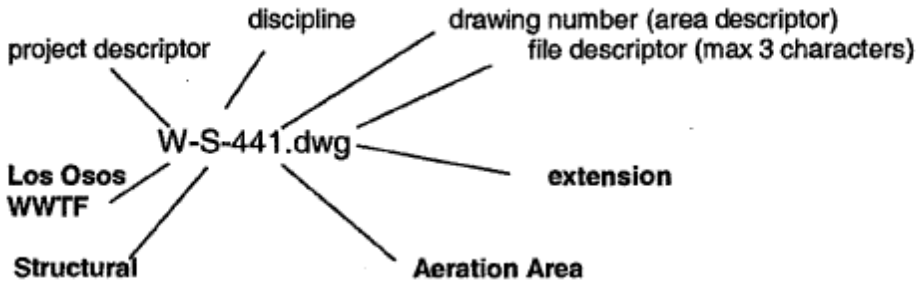
Paper Space / Sheet Files / Composition Files shall be named to be indicative of the drawing number. There should be one file for every drawing in the drawing list.

These file names shall be reflected in the title block on the left hand border. The name in the border shall include the full path name of the location of the file.

Filenames shall not exceed the 8.3 character standard.

Names for Sheet Files shall include PROJECT DESCRIPTOR, DISCIPLINE, DRAWING NUMBER and EXTENSION. Note that for the sheet files the drawing number is both a incremental tag and a area designation.

i.e.…The first structural sheet file for the Aeration Basin will be named…



Below is a listing of Discipline abbreviations.

	DISCIPLINE
a	architectural
c	civil
d	demo
e	electrical
g	general
h	hvac
i	instrumentation
l	landscaping
m	mechanical
pp	plan and profile
s	structural

And a listing of Drawing Number/Areas for Treatment Facilities, Collection, Effluent Disposal, and Pump Station by number.

For General Drawings, inclusive of all disciplines, treatment facilities and pipelines

100 - Collection System

200 - Pump Station

300 - Effluent Distribution

Layer Names

Layer naming conventions shall meet AIA CAD Layering Guidelines. See Section 4 for additional information.

Standard Cells/Blocks

Standard blocks are to be placed in the design files at 1:1 ratio. Do not stretch or modify the scale of blocks or cells non-proportionally. Creation of blocks shall conform to AutoCAD standards and layering rules. Block files shall be delivered with design files in subdirectory (directory named blocks) of each project discipline.

Borders

Border drawing file" Los Osos-bdr.dwg " shall be xref'd to paper space. Every border shall have the file path, date, and time printed on the left of the border edge.

Borders are not to be scaled in the sheet file to maintain a paper space zoom factor 1:1.

Insert block "Los Osos-bdrfill.dwg" for title block information in your paper space file. Insert block at 0,0 and a scale of 1:1.

Drafting Conventions

The following section of drafting standard conventions are to be followed to ensure consistency between consultants. The presentation of the plotted drawing's color, weight, style, font, text size and dimensioning styles should look the same. Standard drafting practices are to be evident

There will be a Project Standard.dwg file supplied on the E-room. Showing text, related callouts and symbols to copy or match for consistency.

Text shall be font ROMANS, width factor of 1, and an oblique angle of O. Text size shall not be smaller than 0.10"Text shall be 0.10". Refer to Project Standard.dwg

Color

Color will be determined "bylayer" in the layer control menu. Subsequently many layers will need to be created to control line weight.

Standard Callouts

Project Specific Detail Callouts

Project specific detail callouts shall be shown using detail callout circles. Use the partially deleted detail callout circle when the drawing number text exceeds the detail circle boundaries. Details are to be label with numbers. Refer to Project Standard.dgw for size.

Standard Detail Callouts

Standard detail callouts shall be shown as circle. New, added or modified standard details are to be labeled with the discipline letter and consecutive number. Refer to Project Standard.dgw for size.

Section Callouts

Section callouts shall be shown using section callout circles. Section callout and arrows are to be shown using standard drafting practices for orientation and placement. Sections are to be label with letters. Refer to Project Standard.dgw for size.

Pipe Callouts

Pipe call outs are shown as rectangles. Pipe callouts include size, fluid type and possibly the optional pipe material type. The fluid type is per the pipe material table.

Equipment Callouts

Equipment callouts are shown as a modified oval. Equipment callouts for major equipment and piping appurtenances 6" and larger are to labeled and included in the equipment lists.

Leader Lines

Leader lines shall be straight with vertices at the note's beginning or end. Curved leader lines shall not be used. Place notes and leader lines so no lines cross. Refer to Project Standard.dgw for size.

Arrowheads

Arrowheads are to be placed as filled, leader lines and dimensions shall have the same size arrowheads. Refer to Project Standard.dgw for size.

Symbols and Abbreviations

Symbols and abbreviations. The project symbols for details and section boxes, matchlines, north arrows and other typical elements are shown in the Project Standard.dgw.

Pipe Depiction

Pipes equal to or greater than 24 inches in diameter shall be shown double line when the scale is less than or equal to 1"=20'. Pipes less than 24 inches in diameter shall be shown single line.

Line Stvle

Line styles shall be limited to the default line style as delivered by AutoCAD. Line styles can be different on a given layer.

Screening Methods

Screening on this project will be controlled through plotting. The color of the element or text will be plotted screened by selecting the appropriate color. Color 15 has been reserved for screening.

Model Files I Composition Files

Other consultants will continually update model files. The file names and location of graphics shall be consistent so file composition integrity remains.

Model Space I Paper Space

Drawings shall be created and assembled using model and paperspace. Graphic elements shall be drawn full size in a drawing file and reference to a sheet file as an xref using paperspace to display area of concern. Paperspace viewports are to be put on layer –vp. Borders are to be placed at 1:1 with the view ports to be scaled. Plotting will be from a paperspace viewport at 1:1

Patterning

Patterning shall use standard AutoCAD patterns. No user-defined patterns shall be used.

Xref Filing

Drawings shall be xref in models space to be plotted in papers space. Xrefs are not bound to the drawings. Xref's will be constantly updated by the consultants.

Plotting

Full size drawings will be plotted on 22x34, using ctb file LOWWP.ctb. Half size drawing's will be plotted on 11x17 using ctb file LOWWP-reduced.ctb Submitted hard copy plots will accompany delivered PDF files. PDF files shall be created for plotting to 11 x 17 paper.

Delivery of Files

Intermediate and final delivery of electronic files are to be made on CD-ROM's in AutoCAD.

Section 2
Drawing Numbering Convention

Drawing numbering shall follow this format:

X-YY-ZZZ

Examples: D-GC-204 Area D - General Civil- Pump Station, Drawing No. 204
Where X is the Prefix tied to the Bid Packages:

A -Area A (includes collection system, pump stations and effluent disposal)

B -Area B (includes collection system, pump stations and effluent disposal)

C -Area C (includes collection system, pump stations and effluent disposal)

D -Area D (includes collection system, pump stations and effluent disposal))

Where YY is the Discipline Description:

G - General
GC - General Civil
C - Civil
PP - Plan and Profile
GL - General Landscape
L - Landscape
GA - General Architectural
A - Architectural
GS - General Structura1
S Structura1
GM- General Mechanical
M – Mechanical
GH – General
H – HVAC
GE - General Electrical
E - Electrical
GI - General Instrumentation and Control
I Instrumentation and Control

Where ZZZ is the Drawing Number based on the following categories:

For all Area Drawings:

100-199	Collection System
200-299	Pump Station
300·399	Effluent Distribution

Sample Drawing list for all components of Area D as follows (other areas are typical of Area D) Not all numbers will be used.

For the Collection System - Area D

D-G-100	THRU	D-G-...	General Drawings
D-GC-100	THRU	D-GC-...	Civil Standard Details*
D-PP-100	THRU	D-PP-...	Plan and Profile Drawings

* First six (6) drawings reserved for standard details that are common to all areas. These sheets will be included in all areas (identical except for drawing number)

For the Pump Station and Wells – Area D

D-G-200	THRU	D-G-...	General Drawings
D-GC-200	THRU	D-GC-...	General Civil Drawings
D-C-200	THRU	D-C-...	Civil Drawings, Site Plans, Sections and Details
D-GL-200	THRU	D-GL-...	General Landscaping Drawings
D-L-200	THRU	D-L-...	Landscaping Drawings, Plans, Details
D-GA-200	THRU	D-GA-...	General Architectural Drawings
D-A-200	THRU	D-A-...	Architectural Drawings, Plans, Elevations
D-GS-200	THRU	D-GS-...	General Structural Drawings
D-S-200	THRU	D-S-...	Structural Drawings, Plans and Sections
D-GM-200	THRU	D-GM-...	General Mechanical Drawings
D-M-200	THRU	D-M-...	Mechanical Drawings, Plans and Sections
D-GH-200	THRU	D-GH-...	General HVAC Drawings
D-H-200	THRU	D-H-...	HVAC Drawings, Plans and Sections, Tables
D-GE-200	THRU	D-GE-...	General Electrical Drawings
D-E-200	THRU	D-E-...	Electrical Drawings, Plans, Schematics
D-GI-200	THRU	D-GI-...	General Instrumentation Drawings
D-I-200	THRU	D-I-...	Instrumentation Drawings, Schematics

For the Effluent Distribution – Area D

D-G-300	THRU	D-G-...	General Drawings
D-GC-300	THRU	D-GC-...	General Civil Drawings
D-C-300	THRU	D-C-...	Civil Drawings, Site Plans, Sections and Details
D-GL-300	THRU	D-GL-...	General Landscaping Drawings
D-L-300	THRU	D-L-...	Landscaping Drawings, Plans, Details
D-GE-300	THRU	D-GE-...	General Electrical Drawings
D-E-300	THRU	D-E-...	Electrical Drawings, Plans, Schematics
D-GI-300	THRU	D-GI-...	General Instrumentation Drawings
D-I-300	THRU	D-I-...	Instrumentation Drawings, Schematics

Section 3
Layer Names

The CAD Layer Guidelines are organized as a hierarchy. This arrangement accommodates expansion and addition of user-defined extensions to the layer list. Layer names are alphanumeric and use abbreviations that are easy to remember and are logical in their descriptions. This approach is particularly important when the CAD files are used by many multiple consultants. The Layer strategy will follow typical CAD layering standards per the "AIA CAD Layer Guidelines" (See Section 4)

The following section details the methodology behind the layer naming conventions and their general use.

```
Field 1 Discipline Code
|  Field 2 Major Group
|  |    Field 3 Minor Group
|  |    |
X-XXXX-XXXX
```

Field 1 or the Discipline Code, is the same as the codes used for the filenames.

	DISCIPLINE
a	architectural
c	civil
d	demo
e	electrical
g	general
h	hvac
i	instrumentation
l	landscaping
m	mechanical
p	plan and profile
s	structural

Field 2, or the Major Group is a description describing a group. The major group system uses names like wall, door, pump, pipe, equip, and text. This field may be a 3 or 4 character description. This field is the most looked at field. The descriptions used here typically are what makes layering useful. The engineer will need to be creative and consistent in how these names are assigned. A listing here would go on and on. Some examples of Major Group descriptions are:

Ablt	Anchor Bolt	Irrg	Irrigation
Accs	Access	Jois	Joists
Area	Area	Ltng	Lightning Protection
Beam	Beam	Mach	Machine Shop
Bldg	Building	Plan	Plans
Code	Code	Plnt	Plant
Cols	Columns	Powr	Power
Comm	Communications	Proc	Process
Cont	Controls	Rcov	Recover
Detl	Detail	Refg	Refrigeration
Domw	Domestic Water	Risr	Risers
Dust	Dust	Road	Road
Elev	Elevation	Roof	Roof
Elht	Electric Heat	Site	Site
Exhs	Exhaust	Slab	Slabs
Fire	Fire	Soun	Sound
Fixt	Fixture	Spcl	Special
Flor	Floor	Sprn	Sprinklers
Fndn	Foundation	Stan	Standpipe Systems
Fuel	Fuel	Stem	Steam
Furn	Furniture	Strm	Storm
Glaz	Glass	Test	Test
Grid	Grids	Topo	Topography
Grnd	Grounding		

Besides a name describing a layer this Field 1 or Major Group can also include the word "ANNO" for annotation.

Annotation can be placed in both paper and model space (Model files/Title files). Dimensions, symbols, and keynotes would typically be placed in model space. Legends, schedules, borders, and title blocks would typically be placed in paper space. The same layer names would be used in both cases.

Types of annotation are as follows:

* represents Discipline Code

*-Anno-Dims	Dimensions
*-Anno-Keyn	Keynotes
*-Anno-Legn	Legends And Schedules
*-Anno-Note	Notes
*-Anno-Nplt	Construction Lines, Non-Plotting Information
*-Anno-Redl	Redline
*-Anno-Revs	Revisions
*-Anno-Symb	Symbols
*-Anno-Text	Text
*-Anno-Ttlb	Border And Title Block

The use of a 4th (fourth) group (not shown) is optional. This group is used to describe layers like, demo (demolition), exst (existing), and futr (future). This group can be at the discretion of the consultant.

APPENDIX G

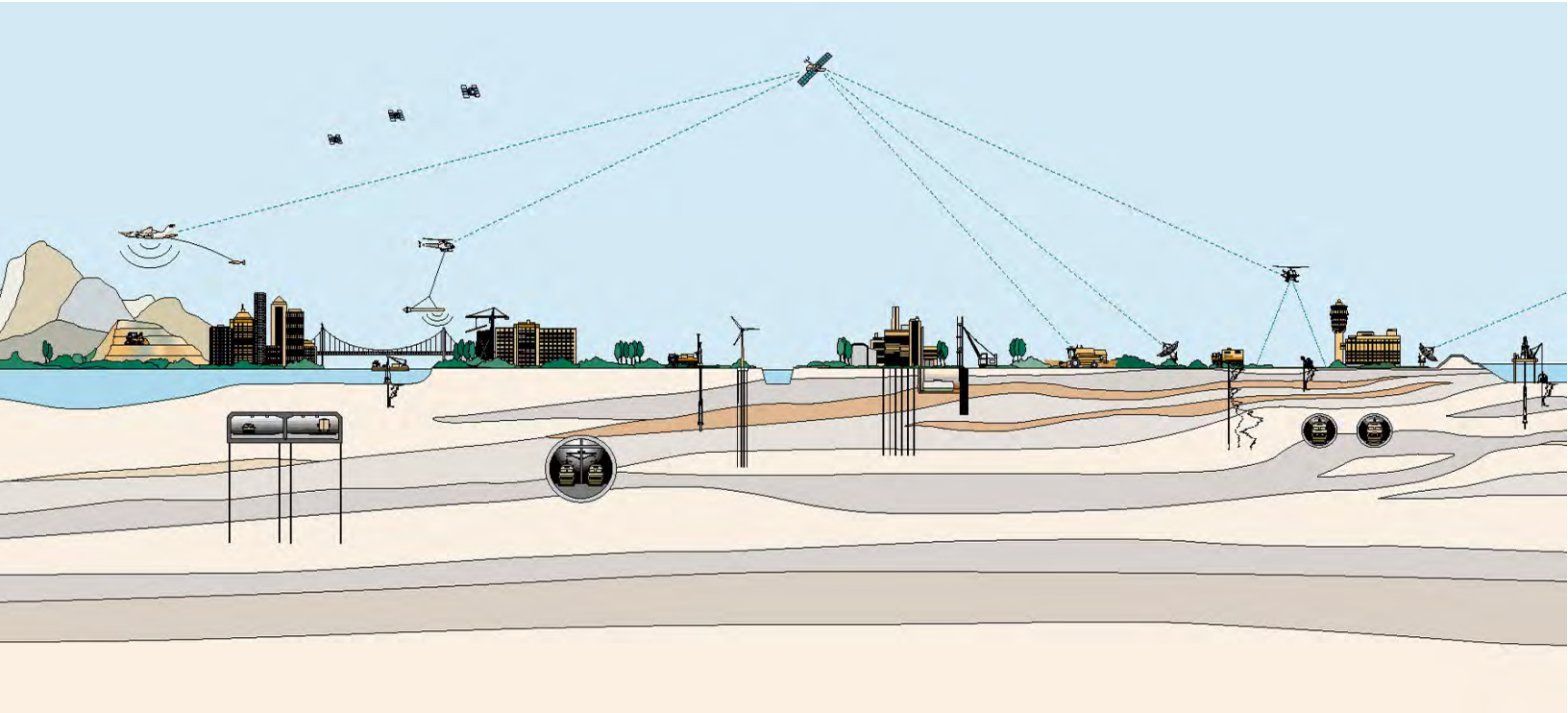
Addendum and Update to Geotechnical Report

FUGRO CONSULTANTS, INC.

ADDENDUM and UPDATE TO GEOTECHNICAL REPORT Los Osos Wastewater Project San Luis Obispo County, California

Prepared for:
Camp, Dresser & McKee, Inc. (CDM)

October 24, 2011
Fugro Project No. 04.6111.0030



FUGRO CONSULTANTS, INC.

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San Luis Obispo, California 93401
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October 24, 2011
Project No. 04.6111.0030

CDM
2295 Gateway Oaks Drive, Suite 240
Sacramento, California 95833

Attention: Mr. Michael Middleton

Subject: Addendum and Update to Geotechnical Report, Los Osos Wastewater Project, San Luis Obispo County, California

Dear Mr. Middleton:

Fugro is pleased to submit this addendum and update to our Geotechnical Report prepared for the design of the County of San Luis Obispo's Los Osos Wastewater Project. The purpose of this report is to provide geotechnical recommendations for the design of the collection system, effluent disposal system, pump stations, and conveyance to and from the wastewater treatment plant. This report was prepared in accordance with our subconsulting agreement for professional services with CDM dated May 17, 2011.

Fugro prepared a Geotechnical Report dated March 9, 2004 report for the design of this project under subcontract to MWH. The report included Volume 2 dated March 4, 2004 that presents supporting field and laboratory test data from various previous geotechnical studies performed by Fugro, CFS, and Metcalf & Eddy. The recommendations of the March 9, 2004 report and supporting data presented in Volume 2 are considered applicable and can be used in the design of the pipeline collection system, pump stations, and effluent disposal system for the current project being designed by CDM.

The recommendations presented in the March 9, 2004 for the design of the mid-town (Tri-W site) wastewater treatment plant site are no longer considered applicable to the current project. A new site has been selected for the wastewater treatment plant that is located behind the cemetery on Los Osos Valley Road (the Giacomazzi site). The design of the new treatment plant site is not a part of our current scope of work or project, and a geotechnical evaluation has not yet been performed for the design of that facility.

This report includes supplemental field and laboratory data collected along Los Osos Valley Road, updated seismic data for use with the 2010 California building code, recommendations for the design of the conveyance pipelines between the treatment plant and the mid-town pump station, and recommendations for the design of the mid-town pump station.

This report is an addendum to the previous report, and should be used in association with the recommendations and data presented in the March 9, 2004 report.

We appreciate the opportunity to provide our services on this project. Please contact the undersigned if you have questions regarding this report, or require additional information

Sincerely,

FUGRO CONSULTANTS, INC.

Jonathan D. Blanchard, GE2312
Principal Geotechnical Engineer

Reviewed by:

Craig D. Prentice, CEG 1602
Principal Engineering Geologist

Copies Submitted: 2 – addressee (1 pdf)
1 – Mr. Bruce Corwin, CDM

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1.0 PROJECT DESCRIPTION

The project generally consists of the design of the collection system for the Los Osos wastewater project. The project components for the effluent disposal system (currently limited to the Broderson site), the pump stations, and collection system are described in the Geotechnical Report. Some modifications are being made to the design to address lower flows being used in the current design of the collection system, and will result in some modifications to the depth and grade of the pipeline network. This addendum provides supplemental information for the design of the pipeline that will reach along Los Osos Valley Road and for the mid-town pump station to the wastewater treatment plant. The location of the project relative to nearby roadways and landmarks is shown on Plate 1, Cumulative Field Exploration Plan.

The improvements addressed by this addendum include the following:

- The collection system will be by gravity flow with pump stations that will divert flow to the new Mid-Town Pump Station that will be located near the intersection of Ravena Avenue and Los Osos Valley Road. The pump station will be located approximately 50 feet north of Los Osos Valley Road. The depth of the pump station has not been determined at this time. The standby power building for this facility will be located on Palisades Avenue, about 30 to 40 feet west of the library parking lot.
- A force main will be designed along approximately 2 miles of Los Osos Valley Road to convey raw sewage from the Mid-Town Pump Station to the new treatment plant site on the Giacomazzi Property, north of the cemetery and the Clark Valley Road intersection (CDM 2011a, 2011b). The force main will be designed with approximately 4 feet of cover, except where the pipeline may be deepened to approximately 8 feet to avoid conflicts with utility pipes.
- The pipeline alignment within town will generally run between the centerline of Los Osos Valley Road and the westbound shoulder between Ravena and Palisades, along the eastbound shoulder between Palisades to about 700 feet east of South Bay Boulevard, and generally between the westbound shoulder and centerline to Clark Valley Road.
- A second recycled water pipeline will be installed along Los Osos Valley Road to convey treated effluent from the plant back into town and to the Broderson site for recycling and disposal. The recycled water pipeline will be buried at approximately the same depth and general alignment as for the force main.
- The force mains will cross Los Osos Creek at the bridge on Los Osos Valley Road. One pipe will likely be located on the south side of the bridge and one on the north side. The pipes will be structurally suspended from the existing bridge.

2.0 WORK PERFORMED

2.1 PURPOSE

The purpose of this report is to provide additional geotechnical recommendations for the design of the force mains along Los Osos Valley Road, to update the seismic data for use with the current building code, and to supplement the previous Geotechnical Report (Fugro 2004). The main geotechnical considerations that we evaluated for the project are characterization of the soil and groundwater conditions encountered, foundation support for the bridge at Los Osos Creek, and the trench subgrade and support conditions along Los Osos Valley Road.

2.2 SCOPE OF WORK

To evaluate the geotechnical considerations for the project, we have performed the following scope of work:

- Consulted with CDM and the County regarding our approach to the geotechnical evaluation, the project objectives, site access, and to obtain project information;
- Visited the site to observe the general site conditions, marked boring locations, contacted Underground Services Alert to clear the drilling locations in advance of our field exploration program, obtained an encroachment permit for drilling from the County, and prepared a Health and Safety Plan for the field work;
- Performed a field exploration program consisting of drilling six (6) borings along Los Osos Valley Road (the numbers of borings were reduced based on modifications to the project limits provided by CDM and helped allow time to comply with permit conditions while backfilling explorations);
- Performed laboratory testing on selected samples obtained from the field exploration program; and
- Prepared this report summarizing the field and laboratory data obtained for the site, providing updated seismic data for the design of the project, and a description of the subsurface conditions and recommendations for the design of the new force mains along Los Osos Valley Road.

2.3 FIELD EXPLORATION

The field exploration program consisted of drilling and sampling six (6) borings at the site on June 20 and 21, 2011. The logs for the field data collected are presented in Appendix A. The approximate locations of the borings are shown on Plate 1, Cumulative Field Exploration Plan and Plate 2, Field Exploration Plan. The drilling contractor for the project was S/G Drilling Company of Lompoc, California. S/G used a CME85, truck-mounted drill rig equipped with 8-inch hollow stem augers to advance the borings to depths of approximately 40 feet below the existing ground surface.

The borings were sampled using 2-inch outside diameter standard penetration test (SPT) split spoon and 3-inch outside diameter modified California split-spoon samplers. The SPT sampler was used without liners. The modified California sampler was used with 1-inch high brass liners. The samplers were driven into the materials at the bottom of the borehole using a 140-pound automatic trip hammer with a 30-inch drop. The blow count (N-value) is the number of blows from the hammer that were needed to drive the sampler 1 foot, after the sampler had been seated 6 inches into the material at the bottom of the hole. Bulk samples were collected from the drill cuttings retrieved from the auger flights. A field engineer from Fugro logged the subsurface conditions encountered, recorded field test data, packaged samples recovered from the borings, and transported the samples to the laboratory for subsequent testing. The borings in Los Osos Valley Road were backfilled with 2 sacks of sand-cement slurry or grout and topped with rapid set concrete that was colored black.

The sample intervals, uncorrected field N-values recorded during sampling, a description of the subsurface conditions encountered, and other field and laboratory data are presented on the logs of the borings in Appendix A.

2.4 LABORATORY TESTING

Laboratory tests were performed on selected soil samples retrieved from the boring. The laboratory program included tests for moisture content and unit weight, grain size analyses, compaction, plasticity (Atterberg Limits), compaction (Proctor), direct shear strength, triaxial shear strength, R-value and corrosion. Corrosion tests were performed by Cooper Testing Labs of Palo Alto, California. The tests were performed in general accordance with the applicable standards of ASTM. The results of the tests are presented in Appendix B.

2.5 GENERAL CONDITIONS

Fugro prepared the conclusions, recommendations, and professional opinions of this report in accordance with the generally accepted geotechnical principles and practices at this time and location. This warranty is in lieu of all other warranties, either expressed or implied. This report was prepared for the exclusive use of Camp Dresser and McKee, Incorporated (CDM) and their authorized agents only. It may not contain sufficient information for the purposes of other parties or other uses. If any changes are made in the project as described in this report, the conclusions and recommendations contained in this report should not be considered valid unless Fugro reviews the changes and modifies and approves, in writing, the conclusions and recommendations of this report. This report and the drawings contained in this report are intended for design-input purposes; they are not intended to act as construction drawings or specifications.

The scope of services did not include any environmental assessments for the presence or absence of hazardous/toxic materials in the soil, surface water, groundwater, or atmosphere. Any statements, or absence of statements, in this report or data presented herein regarding odors, unusual or suspicious items, or conditions observed are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous/toxic assessment.

Soil and rock deposits can vary in type, strength, and other geotechnical properties between points of observations and exploration. Additionally, groundwater and soil moisture conditions can vary seasonally or for other reasons. Therefore, we do not and cannot have a complete knowledge of the subsurface conditions underlying the site. The conclusions and recommendations presented in this report are based upon the findings at the points of exploration, and interpolation and extrapolation of information between and beyond the points of observation. These findings are subject to confirmation based on the conditions revealed by construction.

3.0 SITE CONDITIONS

3.1 GEOLOGIC SETTING

The project area lies within the Los Osos Valley that is part of the Coast Ranges geologic and geomorphic province. The regional geology is described in the Geotechnical Report. The surficial geology of the project vicinity, as mapped by Hall (1973) is shown on Plate 3, Regional Geologic Map. As shown on Plate 3, the collection system area and Los Osos community are underlain predominantly by Sand Dune Deposits. East of Los Osos Creek, the pipeline alignment is within the Sand Dune Deposits, crosses a low area mapped as alluvium along Los Osos Creek and to the east, and then rises up near the cemetery to an area that is also mapped by Hall as Sand Dune Deposits. However, the sand dune deposits encountered in this vicinity appear to be composed of moderately indurated and weathered clayey sand, suggesting these deposits are older (pre-Holocene) deposits that the dune sand encountered west of Los Osos Creek.

3.2 SUBSURFACE CONDITIONS

A description of the predominant geologic units and soil conditions encountered in our explorations is presented below. Logs of the explorations are presented in Appendix A. Previous boring information collected by Moore & Taber (1991) for the Los Osos Creek Bridge is presented in Appendix C. The subsurface conditions encountered at the site generally consisted of units of pavement and artificial fill (Af), alluvium (Qa), sand dune deposits (Qs), and older sand dune deposits (Qos). The approximate locations of the borings and cumulative field exploration plan for the project is shown on Plate 1. The locations of the explorations drilled along Los Osos Valley Road are shown on Plate 2. The subsurface conditions and logs of the previous explorations are presented in the Geotechnical Report (Fugro 2004).

Pavement Conditions. Drill holes DH-501 through DH-505 were drilled within the pavements along Los Osos Valley Road. A summary of the approximate pavement thicknesses encountered is presented below:

Approximate Pavement Thicknesses Encountered

Drill Hole No.	Location along Los Osos Valley Road	Pavement Section Encountered
501	West bound shoulder	8 inches asphalt concrete over 15 inches of base
502	Westbound lane	6.5 inches of asphalt concrete over 5 inches of base
503	Westbound shoulder	9 inches asphalt concrete on subgrade
504	West bound shoulder (near bridge)	5 inches asphalt concrete over 11 inches of base
505	Westbound fast lane	6 to 7 inches of asphalt concrete over 8 inches of base

Artificial fill materials (Af). In addition to the pavement materials described above, artificial fill materials were encountered in DH-504 drilled near the Los Osos Creek Bridge to approximately 4.5 feet below the ground surface. The fill materials appear to be associated with backfill that was previously placed behind the bridge abutments. Embankment fill associated with roadway construction is also present along Los Osos Valley Road, with thicknesses that appear to be up to approximately 15 feet. The fill material encountered in DH-504 consisted of stiff sandy lean clay (CL) with varying amounts of angular gravel and intermixed soil. The artificial fill materials were underlain by alluvium (Qal).

Alluvium (Qal). Alluvium was encountered below the pavement materials in DH-503 and DH-504 that were drilled along the valley floor of Los Osos Creek, and within the areas mapped as alluvium by Hall (1973) on Plate 3. An older alluvial deposit was also encountered below the dune sand deposits in DH-502. The alluvium generally consisted of an upper and lower unit. The upper unit consisted of interbedded loose to medium dense clayey sand (SC) and soft to stiff lean clay with sand (CL). DH-502 and DH-503 were terminated within the upper unit at approximately 15.5 feet below the existing ground surface.

The alluvium encountered below the dune sand in DH-502 is likely older terrace deposits that have not been differentiated by Hall. The alluvium was notably softer at DH-504 drilled on the east side of the bridge on Los Osos Valley Road. The lower unit of alluvium was encountered in DH-504 at a depth of approximately 23 feet. The lower unit consisted of interbedded layers of loose to medium dense sand and gravel with varying amounts of silt. Sand flowed into the augers during the sampling at 25 feet, and likely resulted in the lower field blowcount at that depth as noted on the boring log. DH-504 was terminated with the lower unit at approximately 40.5 feet below the ground surface.

The subsurface conditions encountered near the bridge differed from those reported by Moore & Taber (1991) for the Los Osos Creek Bridge in that soils encountered within DH-504 were generally softer, and less interbedded. Moore & Taber reportedly encountered relatively dense sand and gravel and hard clay soil below depths of approximately 50 to 60 feet.

Samples of the alluvium that were tested had dry unit weights that ranged from approximately 97 to 131 pounds per cubic foot (pcf) and corresponding moisture contents of approximately 7 to 23 percent.

Sand Dune Deposits (Qs): Sand dune deposits were encountered in the drill holes west of Los Osos Creek, and near the cemetery east of the lowland area along Los Osos Creek. Dune sand deposits comprise the predominant geologic unit exposed at the ground surface over the collection system area. The areal extent of the dune sand deposits, as mapped by Hall (1973), is indicated on Plate 3, and is generally consistent with units encountered in the explorations. The dune sands encountered east of Los Osos Creek appear to be an older dune sand deposit that is composed of moderately indurated sand, referred to as Qos on the boring logs.

The older dune sand encountered within DH-501 and DH-502 generally consisted of medium to very dense clayey sand (SC). The older dune sand was relatively heavily oxidized with orange and gray mottling throughout, and contained pockets of clay. The older dune sand was underlain by older alluvium in DH-502 at approximately 7 feet below the ground surface and was encountered to the maximum depth explored in DH-501, approximately 15.5 feet below the ground surface.

Dune sand, typical of that encountered elsewhere within the collection area, was encountered in DH-505 and DH-506 drilled approximately 1,000 feet west of Los Osos Creek and at the mid-town pump station site (near Ravena Avenue), respectively. The dune sand generally consisted of medium dense poorly graded sand and sand with silt (SP-SM). The relative density of the dune sand generally increased with depth, and the dune sand was dense to very dense below depths of approximately 15 to 20 feet. The dune sand was encountered to the maximum depths explored, approximately 40 feet below the ground surface.

Laboratory tests performed on selected samples typically had dry densities that ranged from approximately 114 to 117 pcf within the older dune sand, and from approximately 100 to 114 pcf within the dune sand encountered west of Los Osos Creek. Moisture contents ranged from approximately 3 to 15 percent. Sieve analysis tests indicate that material finer than the U.S. Standard 200 sieve ranged from approximately 19 to 34 percent for samples of the older sand dune deposits (from DH-501 and DH-502), and from approximately 1 to 9 percent for samples of the younger dune sand deposits (from DH-505 and DH-506). Sand equivalent test results for samples of older dune sand ranged from approximately 14 to 17. Sand equivalent test results for samples the younger dune sand ranged from approximately 24 to 76.

3.3 GROUNDWATER CONDITIONS

Groundwater was encountered in DH-503 and DH-504 drilled within the lowland areas of Los Osos Valley Road at approximately 13 and 24 feet below the ground surface, respectively (approximately el. 72 feet). The soils were relatively wet at a depth of approximately 15 feet in DH-505 (el. 148 feet). Moore & Taber (1991) reportedly encountered groundwater near el. 69 feet near the Los Osos Creek Bridge in March of 1989. The groundwater levels in the vicinity of the bridge are likely near or higher than the water level in Los Osos Creek which was flowing at

the time of our June 2011 field exploration program. Groundwater was encountered at approximately 39 feet below the ground surface in DH-506 drilled near the proposed mid-town pump station site and Ravena Avenue. Groundwater and soil moisture conditions will vary seasonally due to storm runoff, groundwater pumping, and irrigation, as well as other factors.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of this report are intended to supplement the previous recommendations presented in the Geotechnical Report. The following recommendations presented for the design of the proposed raw sewage and recycled water force mains along Los Osos Valley Road are intended to be complete for that reach of pipeline. Other recommendations for the design of the collection system, effluent disposal, and pump stations are presented in the Geotechnical Report (Fugro 2004). Seismic data has been updated for the current building code.

4.1 SEISMIC DATA

4.1.1 Liquefaction

Liquefaction and seismic hazards were evaluated as part of the 2004 report, and can be considered applicable to the design of the current collection and pump stations. Generally, potentially liquefiable soils were encountered within low-lying areas within the collection system area and along the shoreline of Morro Bay where various pump stations are also planned that extend to depths of roughly 10 feet below the ground surface and could result in approximately 1 to 2 inches of seismic settlement in response to the design earthquake. The structures are generally to be designed to tolerate the additional settlement. Seismic data for the updated building code based design considered the potential for liquefaction.

4.1.2 Code Based Design

Structures should be designed to resist the lateral forces generated by earthquake shaking in accordance with the building code and local design practice. This section presents seismic design parameters for use with the 2010 California Building Code (CBC). The site coordinate and USGS interactive web page “Seismic Design Values for Buildings” (USGS 2008) was used to obtain seismic design criteria. Based on these criteria, the seismic data for use with code-based designs are provided:

Seismic Data

California Building Code	Seismic Parameter	Value for Site Class D	Value for Site Class F (liquefaction)
Site Coordinates	Latitude, degrees	35.3127	35.3127
	Longitude, degrees	-120.8383	-120.8383
Section 1613.5.1 Figure 1613.5	Ss , Seismic Factor, Site Class B at 0.2 sec	1.472	1.472
	S_1, Seismic Factor, Site Class B at 1 sec	0.555	0.555
	Site Class	S_D, Stiff soil*	S_F, Liquefiable**
Section 1613.5.3 Table 1613.5.3(1)	Fa, Site Coefficient for Site Class	1.0	0.9
Section 1613.5.3 Table 1613.5.3(2)	Fv, Site Coefficient for Site Class	1.5	2.4
Section 1614A	S_{MS}, Site Specific Response Parameter for Site Class at 0.2 sec.	1.472	1.325
	S_{M1}, Site Specific Response Parameter for Site Class at 1 sec.	0.833	1.333
	S_{DS} = 2/3 S_{MS},	0.981	0.883
	S_{D1} = 2/3 S_{M1}	0.555	0.889

* Assumes site mitigation performed to address liquefaction.
**Assume no site mitigation is performed to address liquefaction and is equivalent Site Class E.

Based on potential liquefaction hazards, lower portions of the collection system area and some pump station locations are classified as a Site Class F per the building code. The values and subsequent response spectra were estimated for a Site Class E, "S_E", soft soil site, based on the estimated residual shear strength of potentially liquefiable soils. Other areas of the site, and prior to there being liquefaction, are classified as Site Class D, "S_D",, The design for pump stations should consider the higher of either the Site Class F or Site Class D values presented in the table above for design and the structural period being considered.

4.2 LOS OSOS VALLEY ROAD FORCE MAINS

The following recommendations apply to the design of the force mains along Los Osos Valley Road between the mid-town pump station and Clark Valley Road. The pipe within this reach is designed with 4 feet of cover, except where the pipe will be deepened to a depth of approximately 8 to 10 to avoid existing utilities. Material recommendations for bedding and trench backfill materials are presented in the Geotechnical Report.

4.2.1 Foundation Support and Trench Bottom Stabilization

Pipe bedding should generally be placed on a relatively undisturbed subgrade, free of loose or disturbed materials. Where the subgrade is relatively firm and unyielding the pipe bedding material can be placed directly on the undisturbed trench bottom.

Where soft, wet, or yielding subgrade material is encountered, the trench subgrade should be stabilized to a firm and unyielding condition prior to placement of bedding material. Stabilization of the subgrade can consist of removing 12 inches of trench subgrade and replacing the soil with a thicker layer of gravel bedding material. Open-graded materials used for bedding (such as pea gravel) should be encased in a geotextile to reduce the potential for the adjacent sandy soil to migrate into the trench. Where the base of the trench has been disturbed or is not properly dewatered, the contractor should be responsible for removing the disturbed material and replacing it with compacted fill. The contractor may elect to scarify and compact the exposed subgrade of the trench to assist in achieving compaction in the bedding if desired. The following table summarizes the anticipated subgrade conditions along the trench subgrade for the force main construction on Los Osos Valley Road.

Anticipated Subgrade Conditions along Los Osos Valley Road Force Mains

Reach	Trench Depth (feet)	Subgrade	Foundation Preparation
Midtown PS to 300 feet east of Palomino Drive	5 feet typical 10 feet maximum	Loose to medium dense sand	Undisturbed trench bottom
300 feet east of Palomino Drive to 300 feet east of Sombrero Drive	5 feet typical	Clay and loose clayey sand that is wet of optimum	Stabilize with 12 inches gravel in fabric
300 feet east of Sombrero Drive to Clark Valley Road	5 feet typical	Older dune sand and roadway embankment (to west)	Undisturbed trench bottom

We recommend that the project specifications provide for review of the pipe subgrade conditions at the time of construction, and allowances for increasing the quantity of trench excavation and bedding thickness below the pipe at the contract unit rates, if needed, to help stabilize the foundation support soils below the trench. The actual thickness of gravel needed to stabilize the subgrade should be evaluated based on the subgrade conditions encountered and bedding material used during the construction. The gravel used in stabilization of the subgrade can be included in the recommended bedding thickness below the pipe. A cushion of sand bedding can be provided over the gravel and geotextile, if needed, to help set the pipe.

4.2.2 Pipe Zone Bedding Material

Bedding is select material placed between the trench subgrade and the bottom of the pipe. Bedding material can consist of imported sand, gravel, crushed aggregate, or excavated on-site material having a sand equivalent of at least 30 and conforming to the suggested materials specification of the Geotechnical Report. Where open graded gravel materials are used as bedding, a geotextile for separation should be provided around the bedding material to reduce the potential for the native soil to pipe into the bedding material. Where gravel is placed to stabilize the subgrade below the pipe, the gravel should be continued up to the springline of the pipe.

The bedding thickness below the pipe should be at least 6 inches or one third of the pipe diameter, whichever is greater. Where the in-situ materials below the bottom of pipe meet the recommended material requirements for pipe zone bedding, the bedding material can be omitted provided the trench subgrade is prepared and compacted as recommended below. Bedding materials should be compacted to at least 90 percent relative compaction, prior to placing the pipe or the pipe zone materials. Bedding should be placed such that the middle third of the pipe is supported in the bedding material prior to placement and compaction of the subsequent pipe zone material.

Where the in-situ material within 9 inches of the bottom of the pipe meets the recommended material requirements for bedding, bedding can consist of scarifying the existing soil, and compacting the in-situ material in-place to at least 90 percent relative compaction. The depth of compaction should extend to at least 9 inches below the bottom of the pipe. The purpose of scarifying the subgrade is to evaluate if there are rocks or deleterious objects within the bedding thickness and to allow for removal of the oversized material. Care should be taken that scarification or disturbance of the soil does not occur below 9 inches or the depth of compaction. Excavation of the prepared bedding should be provided below the bell of the pipe such that the entire pipe is supported and in firm contact with the bedding. Additional material meeting the requirements for pipe bedding can be used to fill depressions left from trench excavation or compaction, if needed.

4.2.3 Pipe Zone Material

Pipe zone material placed above the bedding to at least 12 inches above the top of the pipe should be compacted to at least 90 percent relative compaction prior to placing trench backfill. Compaction within the pipe zone should be performed such that the pipe is fully supported, and such that excessive deformation or damage to the pipe does not occur. Material should be hand shoveled and sliced below the haunches of the pipe during placement to provide support for the pipe and assist with compaction.

4.2.4 Trench Backfill

Trench backfill is material placed above the pipe zone material and below the ground surface, finished grade, or pavement structural section. Trench backfill should consist of excavated on-site soil that conforms to the suggested material specification of this report, or imported material that is free of organics, debris and other deleterious materials. Trench backfill should be compacted to at least 90 percent relative compaction, except in roadway areas where trench backfill placed within 3 feet of finished grade of the pavement surface should be compacted to at least 95 percent relative compaction.

4.2.5 Backfill and Compaction

Fill placement and grading operations should be performed according to the grading recommendations of this report. We recommend that fill materials be compacted to at least 90 percent relative compaction, as determined by the latest approved edition of ASTM D 1557,

unless a higher degree of compaction is otherwise recommended. We recommend the following minimum relative compaction be provided for the locations indicated:

Location	Recommended Minimum Relative Compaction
General	90 % U.O.N.
Pipe Zone and Bedding	90 % U.O.N.
Trench backfill in non-pavement areas or placed greater than 3 feet below finished grade in pavement areas	90 % U.O.N.
Trench backfill placed within 3 feet of finished grade in pavement areas	95 %
Aggregate Base or Subbase	95 %
Asphalt Concrete	95 %
Building Areas	95 %

U.O.N. = unless otherwise noted

4.2.6 Thrust Resistance

Where pressurized portions of the pipeline change direction abruptly, resistance to thrust forces can be provided by mobilizing frictional resistance between the pipe and surrounding soil, and by the use of a thrust block, or by a combination of the two.

We understand that pressurized pipelines could be designed to resist thrust using restrained joints in conjunction with mobilized pipeline/soil resistance. A coefficient of lateral earth pressure, K_o, value of 0.7 can be used in conjunction with a coefficient of friction of 0.35 or 0.20 between the pipe and granular backfill material in contact with DIP or PVC pipes, respectively. The recommended values assume that granular pipe zone materials will be placed adjacent to the pipe, as recommended in this report.

Thrust blocks can be designed to resist lateral forces based on the passive resistance acting on the bearing side of the block, and the estimated frictional resistance acting along the base of the block. Thrust blocks should be designed with a minimum cover of 3 feet below finished grade and a net passive resistance of 350 pounds per cubic foot, equivalent fluid weight. One half of the recommended passive resistance should be used if the block will be submerged or founded below the groundwater table. A coefficient of friction of 0.45 can be used to estimate sliding resistance on the base of thrust blocks.

We recommend that thrust blocks be designed assuming submerged overburden soils. A buoyant soil unit weight of 48 pounds per cubic foot for the overburden soils should be used when computing the frictional and passive resistance on thrust blocks or pipes with restrained joints.

4.2.7 Modulus of Soil Reaction (E′)

Flexible and semi-rigid pipes are typically designed to withstand a certain amount of deflection from applied earth loads. Those deflections can be estimated with the aid of

equations developed by Spangler and Handy (1982) or Howard (2002). We have recommended E′ values for general conditions that were estimated for pipeline trenches backfilled with granular materials complying with the recommendations of this report, and for in-situ materials consisting of normally consolidated sand. On the basis of our evaluation, we recommend that an E′ value of 1,000 psi be used for pipe design.

The E′ value was estimated as the weaker of the pipe zone material or in-situ material beyond the springline of the pipe. The recommended E′ value was selected based on the soil conditions encountered at the site. The geotechnical engineer should review the trench during construction. If unsuitable materials are encountered along the spring line of the pipe, the trench detail and design of the pipe should be reviewed to evaluate if modifications to the design are needed to provide for the lower springline support. Placing slurry or a concrete cradle below the haunches of the pipe can help to provide additional springline support for pipes embedded in relatively weak soils.

4.3 MID TOWN PUMP STATION

The mid-town pump station and standby power building will be located on the north side of Los Osos Valley Road near Ravena Drive. The pump stations and vaults for the pump stations should be designed according to the recommendations of the Geotechnical Report. The soil conditions encountered at the site (DH-506) generally consist of dune sand with groundwater encountered at approximately 38 feet below the ground surface.

4.4 STANDBY POWER BUILDINGS

Recommendations for site preparation, grading and foundation design for the standby power buildings are provided in the Geotechnical Report. The following table supplements the table presented in Section 6.5.2.1 of the Geotechnical Report to include recommendations for the standby power buildings at Palisades Drive and Solano Street:

Location	Existing Ground Surface	Groundwater Depth Encountered	Estimated Depth of Removal Below the Existing Ground Surface
Palisade (Midtown) Standby Power Building west of library parking lot	el. 86 ft.	13 feet in B-1	5 feet or 1 foot below the bottom of footings, whichever is deeper.
Solano Standby Power Building and Pump Station at Donna Avenue	el. 16 ft.	3 feet in DH--116	5 feet or 1 foot below the bottom of footings, whichever is deeper[1]
[1] Provide subgrade stabilization to address groundwater or wet soil conditions as recommended in Geotechnical Report (Section			

5.0 NATURALLY OCCURRING ASBESTOS

Naturally occurring asbestos (NOA) is common in serpentine rock throughout San Luis Obispo County. The California Air Resources Board has identified serpentine rock as having the potential to contain asbestos that locally is common to or within the Franciscan Formation. Franciscan or serpentine rocks are not mapped or know to be present within the project area,

and were not encountered within the depth of the anticipated site grading and excavation at the locations explored. Therefore, it is our opinion that there is a low potential to encounter serpentine rocks during construction, and no special mitigation will need to be considered for the design or construction of the project to address NOA.

6.0 CONTINUATION OF SERVICES

The geotechnical evaluation consists of an ongoing process involving the planning, design, and construction phases of the project. To provide this continued service, we recommend that the geotechnical engineer be provided the opportunity to review the project plans and specifications, and observe portions of the construction.

6.1 REVIEW OF PLANS AND SPECIFICATIONS

The geotechnical engineer should review the foundation and grading plans for the project. The purpose of the review is to evaluate if the plans and specifications were prepared in general accordance with the recommendations of this report.

6.2 GEOTECHNICAL OBSERVATION AND TESTING

Field exploration and site reconnaissance provides only a limited view of the geotechnical conditions of the site. Substantially more information will be revealed during the excavation, grading and ground improvement phases of the construction. Subsurface conditions, excavations and fill placement should be observed by the geotechnical professional during construction to evaluate if the materials encountered during construction are consistent with those assumed for this report.

7.0 REFERENCES

Camp, Dresser & McKee, Inc. (CDM 2011b), Los Osos Wastewater Project, draft plans for the Solano, Mid-Town, and Palisades pump stations and standby power buildings, and the pump stations plans for Areas A and D, received via email on October 21.

Camp, Dresser & McKee, Inc. (CDM 2011a), Los Osos Wastewater Project, Preliminary Plan and Profile, Force Main between Ravena and Clark Valley Road, draft sketch and mark-up, received via email on July 27.

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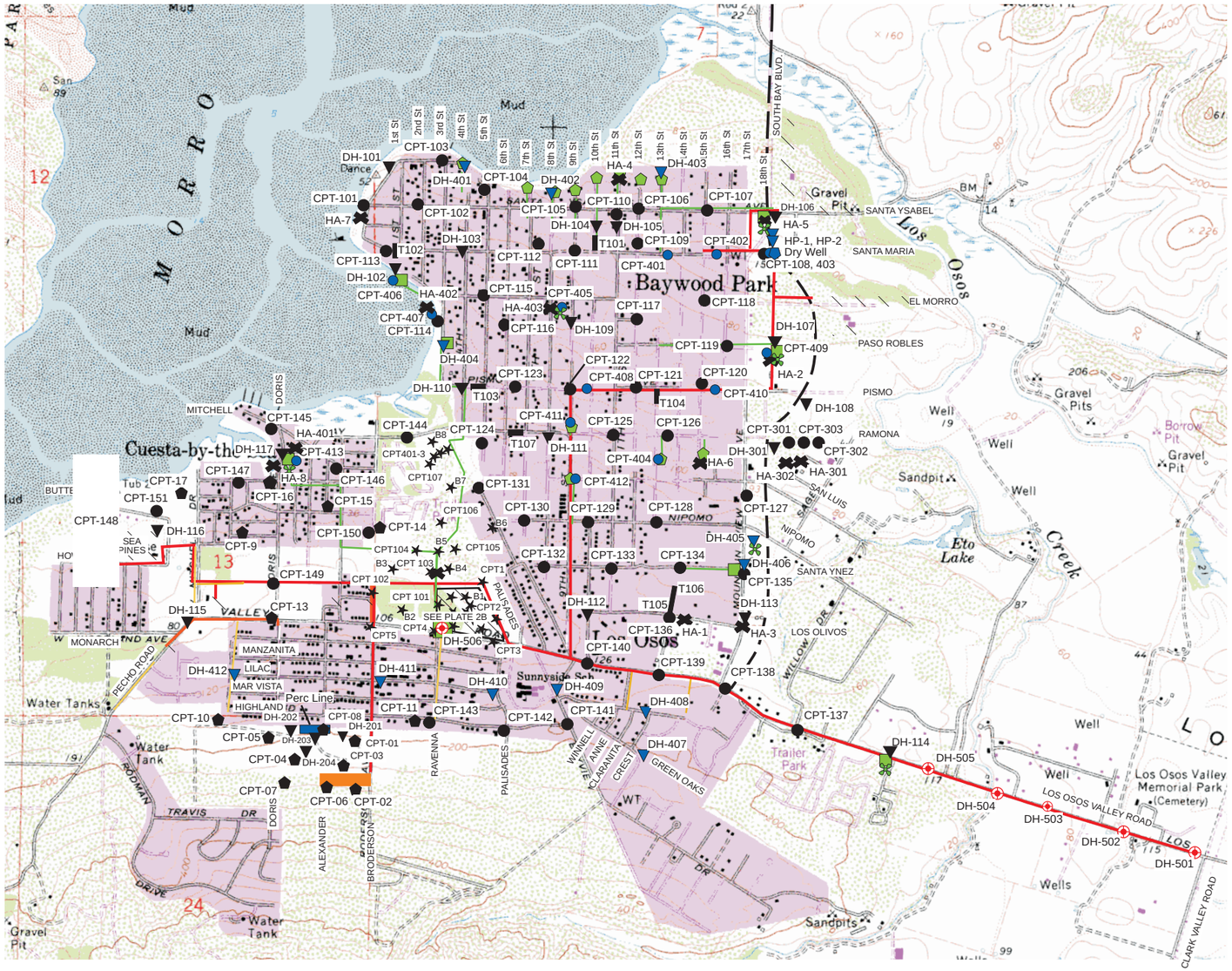
Howard, A. (1996), *Pipeline Installation*, A Manual for Construction of Buried Pipe, Relatively Publishing, Lakewood, CO.

Moore & Taber (1991), As-Built Plans Entitled: *Los Osos Valley Road at Los Osos Creek, San Luis Obispo, California, Log of Test Borings",* Drilling Date March 20, 1989, Sheet 20 of 20, Job No. P12A140, plans dated February 1991.

Rick Engineering, Inc. (2011), Plans Entitled: Aerial Topographic Survey, Los Osos Valley Road, Los Osos, California, Scale 1" = 40 feet, 6 sheets, original dated June 17.

Spangler, M.G. and Handy, R.L. (1982), "Loads on Underground Conduit", *Soil Engineering*, Harper and Rowe, 4th edition, pp. 727-761.

PLATES



Previous Data

- CPT site (Fugro 1996)
- CPT site (Fugro 1997)
- Hand auger site (Fugro 1997)
- Trench (Fugro 1997)
- Hollow stem auger boring site (Fugro 1997)
- Boring/CPT site (CFS 2000)
- Hollow stem auger boring site (Fugro 2011 - current study)

Supplemental Data

- Hollow stem auger boring site; HP = boring with hydro probe casing (Fugro 2002)
- CPT site (Fugro 2003)
- Prototype dry well
- Prototype percolation line

Proposed Improvements (based on MWH 2004 design)

- Distribution pipelines
- Force mains
- Pump station
- Pocket pump station
- Effluent disposal site
- Standby power building
- Previous Tri-W wastewater treatment facility site

NORTH

0 2000
FEET

CUMULATIVE FIELD EXPLORATION PLAN
Los Osos Wastewater Collection System
Los Osos, California

Base Map: Rick Engineering (2011) aerial topographic survey.

NORTH

0 100 200
FEET

All locations and dimensions are approximate

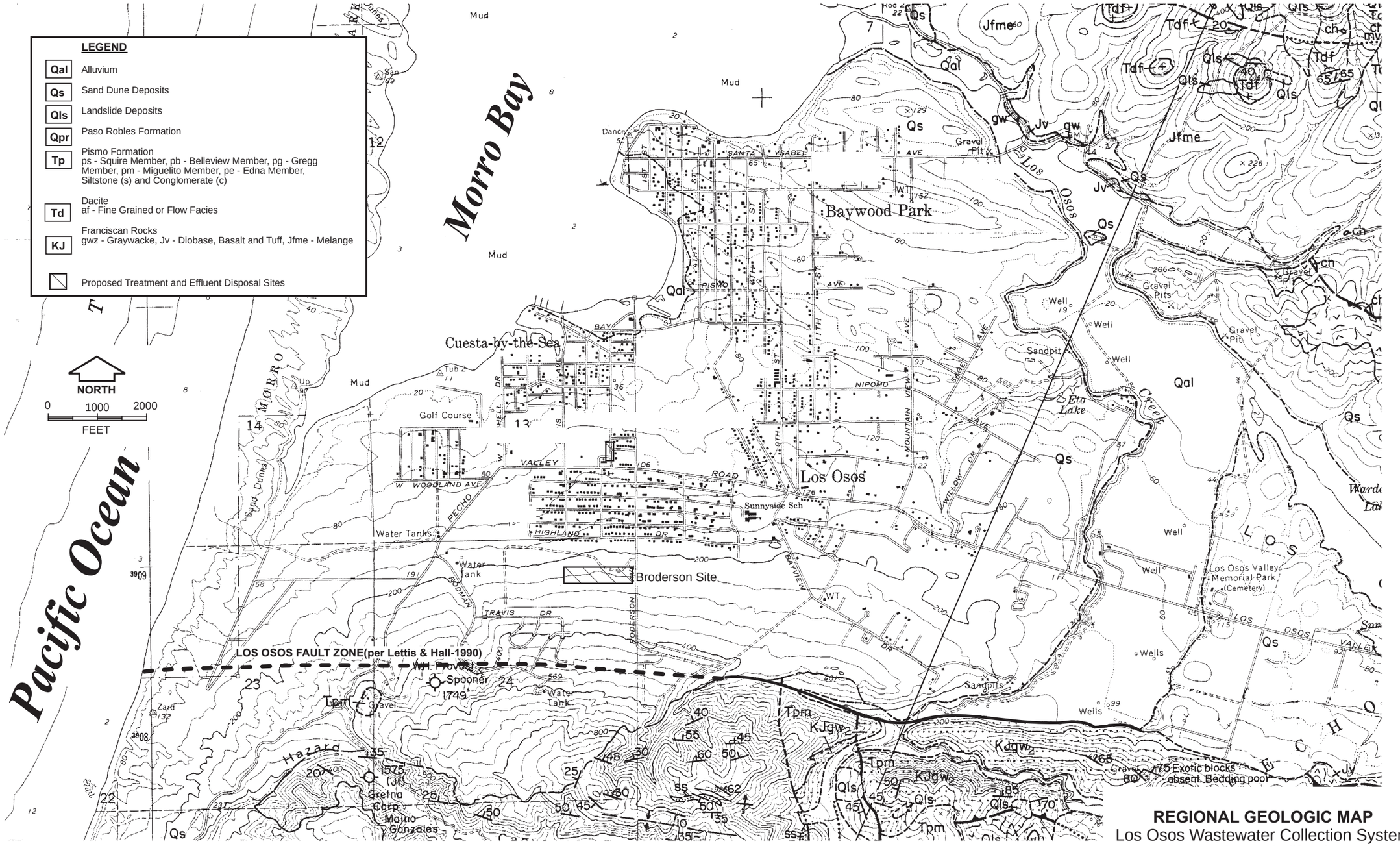
LEGEND

DH-501 June 2011 drill hole location

DH-114 January (1997) drill hole (see Fugro 2004 report)

FIELD EXPLORATION PLAN
Los Osos Wastewater Collection System
Los Osos, California

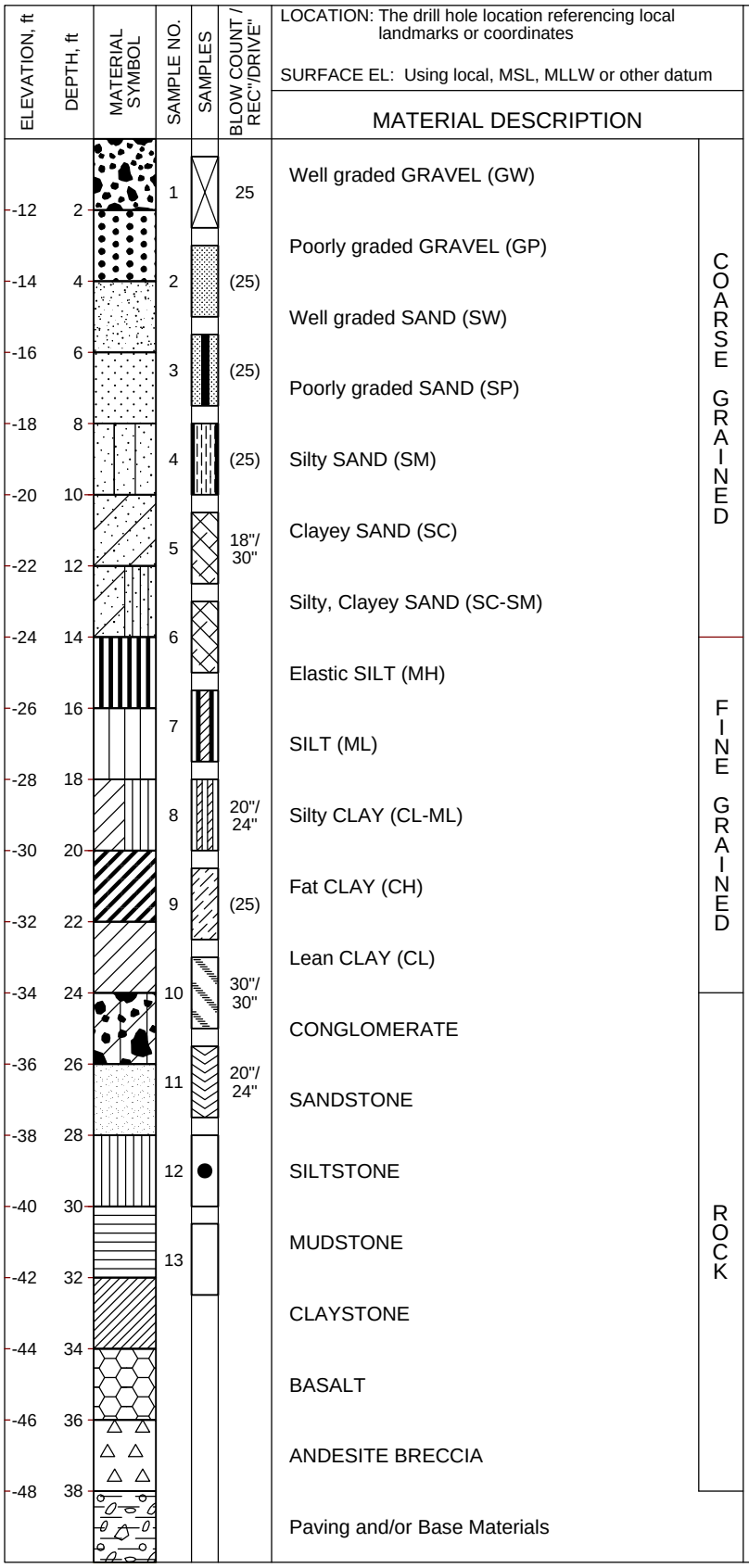
PLATE 2



REGIONAL GEOLOGIC MAP
Los Osos Wastewater Collection System
Los Osos, California

BASE MAP: Hall (1973), Geologic Map of the Morro Bay South and Port San Luis Quadrangles, San Luis Obispo, California.

APPENDIX A



LOCATION: The drill hole location referencing local landmarks or coordinates

SURFACE EL: Using local, MSL, MLLW or other datum

MATERIAL DESCRIPTION

Well graded GRAVEL (GW)	COARSE GRAINED
Poorly graded GRAVEL (GP)	COARSE GRAINED
Well graded SAND (SW)	COARSE GRAINED
Poorly graded SAND (SP)	COARSE GRAINED
Silty SAND (SM)	COARSE GRAINED
Clayey SAND (SC)	COARSE GRAINED
Silty, Clayey SAND (SC-SM)	COARSE GRAINED
Elastic SILT (MH)	FINE GRAINED
SILT (ML)	FINE GRAINED
Silty CLAY (CL-ML)	FINE GRAINED
Fat CLAY (CH)	FINE GRAINED
Lean CLAY (CL)	FINE GRAINED
CONGLOMERATE	ROCK
SANDSTONE	ROCK
SILTSTONE	ROCK
MUDSTONE	ROCK
CLAYSTONE	ROCK
BASALT	ROCK
ANDESITE BRECCIA	ROCK
Paving and/or Base Materials	

General Notes

Soil Texture Symbol

Sloped line in symbol column indicates transitional boundary

Samplers and sampler dimensions
(unless otherwise noted in report text) are as follows:

Symbol for:

1	SPT Sampler, driven 1-3/8" ID, 2" OD
2	CA Liner Sampler, driven 2-3/8" ID, 3" OD
3	CA Liner Sampler, disturbed 2-3/8" ID, 3" OD
4	Thin-walled Tube, pushed 2-7/8" ID, 3" OD
5	Bulk Bag Sample (from cuttings)
6	CA Liner Sampler, Bagged
7	Hand Auger Sample
8	CME Core Sample
9	Pitcher Sample
10	Lexan Sample
11	Vibracore Sample
12	No Sample Recovered
13	Sonic Soil Core Sample

Sampler Driving Resistance

Number of blows with 140 lb. hammer, falling 30" to drive sampler 1 ft. after seating sampler 6"; for example,

Blows/ft	Description
25	25 blows drove sampler 12" after initial 6" of seating
86/11"	After driving sampler the initial 6" of seating, 36 blows drove sampler through the second 6" interval, and 50 blows drove the sampler 5" into the third interval
50/6"	50 blows drove sampler 6" after initial 6" of seating
Ref/3"	50 blows drove sampler 3" during initial 6" seating interval

Blow counts for California Liner Sampler shown in ( )

Length of sample symbol approximates recovery length

Classification of Soils per ASTM D2487 or D2488

Geologic Formation noted in bold font at the top of interpreted interval

Strength Legend

Q = Unconfined Compression
u = Unconsolidated Undrained Triaxial
t = Torvane
p = Pocket Penetrometer
m = Miniature Vane

Water Level Symbols

- Initial or perched water level
- Final ground water level
- Seepages encountered

Rock Quality Designation (RQD) is the sum of recovered core pieces greater than 4 inches divided by the length of the cored interval.

KEY TO TERMS & SYMBOLS USED ON LOGS

PLATE A-1

LOCATION: Westbound shoulder of Los Osos Valley Road, 40' west of Clark Valley Road

SURFACE EL: 113 ft +/- (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
						8" of asphalt concrete							
112						15" of base material, yellowish brown gravelly SAND (SP)							
	2		1		(14)				12	34			
						SAND DUNE DEPOSITS (Qos) Silty, Clayey SAND (SC-SM): loose, grayish brown, moist, mottled, minor gravel to 1/2", pockets of lean CLAY (CL) with sand							
110			2										
	4		3		(52)	Clayey SAND (SC): dense, dark yellowish brown with gray and orange mottles, moist	134	117	14	33			
108													
	6												
106													
	8												
104													
	10		4		25	- light brown to moderate brown, orange staining throughout							
102													
	12												
100													
	14		5		(71)		131	114	15	19			
98													
	16												
96													
	18												
94													
	20												
92													
	22												
90													
	24												
88													
	26												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 15.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Sand cement slurry
DRILLING DATE: June 20, 2011

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling Company
LOGGED BY: T Nicely
CHECKED BY: J Blanchard

LOG OF BORING NO. DH-501

Los Osos Wastewater Collection System
Los Osos, California

LOCATION: Westbound slow land of Los Osos Valley Road, 180' east of driveway at 2190 LOVR

SURFACE EL: 115 ft +/- (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
						6.5" of asphalt concrete over 5" of gravelly SAND (SP): moderate yellowish brown, gravel to 1", subrounded to angular							
114			6		(33)	**SAND DUNE DEPOSITS (Qos)**							
	2					Clayey SAND (SC): medium dense, moderate brown to grayish brown, moist, minor gravel to 1/2"							
112			7			- pale yellowish brown to light olive gray, moist, gravel absent							
	4		8		(78)		134	117	14	21			
110						- very dense, light brownish gray to light brown							
	6												
108													
	8					**OLDER ALLUVIUM (Qoal)** Fat CLAY (CH): very stiff, dark yellowish brown, moist, plastic							
106			9		22								
	10						128	113	13				p 4.0
104													
	12												
102													
	14		10		(60)		124	108	15				
100													p 4.2
						Lean CLAY with sand (CL): hard, moderate yellowish brown, moist							
	16												
98													
	18												
96													
	20												
94													
	22												
92													
	24												
90													
	26												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 15.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Sand cement slurry
DRILLING DATE: June 20, 2011

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling Company
LOGGED BY: T Nicely
CHECKED BY: J Blanchard

LOG OF BORING NO. DH-502

Los Osos Wastewater Collection System
Los Osos, California

PLATE A-3

LOCATION: Westbound shoulder of Los Osos Valley Road, 925' east of creek

SURFACE EL: 85 ft +/- (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
					9" of asphalt concrete							
84					**ALLUVIUM (Qal)**							
	2	11		(17)	Lean CLAY with sand (CL): stiff, dark yellowish brown, moist	130	112	16		35	20	
82		12										
	4	13		(14)		112	105	7				
80					- interbeds of sandy lean CLAY with gravel (CL) and clayey SAND with gravel (SC), gravel to 1/2"							p 2.0
	6											
78												
	8				Clayey SAND with gravel (SC): medium dense, moderate yellowish brown, moist to dry, coarse sand, fine gravel, subrounded to angular							
76		14		18								
	10											
74												
	12											
72					Sandy Lean CLAY (CL): soft, grayish brown, wet							
	14	15		(6)					57			
70												p 0.3
	16											
68												
	18											
66												
	20											
64												
	22											
62												
	24											
60												
	26											

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 15.5 ft
DEPTH TO WATER: 13.0 ft
BACKFILLED WITH: Sand cement slurry
DRILLING DATE: June 20, 2011

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling Company
LOGGED BY: T Nicely
CHECKED BY: J Blanchard

LOG OF BORING NO. DH-503

Los Osos Wastewater Collection System
Los Osos, California

LOCATION: Westbound shoulder of Los Osos Valley Road, 10' east of bridge at Los Osos Creek

SURFACE EL: 95 ft +/- (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
					5" of asphalt concrete over 11" of base material							
94												
	2	32		(18)	**ARTIFICIAL FILL (af)** Sandy Lean CLAY with gravel (CL): stiff, grayish brown to dark brown, intermixed with clay, gravel to 1/2", angular	129	116	11				p 1.8
92		33										
	4	34		(7)		112	97	16		27	11	
90					**ALLUVIUM (Qal)** Clayey SAND (SC): loose, grayish brown, moist							p 1.5
	6											
88					Lean CLAY with sand (CL): soft to medium stiff, dark yellowish brown, moist							
	8											
86		35		2								
	10											p 1.0
84												
	12											
82												
	14	36		(13)		125	102	23		30	14	
80					- medium stiff to stiff							p 0.5
	16											p 2.0
78												
	18											
76		37		8								
	20				- medium stiff to stiff, wet							p 1.3
74												
	22											
72					Poorly graded SAND with silt and gravel (SP-SM): loose, multicolored to moderate yellowish brown, wet, interbedded layers (2" to 3") of silty SAND (SM)							
	24	38		(15)	- flowing sands in auger	124	102	22				
70												
	26											

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 40.5 ft
DEPTH TO WATER: 24.0 ft
BACKFILLED WITH: Grout
DRILLING DATE: June 21, 2011

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling Company
LOGGED BY: T Nicely
CHECKED BY: J Blanchard

LOG OF BORING NO. DH-504

Los Osos Wastewater Collection System
Los Osos, California

PLATE A-5a

LOCATION: Westbound shoulder of Los Osos Valley Road, 10' east of bridge at Los Osos Creek

SURFACE EL: 95 ft +/- (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
68													
	28												
66			39		22								
	30					Silty SAND (SM): medium dense, moderate yellowish brown, wet, fine to coarse sand							
64													
	32					Well-graded GRAVEL with silt and sand (GW-GM): medium dense, multicolored, wet, moderate yellowish brown silt lenses, well rounded fine gravel							
62													
	34		40		(52)		146	131	12				
60													
	36												
58													
	38					Poorly graded SAND with silt (SP-SM): medium dense, pale yellowish brown, wet, very fine to fine sand, pockets of silty SAND (SM)							
56			41		27					6			
	40												
54													
	42												
52													
	44												
50													
	46												
48													
	48												
46													
	50												
44													
	52												
42													

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 40.5 ft
DEPTH TO WATER: 24.0 ft
BACKFILLED WITH: Grout
DRILLING DATE: June 21, 2011

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling Company
LOGGED BY: T Nicely
CHECKED BY: J Blanchard

LOG OF BORING NO. DH-504

Los Osos Wastewater Collection System
Los Osos, California

PLATE A-5b

LOCATION: Westbound Los Osos Valley Road fast lane, 20' west of 1772 LOVR

SURFACE EL: 163 ft +/- (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
						6" to 7" of asphalt concrete over 8" of fill material							
162													
	2		27		(27)	**SAND DUNE DEPOSITS (Qs)** Poorly graded SAND with silt (SP-SM): medium dense, moderate brown, fine sand	105	101	4	9			
160			28										
	4		29		(18)	- grades to poorly-graded SAND (SP), light brown	103	100	3	4			
158													
	6												
156													
	8												
154			30		28								
	10												
152													
	12												
150													
	14		31		(51)	- dense, moist to wet, light brown to moderate yellowish brown							
148													
	16												
146													
	18												
144													
	20												
142													
	22												
140													
	24												
138													
	26												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 15.5 ft
DEPTH TO WATER: Not Encountered
BACKFILLED WITH: Sand cement slurry
DRILLING DATE: June 21, 2011

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling Company
LOGGED BY: T Nicely
CHECKED BY: J Blanchard

LOG OF BORING NO. DH-505

Los Osos Wastewater Collection System
Los Osos, California

PLATE A-6

LOCATION: Mid-town Pump Station, 40' north of Los Osos Valley Road at Ravenna Avenue

SURFACE EL: 100 ft +/- (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
					SAND DUNE DEPOSITS (Qs) Poorly graded SAND with silt (SP-SM): medium dense, moderate brown, moist, fine sand							
98	2	16 17		(18)		105	101	4				
96	4	18		(20)	- grades to poorly graded SAND (SP)				1			
94	6											
92	8											
		19		(29)								
90	10											
		20		23								
88	12											
86	14	21		(29)		120	114	6	2			
84	16											
82	18											
		22		33								
80	20				- dense							
78	22											
76	24	23		(59/9")					1			
					- very dense							
74	26											

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 40.5 ft
DEPTH TO WATER: 40.5 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: June 20, 2011

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling Company
LOGGED BY: T Nicely
CHECKED BY: J Blanchard

LOG OF BORING NO. DH-506

Los Osos Wastewater Collection System
Los Osos, California

PLATE A-7a

LOCATION: Mid-town Pump Station, 40' north of Los Osos Valley Road at Ravenna Avenue

SURFACE EL: 100 ft +/- (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOW COUNT	MATERIAL DESCRIPTION	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, S_u, ksf
72	28												
			24		75								
70	30												
68	32												
66	34		25		(85/11")		116	107	8				
64	36												
62	38												
			26		56	- wet at 39'							
60	40												
58	42												
56	44												
54	46												
52	48												
50	50												
48	52												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

COMPLETION DEPTH: 40.5 ft
DEPTH TO WATER: 40.5 ft
BACKFILLED WITH: Native Materials
DRILLING DATE: June 20, 2011

DRILLING METHOD: 8-inch-dia. Hollow Stem Auger
HAMMER TYPE: Automatic Trip
DRILLED BY: S/G Drilling Company
LOGGED BY: T Nicely
CHECKED BY: J Blanchard

LOG OF BORING NO. DH-506

Los Osos Wastewater Collection System
Los Osos, California

PLATE A-7b

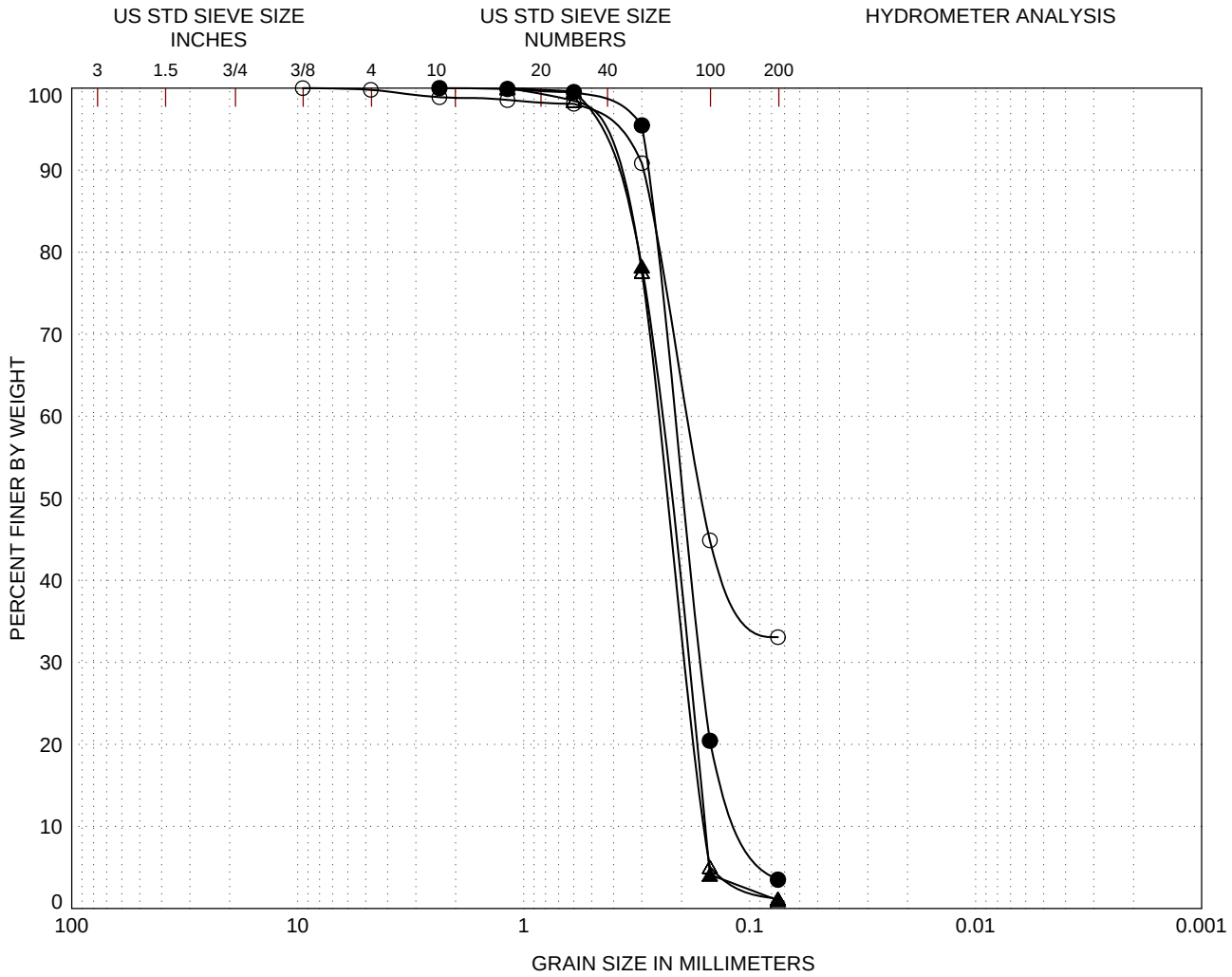
APPENDIX B

DRILL HOLE	DEPTH, ft	SAMPLE NUMBER	MATERIAL DESCRIPTION	UWW pcf	UDW pcf	MC %	FINES %	ATTERBERG LIMITS		COMPACTION TEST		DIRECT SHEAR		COMPRESSIVE STRENGTH TESTS		CORROSIVITY TESTS				R-VALUE	EXPANSION INDEX	SAND EQUIVALENT (SE)	SPECIFIC GRAVITY
								LL	PI	MAX DD pcf	OPT MC %	C ksf	PHI deg	Qu, ksf	S_u (Cell Prs.) ksf	R	pH	Cl	So_4 (ppm)				
DH-501	1.5	1	Clayey SAND (SC)			12	34																
DH-501	3.5	2	Clayey SAND (SC)																	18			
DH-501	4.0	3	Clayey SAND (SC)	134	117	14	33															14	
DH-501	14.0	5	Clayey SAND (SC)	131	114	15	19																
DH-502	1.0	6	Clayey SAND (SC)	127	115	17						0.5	35										
DH-502	2.5	7	Clayey SAND (SC)													2082	8.10	30	15.5				
DH-502	4.0	8	Clayey SAND (SC)	134	117	14	21															17	
DH-502	10.0	9	Fat CLAY (CH)	128	113	13																	
DH-502	14.0	10	Clayey SAND (SC)	124	108	15																	
DH-503	1.5	11	Lean CLAY with sand (CL)	130	112	16		35	20														
DH-503	3.0	12	Lean CLAY (CL)											1.9	1.0 (0.4)	1658	7.80	13	26	10			
DH-503	4.0	13	Clayey SAND with gravel (SC)	112	105	7								3.2	1.6 (0.9)								
DH-503	14.0	15	Sandy Lean CLAY (CL)	125	102	23	57																
DH-504	1.5	32	Sandy Lean CLAY (CL)	129	116	11																	
DH-504	3.0	33	Sandy Lean CLAY (CL)							126.7	9.9			1.3	0.7 (0.4)								
DH-504	4.0	34	Clayey SAND (SC)	112	97	16		27	11														
DH-504	9.0	35	Lean CLAY with sand (CL)																				
DH-504	14.0	36	Lean CLAY with sand (CL)	125	102	23		30	14							1971	7.70	22	47				
DH-504	24.0	38	Poorly graded SAND with silt (SP-SM)	124	102	22																	
DH-504	34.0	40	Poorly graded GRAVEL with clay (GP-GC)	146	131	12																	
DH-504	39.0	41	Poorly graded SAND with silt (SP-SM)				6																
DH-505	1.5	27	Poorly graded SAND with silt (SP-SM)	105	101	4	9															24	
DH-505	4.0	29	Poorly graded SAND (SP)	103	100	3	4															49	
DH-506	2.0	17	Poorly graded SAND (SP)	105	101	4																	
DH-506	4.0	18	Poorly graded SAND (SP)				1															76	
DH-506	14.0	21	Poorly graded SAND (SP)	120	114	6	2																
DH-506	24.0	23	Poorly graded SAND (SP)				1																
DH-506	34.0	25	Poorly graded SAND (SP)	116	107	8																	

SUMMARY OF LABORATORY TEST RESULTS

Los Osos Wastewater Collection System
Los Osos, California

LAB SUMMARY TABLE VENTURA _ F:\FUGRO SLO GEOTECH DOCUMENTS\GINT\GINT PROJECTS\04.6111.0030.GPJ_ 8/11/11 10:36 AM-cab

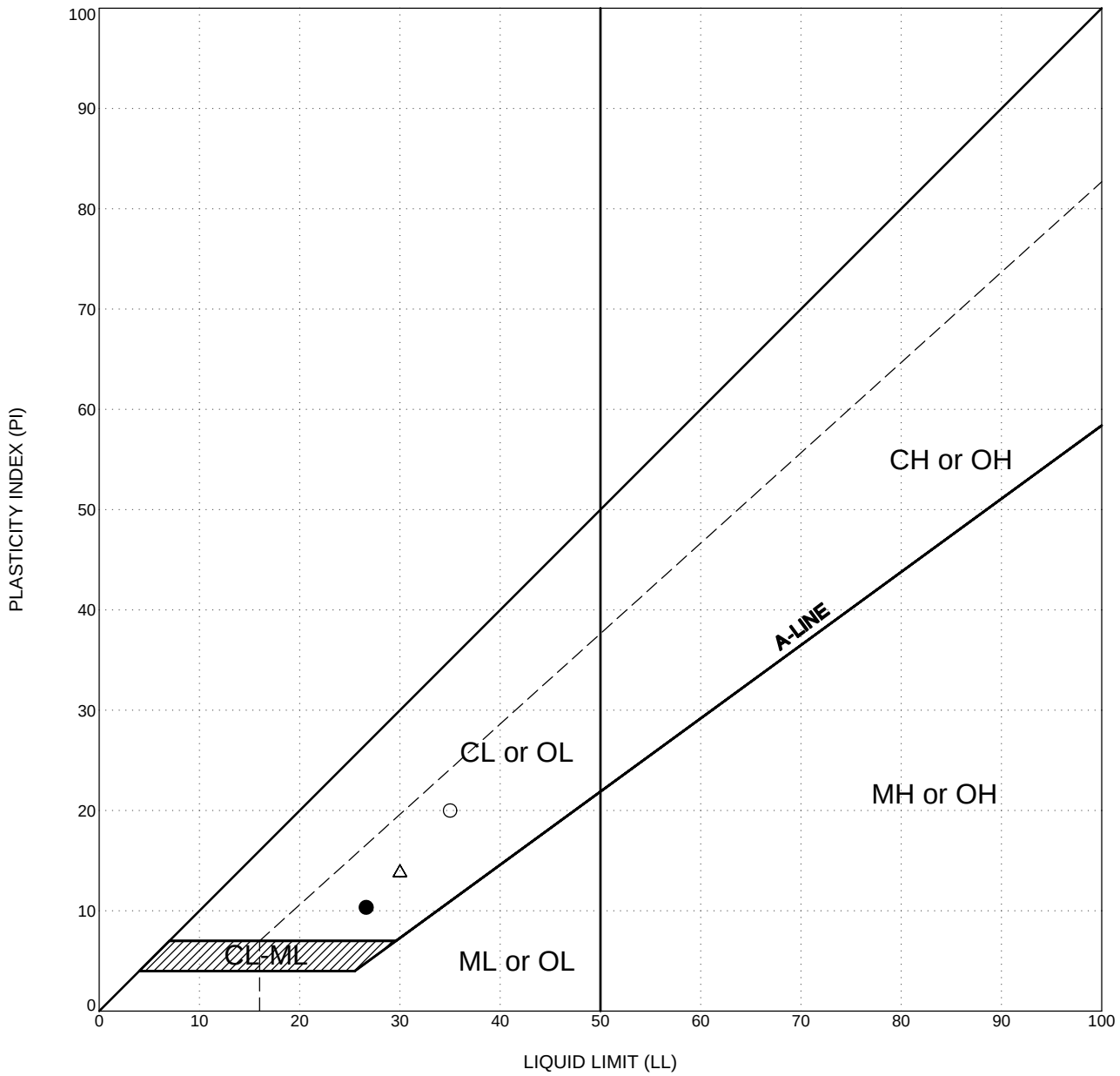


GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

LEGEND	(location)	(depth,ft)	CLASSIFICATION	Cc	Cu
○	DH-501	4.0	Clayey SAND (SC)		
●	DH-505	4.0	Poorly graded SAND (SP)	1.3	2.2
△	DH-506	4.0	Poorly graded SAND (SP)	0.9	1.6
▲	DH-506	24.0	Poorly graded SAND (SP)	0.9	1.6

GRAIN SIZE CURVES
Los Osos Wastewater Collection System
Los Osos, California

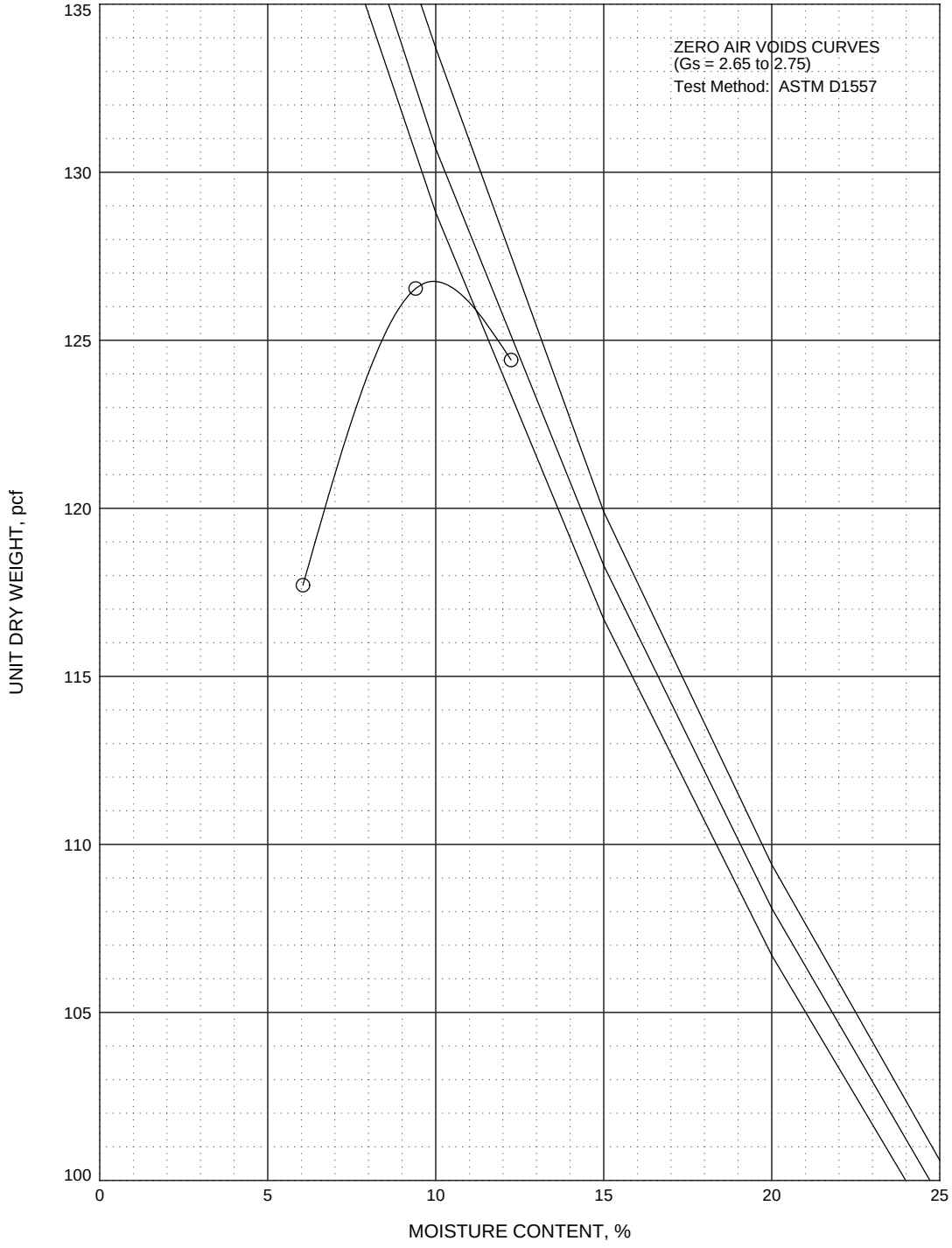
PLATE B-2



LEGEND	location	depth, ft	CLASSIFICATION	ATTERBERG LIMITS TEST RESULTS LIQUID LIMIT(LL)	PLASTIC LIMIT(PL)	PLASTICITY INDEX (PI)
○	DH-503	1.5	Lean CLAY with sand (CL)	35	15	20
●	DH-504	4.0	Clayey SAND (SC)	27	16	11
△	DH-504	14.0	Lean CLAY with sand (CL)	30	16	14

PLASTICITY CHART
Los Osos Wastewater Collection System
Los Osos, California

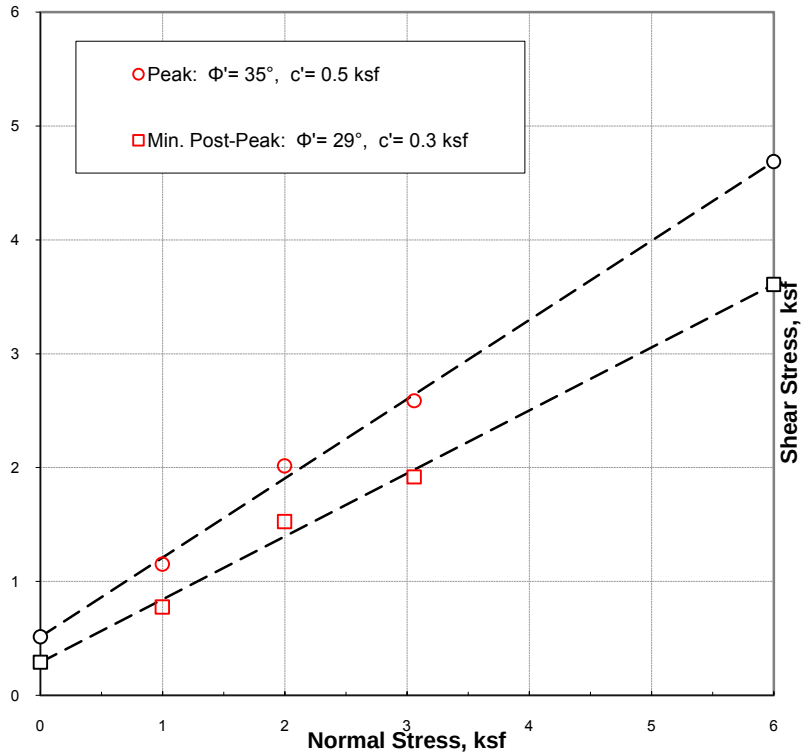
PLATE B-3

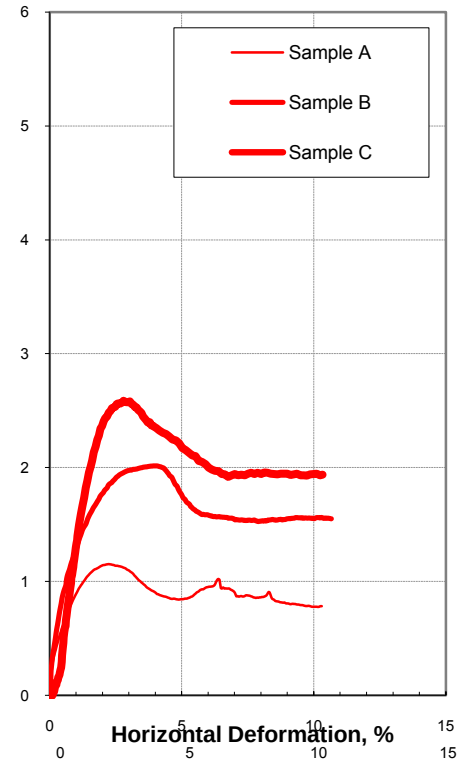


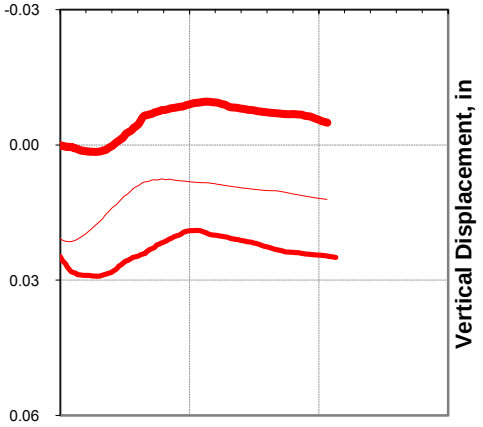
LEGEND (location)	depth, ft	CLASSIFICATION	MAXIMUM UNIT DRY WEIGHT, pcf	OPTIMUM WATER CONTENT, %
○ DH-504	3.0	Sandy Lean CLAY (CL)	126.7	9.9

COMPACTION TEST RESULTS
Los Osos Wastewater Collection System
Los Osos, California

PLATE B-4



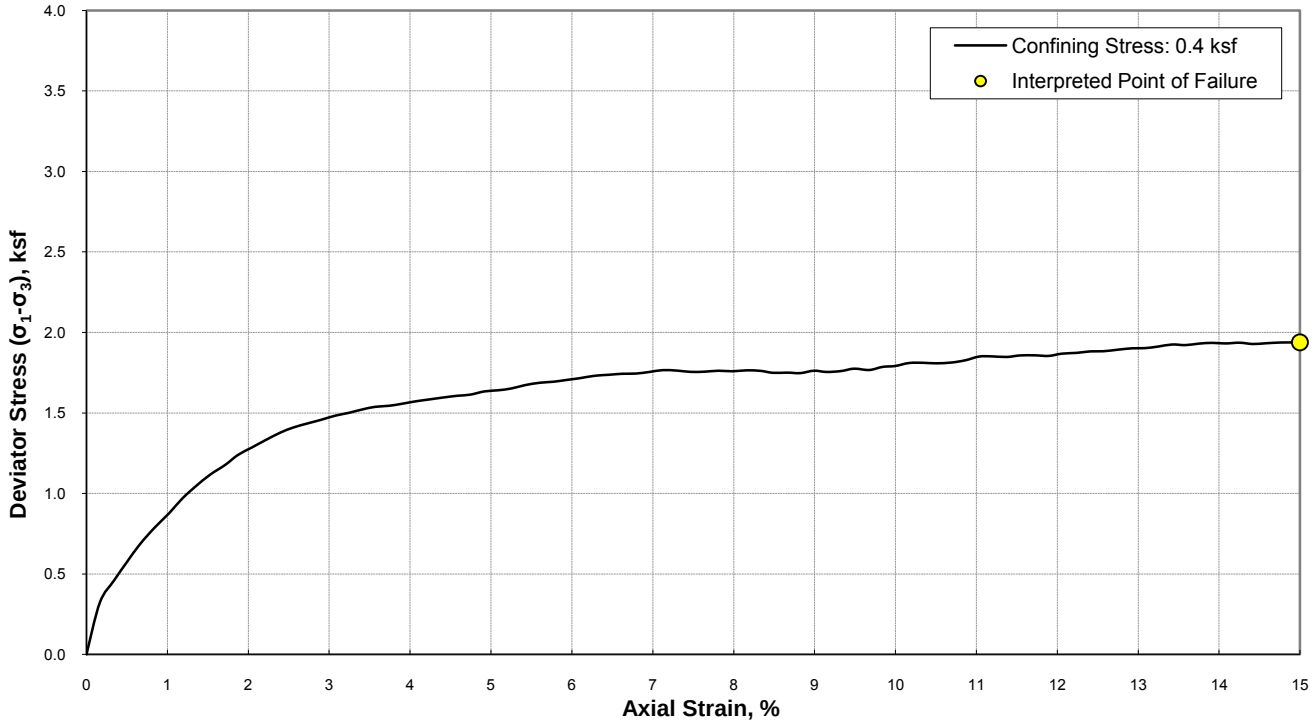




SAMPLE ID	Boring Number:	DH-502			
	Sample Number:	6			
	Sample Depth:	1.0 ft			
	USCS Classification:	Clayey SAND (SC): gray w/ FeO2 staining, moist			
INITIAL	Sample No.	A	B	C	D
	Water Content, %	12.9%	12.9%	12.9%	
	Dry Unit Weight, pcf	114.8	112.8	112.2	
	Saturation, %	78%	73%	72%	
	Void Ratio	0.44	0.47	0.47	
	Diameter, in	2.42	2.42	2.42	
	Height, in	1.00	1.00	1.00	
FINAL	Water Content, %	16.8%	17.9%	16.8%	
	Dry Unit Weight, pcf	112.2	109.2	112.1	
	Void Ratio	0.47	0.51	0.48	
TEST SUMMARY	Deformation at Peak, %	2.23	3.92	2.79	
	Displacement Rate, in/min	0.001	0.001	0.001	
	Normal Stress, ksf	1.0	2.0	3.1	
	Peak Shear Stress, ksf	1.15	2.02	2.59	
	Min. Post-Peak Stress, ksf	0.78	1.53	1.92	
REMARKS	Test Method: ASTM D3080				

CLASSIFICATION	Sieve Size	% Passing
	3/8-in. (9.5mm)	---
	#4 (4.75mm)	---
	#16 (1.18mm)	---
	#30 (0.6mm)	---
	#100 (0.150mm)	---
	#200 (0.075mm)	---
	Atterberg Limits	
	Liquid Limit, %	---
	Plastic Limit, %	---
	Plasticity Index, %	---
	Estimated Gs	2.65
	k_{avg} 20ºC, cm/sec	---

DIRECT SHEAR TEST RESULTS
Los Osos Wastewater Collection System
Los Osos, California



SAMPLE ID

Boring Number.:	DH-503
Sample Number.:	13
Sample Depth:	4.0 ft
USCS Classification:	Sandy lean CLAY (CL): olive brown, moist

SAMPLE PROPERTIES

Water Content, %	7.3%
Dry Unit Weight, pcf	104.7
Saturation, %	47%
Void Ratio	0.61
Diameter, in	2.42
Height, in	5.00

SAMPLE IMAGES

Sample Not Recoverable for Post-Test Photograph

CLASSIFICATION

Sieve Size	% Passing	Other Parameters	
3/8-in. (9.5mm)	---	Liquid Limit	---
#4 (4.75mm)	---	Plastic Limit	---
#16 (1.18mm)	---	Plasticity Index	---
#30 (0.6mm)	---	Estimated Gs	2.70
#100 (0.150mm)	---	S_u from T_v, ksf	---
#200 (0.075mm)	---	S_u from PP, ksf	---

TEST SUMMARY

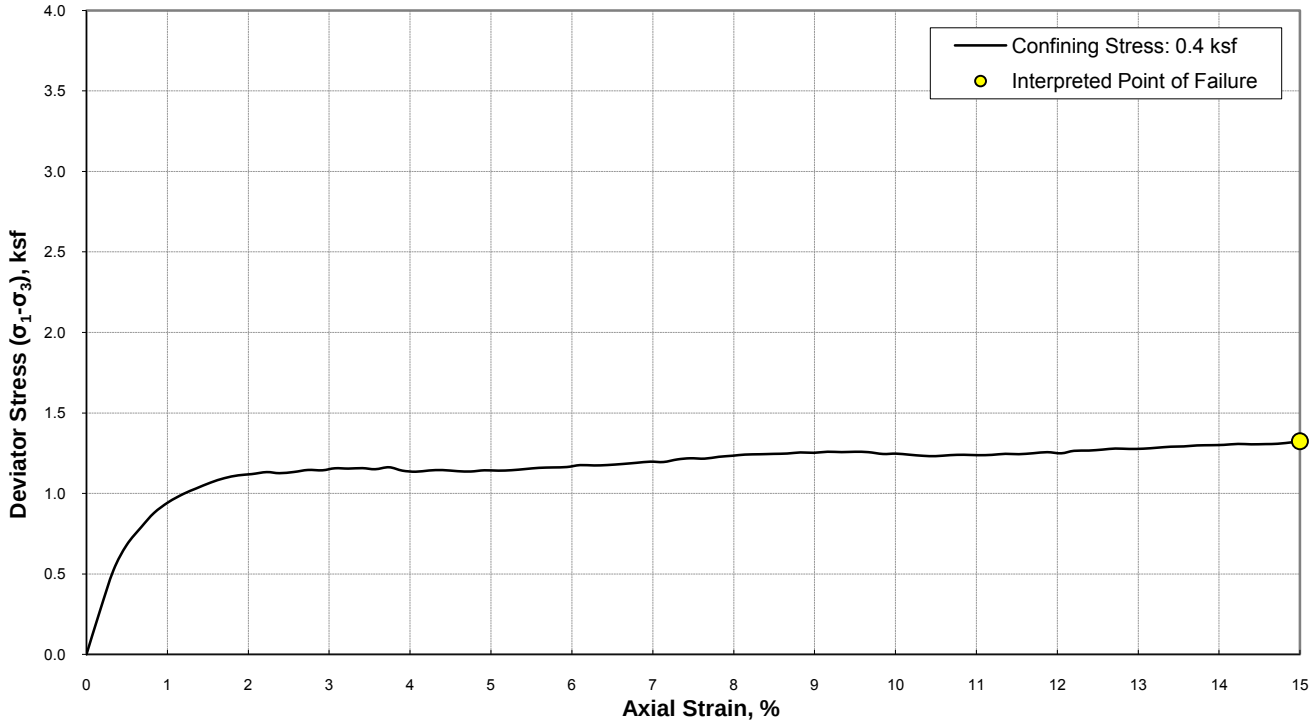
Maximum Deviator Stress, ksf	1.9
Undrained Shear Strength, ksf	1.0
Axial Strain at Failure, %	15.0
Strain Rate, %/min	1.0
Cell Pressure, ksf	0.4
Tested By:	JC
Date Tested:	6/29/11

REMARKS

Test Method: ASTM 2850

UNCONSOLIDATED, UNDRAINED TRIAXIAL TEST

Los Osos Wastewater Collection System
Los Osos, CA



SAMPLE ID

Boring Number.:	DH-504
Sample Number.:	34
Sample Depth:	4.0 ft
USCS Classification:	Clayey SAND (SC): dark olive brown, moist

SAMPLE PROPERTIES

Water Content, %	15.9%
Dry Unit Weight, pcf	96.7
Saturation, %	52%
Void Ratio	0.74
Diameter, in	2.42
Height, in	5.00

SAMPLE IMAGES

CLASSIFICATION

Sieve Size	% Passing	Other Parameters	
3/8-in. (9.5mm)	---	Liquid Limit	---
#4 (4.75mm)	---	Plastic Limit	---
#16 (1.18mm)	---	Plasticity Index	---
#30 (0.6mm)	---	Estimated Gs	2.70
#100 (0.150mm)	---	S_u from T_v, ksf	---
#200 (0.075mm)	---	S_u from PP, ksf	---

TEST SUMMARY

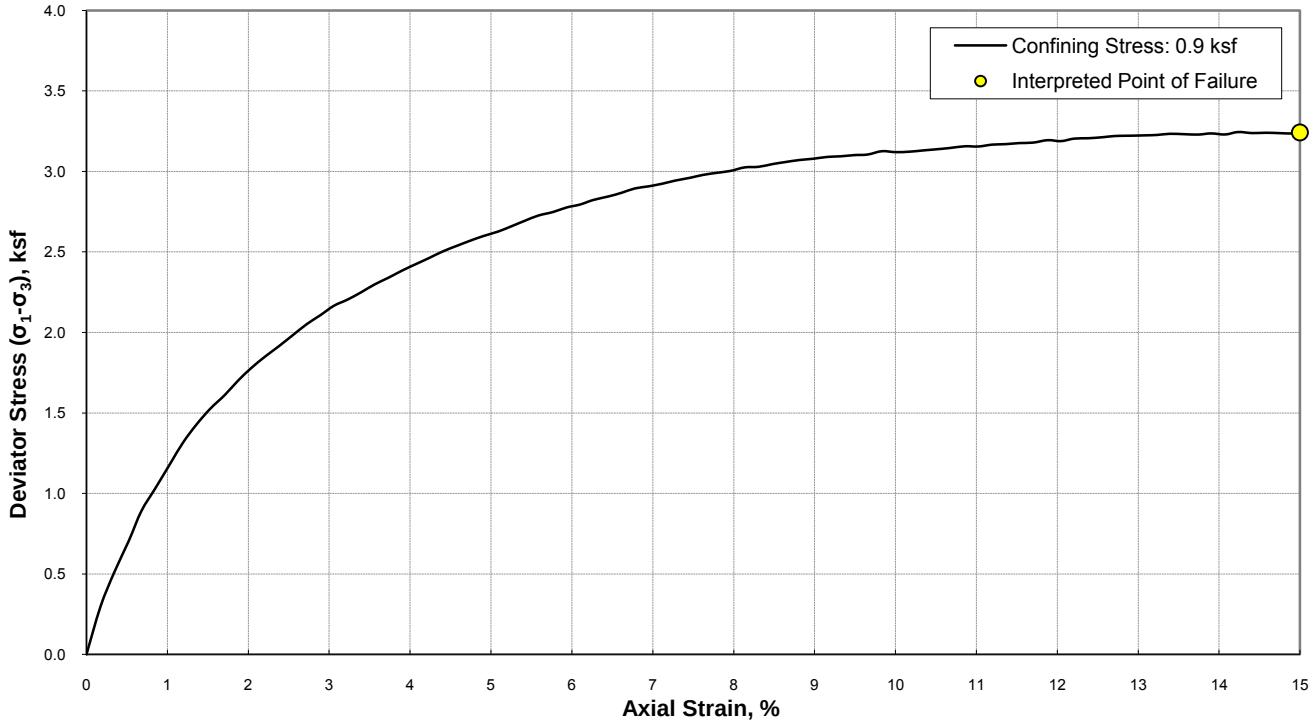
Maximum Deviator Stress, ksf	1.3
Undrained Shear Strength, ksf	0.7
Axial Strain at Failure, %	15.0
Strain Rate, %/min	1.0
Cell Pressure, ksf	0.4
Tested By:	JC
Date Tested:	6/29/11

REMARKS

Test Method: ASTM 2850

UNCONSOLIDATED, UNDRAINED TRIAXIAL TEST

Los Osos Wastewater Collection System
Los Osos, CA



SAMPLE ID

Boring Number.:	DH-504
Sample Number.:	36
Sample Depth:	14.0 ft
USCS Classification:	Lean CLAY with sand (CL): dark olive brown, moist

SAMPLE PROPERTIES

Water Content, %	22.5%
Dry Unit Weight, pcf	102.2
Saturation, %	75%
Void Ratio	0.65
Diameter, in	2.42
Height, in	5.00

SAMPLE IMAGES

CLASSIFICATION

Sieve Size	% Passing	Other Parameters	
3/8-in. (9.5mm)	---	Liquid Limit	---
#4 (4.75mm)	---	Plastic Limit	---
#16 (1.18mm)	---	Plasticity Index	---
#30 (0.6mm)	---	Estimated Gs	2.70
#100 (0.150mm)	---	S_u from T_v, ksf	---
#200 (0.075mm)	---	S_u from PP, ksf	---

TEST SUMMARY

Maximum Deviator Stress, ksf	3.2
Undrained Shear Strength, ksf	1.6
Axial Strain at Failure, %	15.0
Strain Rate, %/min	1.0
Cell Pressure, ksf	0.9
Tested By:	JC
Date Tested:	6/29/11

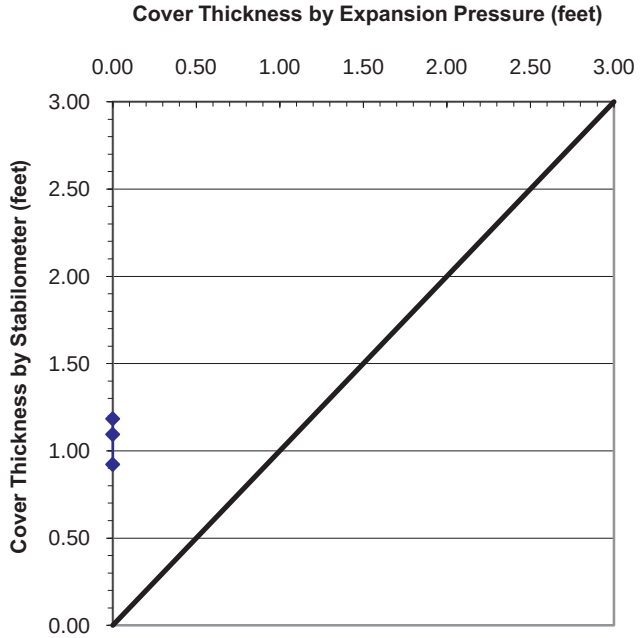
REMARKS

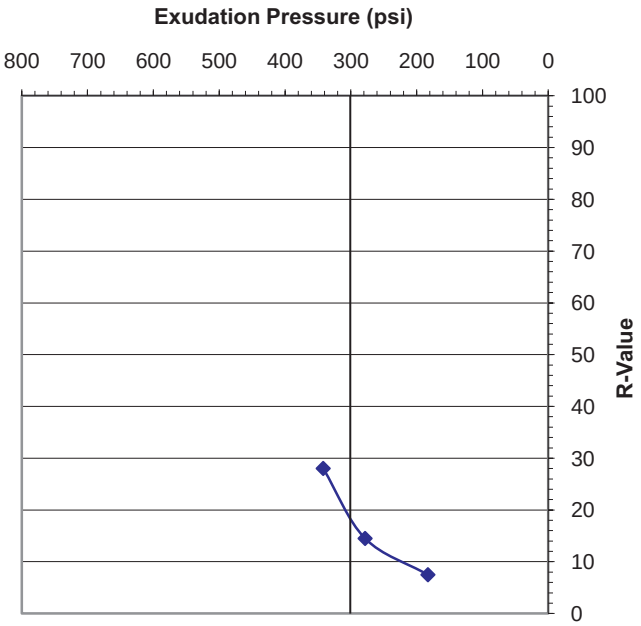
Test Method: ASTM 2850

UNCONSOLIDATED, UNDRAINED TRIAXIAL TEST

Los Osos Wastewater Collection System

Los Osos, CA





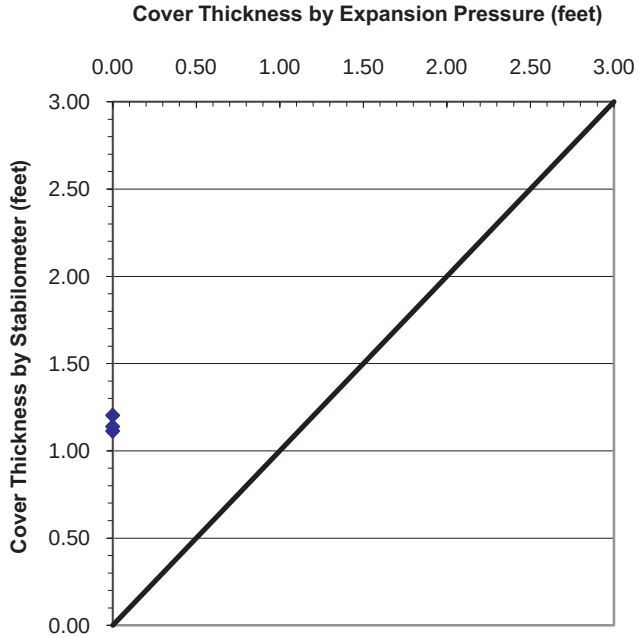
Sample No. DH-501 #2 **Depth:** 3'-5'
Description: Brown clayey SAND (SC)
Date Tested: 6/30/2011
Test Method: ASTM D2844, CT301
Initial Moisture Content: 11.2%

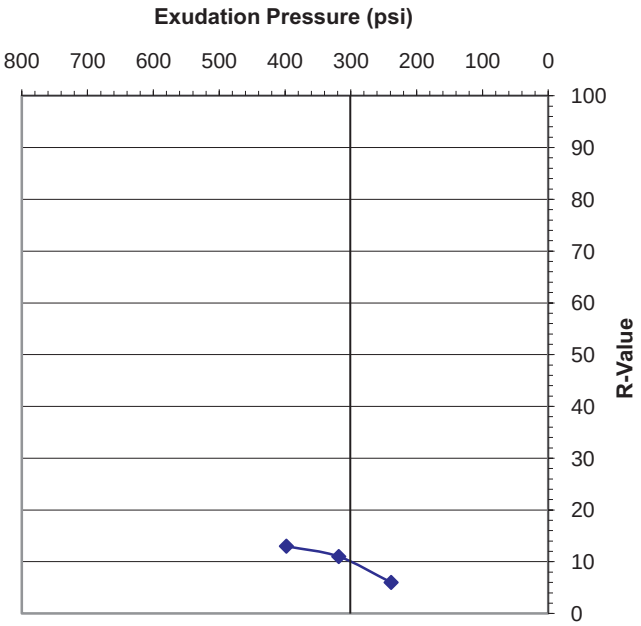
Dry Unit Weight (pcf)	Water Content (%)	Exudation Pressure (psi)	Expansion Pressure (psf)	R-Value
118.7	13.4	183	0	8
123.3	12.2	278	0	15
124.6	11.2	342	0	28

R-value at Exudation Pressure of 300 psi: **18**
R-value by Expansion Pressure: TI = 4 **N/A**

Remarks: R-value by stabilometer controls.

R-VALUE TEST RESULTS
Los Osos Wastewater Collection System
Los Osos, California





Sample No. DH-503 #12 **Depth:** 3'-5'
Description: Dark brown sandy lean CLAY (CL)
Date Tested: 6/30/2011
Test Method: ASTM D2844, CT301
Initial Moisture Content: 16.5%

Dry Unit Weight (pcf)	Water Content (%)	Exudation Pressure (psi)	Expansion Pressure (psf)	R-Value
105.6	20.6	239	0	6
107.7	19.4	318	0	11
110.5	18.3	398	0	13

R-value at Exudation Pressure of 300 psi: **10**
R-value by Expansion Pressure: TI = 4 **N/A**

Remarks: R-value by stabilometer controls.

R-VALUE TEST RESULTS
Los Osos Wastewater Collection System
Los Osos, California

Corrosivity Test Summary

CTL # 446-111 **Date:** 7/11/2011 **Tested By:** PJ **Checked:** PJ
Client: Fugro West **Project:** Los Osos WWP Collection System **Proj. No:** 04.6111.0030
Remarks:

Sample Location or ID			Resistivity @ 15.5 °C (Ohm-cm)			Chloride	Sulfate		pH	ORP	Moisture	Soil Visual Description
Boring	Sample, No.	Depth, ft.	As Rec.	Minimum	Saturated	mg/kg Dry Wt.	mg/kg Dry Wt.	% Dry Wt.		(Redox) mv	At Test %	
			ASTM G57	Cal 643	ASTM G57	Cal 422-mod.	Cal 417-mod.	Cal 417-mod.	Cal 643	SM 2580B	ASTM D2216	
DH-502	7	2.5-4	-	2082	-	30	155	0.0155	8.1	-	13.6	Olive Clayey SAND
DH-503	12	3-5	-	1658	-	13	26	0.0026	7.8	-	15.3	Brown Sandy CLAY
DH-504	35	9.0	-	1971	-	22	47	0.0047	7.7	-	18.5	Greenish Gray Sandy CLAY/ Clayey SAND

CORROSION TEST RESULTS
Los Osos Wastewater Collection System
Los Osos, California

APPENDIX C

33798

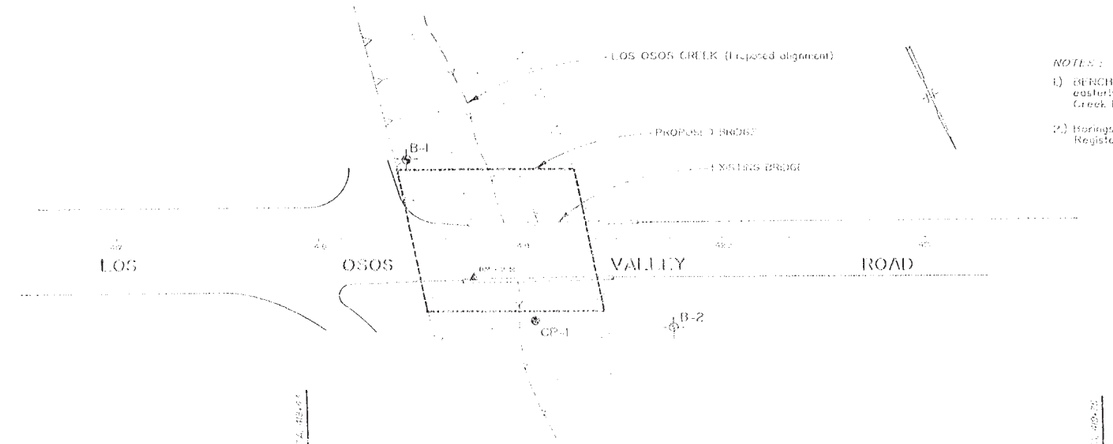
NOTES:

1.) BENCHMARK "B" on northeasterly wingwall of I-1 on Osos Creek Bridge. (Elev. 91.04)

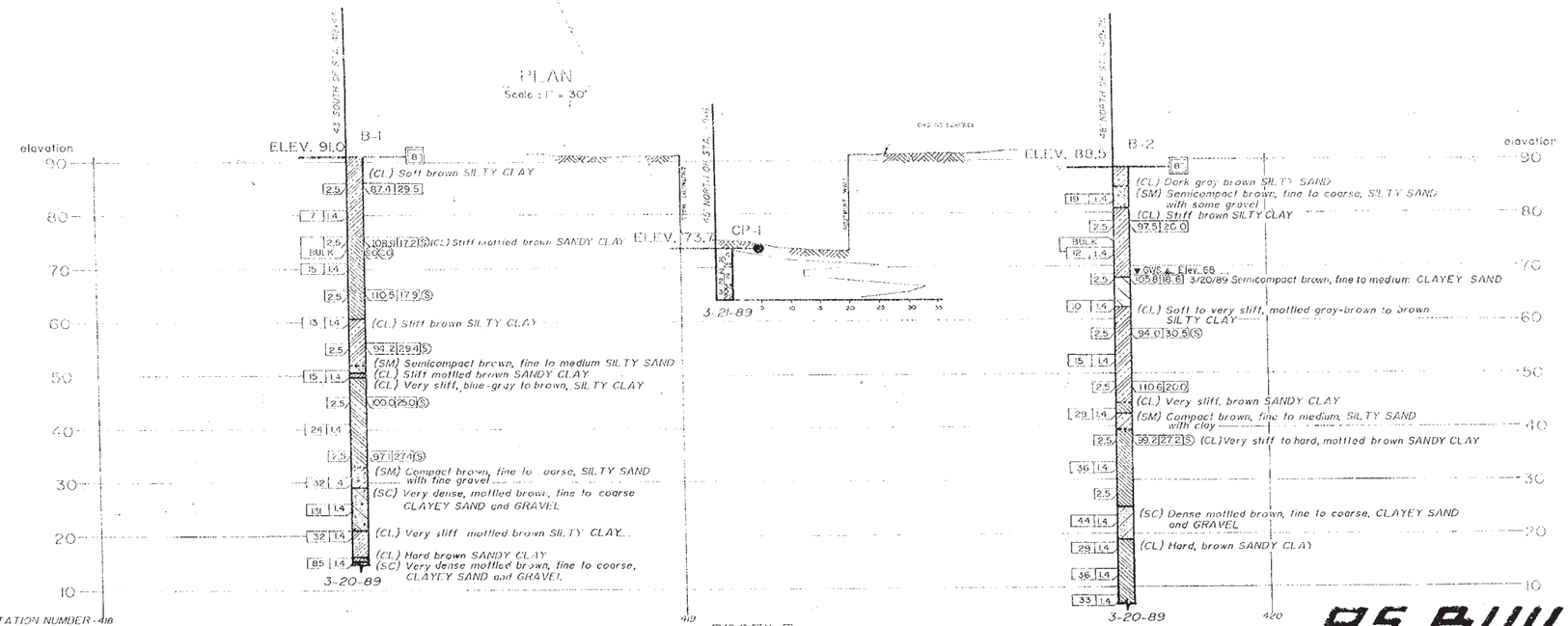
2.) Borings logged by David L. Fearnes Registered Geotechnical Engineer

MOORE & TABER
5620 DISTRICT BLVD., SUITE 103
BAKERSFIELD CA. 93313

12/3/91



PLAN
Scale : 1" = 30'



PROFILE
Scale : 1" = 10'

AS BUILT

JOB #: P12A140 RE: [illegible] DATE: [illegible]

MOORE & TABER
CONSULTING GEOTECHNICAL ENGINEERS

STRUCTURES - DESIGN

BRIDGE NO. 49C - 238
POST MILE

LOS OSOS VALLEY ROAD BRIDGE AT LOS OSOS CREEK
SAN LUIS OBISPO COUNTY, CALIFORNIA

LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET OF

APPENDIX H

Pipe Material Memorandum

To: John Waddell, Project Manager

From: Bruce Corwin, P.E. Vice President CDM
Bob Allen, P.E. Senior Project Engineer CDM
William Fernandez, P.E., Water Resources Engineer, CDM

Date: November 10, 2011

Subject: Pipe Material Technical Memorandum

Condition number 98 of the September 29, 2009 Coastal Development Permit issued for the Los Osos Wastewater Project requires:

> Where the collection system pipes will be located in areas of high groundwater, or areas subject to future 5 foot sea level rise, as shown on the June 29 and 30, 2009 PC Memo – page: 1-16 (see Attachment 3), and as identified in the field during construction; the applicant shall utilize fusion welded pipes or chemically sealed pipes. In areas of high groundwater, additional inspections to ensure proper installation shall be completed prior to backfilling the trenches. All laterals to individual residences shall utilize fusion welded pipes or chemically sealed pipes. Lateral connections at the property line shall utilize fusion welded pipes, chemically sealed pipes, or collars.

The purpose of condition 98 is to minimize or eliminate infiltration of groundwater into the wastewater collection system and prevent the discharge of untreated wastewater directly to groundwater through failed pipe joints. CDM has analyzed three different approaches to complying with condition 98 and recommends the use of American Water Works Association (AWWA) C900/C905 pressure pipe in order to achieve a sealed system. This pipe is commonly used for water distribution and other pressurized applications so it is well suited for an application where leaks need to be kept as near to zero as possible. The lateral connections will be made using molded sanitary wye fittings and not strap-on saddles to minimize leakage at the service.

AWWA C900/C905 pressure pipe is the most practical and economical solution for the following reasons:

- HDPE or fusible PVC must be welded outside the trench to avoid substantially higher costs from over-excavation and excessive dewatering. In-trench welding without over-excavation and dry trench conditions would result in a high probability of defective pipe welds, leading to the potential for excessive pipe leakage.

- Trench lengths must be limited in length due to the high number of existing utilities and utility service lines that will cross the open trenches; excavation in urbanized areas requires closing or covering trenches at the end of each day; and in high groundwater areas the open trench must be dewatered.

- The need to limit open trench lengths is in conflict with the need to weld HDPE and PVC pipes outside the trench.

- Using HDPE or fusible PVC with strap-on saddles for lateral connections will increase the infiltration and inflow from the leaky sewer laterals to homes, which is a major source of infiltration in many communities.

- It is estimated that fusible PVC would cost approximately 12 percent more per linear foot that bell-and-spigot PVC pipe.

The following table compares the three pipe material alternatives and their relative characteristics:

Comparison of Los Osos Collection System Pipe Material Alternatives

Pipe	C900/C905 PVC	Fusible PVC	HDPE
Use	Gravity line	Force main and gravity line	Force main and gravity line
Availability	In stock	Limited	Available
Size Ranges	4" to 12" (C900) 14" to 48" (C905)	14" to 48"	4" to 54"
Track Record	Good	Very Limited	Good
Construction Cost	$	$$$	$$
Internal Bead Removal?	No	Yes	Yes
Special Certification of Fusion Operator?	No	Yes	Yes
Pipe Assembly	In the trench	On the surface	Either on the surface or in the trench
Joint Type	Rubber gasketed seal	Butt Fused PVC	Butt Fused HDPE above trench Fusible Coupling HDPE in trench
Restraint	Not needed for gravity	Self-restrained	Self-restrained
Repair Options	Easy with Pipe Straps	Easy with Pipe Straps	Expensive with Fusible

			Coupling
Field Connections	Easy with Sewer Lateral Wyes	Easy with Metal Pipe Saddles	Expensive with Fusible Coupling
Pressure Fittings	Injection molded PVC or DIP	DIP	Mitered HDPE (derated pressure)

Anticipated Areas of High Groundwater

The general alignment of the sewer mains and the locations of the pump stations for the collection system are shown in Figure 1. The depth of the sewer mains ranges from 5 feet to 16 feet below grade. Areas where the sewer will be located below the groundwater are also shown in Figure 1 as red lines. The approach used to estimate areas where the depth of the as-designed sewer was below the estimated groundwater depth involved a digitized surface of the water table from groundwater contour data for the 1999 — 2003 time period. The depth of the groundwater was then compared to the proposed pipe invert elevation at each manhole. The result was that approximately 35,700 feet of pipe will be installed at or below the water table.

This correlates well with the high groundwater areas defined in the June 29, 2009 Planning Commission Memo. Pipes constructed below an elevation of 5 ft msl, which could potentially be impacted by future sea level rise, are shown as well as those pipes to be installed above an elevation of 5 ft msl but still below the water table.. The pipes installed below the water table identified in this figure are similar to the pipes identified in Figure 1.

Current standards for materials and installation practices provide for sealed joints with PVC sewer pipes. However, the combination of deep pipes and high ground water does raise constructability issues which could lead to a decrease in the quality of workmanship during construction if not properly managed and inspected. Additionally, the costs of future repairs in these areas, if needed, would be disproportionate to repairs elsewhere in the system. CDM would recommend fusion welded pipes in such areas. Specifically, near the Lupine Pump Station where portions of the collection system pipes are more than 13 feet deep with high groundwater.

In other areas of the collection system that are in high groundwater, but not deep, more stringent construction inspection measures are warranted to ensure proper installation of the bell-and-spigot AWWA C900/C905 PVC pipe. The standard for construction oversight is for “observation” of the work, with close inspection provided on a random sample of the work. Additional verification of quality is provided by testing requirements.

CDM recommends AWWA C900/C905 PVC pipe in areas of high groundwater and that all joints and pipe sections be visually inspected for proper installation and joint integrity.

Page 10 of the June 29, 2009 Planning Commission Memo also discussed the issue of potential infiltration of seawater into the collection system in the event of a major rise in global sea levels. The impact of sea level rise can vary based, in part, on topography and geology (for example tidal zones). Nevertheless, the relatively high levels of fresh groundwater in the upper aquifer are expected to remain, even after the collection of septic tank effluent, due to other urban influences and natural conditions. The groundwater levels at the bay will be at least a couple feet above sea level and sea level rise will result in a corresponding rise of the groundwater system near the bay to reach a new equilibrium at about the same elevation above the new sea level. Because of the density difference between fresh and salt water, there will be 40 feet of fresh water below sea level for every foot of fresh water head above sea level. The ground surface in the collection system design is generally above 5-foot elevation. These areas would not be inundated with ocean water and maintain fresh groundwater to depths below any buried pipes, with one potential exception. Low points on both sides of the road on Doris Avenue, near Lupine Street, would be permanently inundated by a 5-foot sea level rise.

Conclusion

CDM recommends the use of AWWA C900/C905 pressure pipe as the most practical and economical solution to provide a sealed piping system in areas of high ground water.

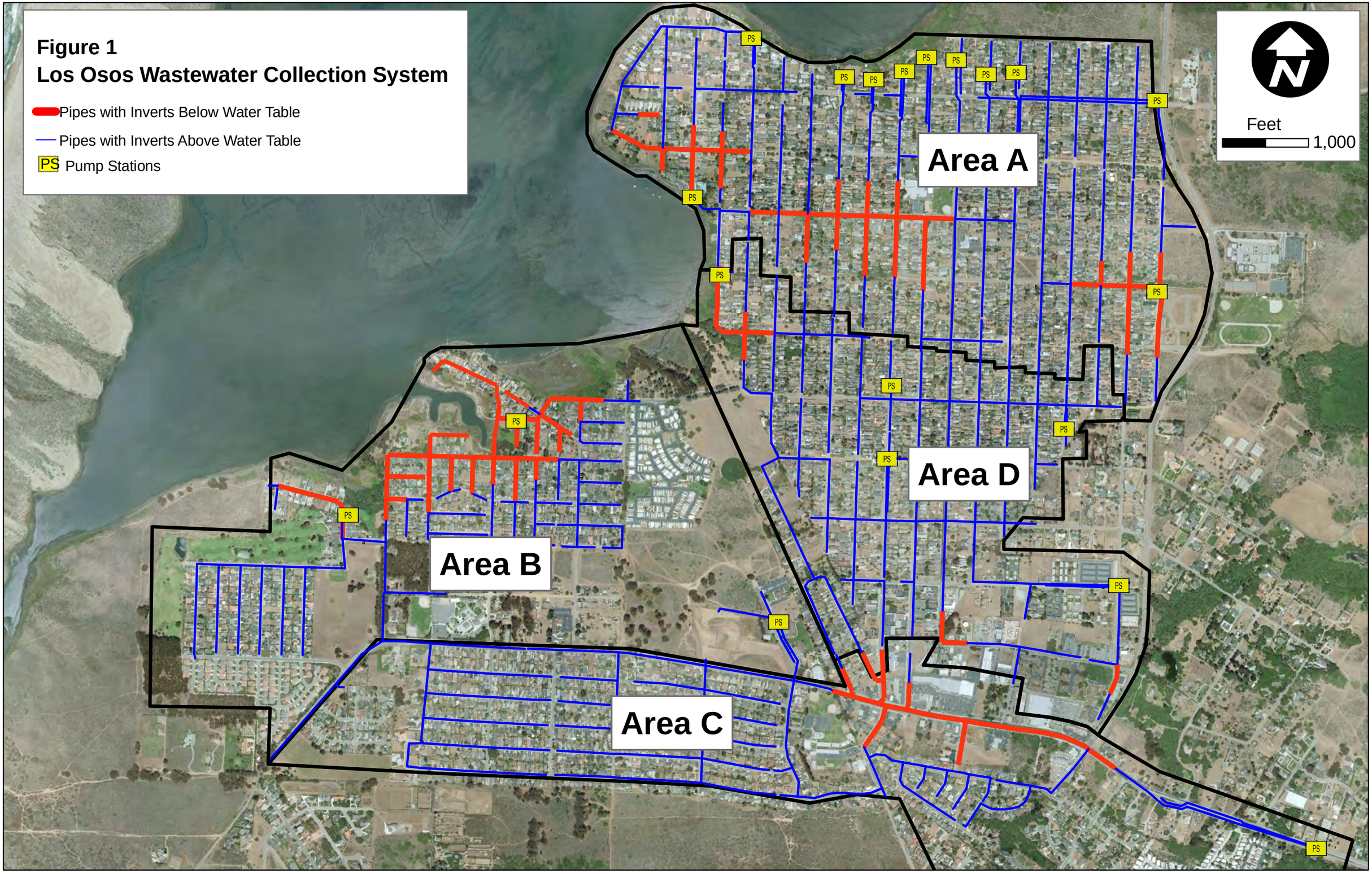


Figure 1
Los Osos Wastewater Collection System
Pipes with Inverts Below Water Table
Pipes with Inverts Above Water Table
PS Pump Stations
Area A
Area B
Area C
Area D
PS
Feet
1,000

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