LOS OSOS WASTEWATER PROJECT

San Luis Obispo County Department of Public Works

The following issues document was submitted to the County at the Board of Supervisors meeting on September 9, 2008, during the public comment period on the Los Osos Wastewater Project. The County's Project Team welcomes the comments submitted as they will allow for a better understanding of the perspectives and preferences of several community organizations. The key issues presented on the first page are consistent with the Project Mission Statement developed by the County and were further validated by the Project peer review panel in their final report, dated October 23, 2008.

The issues document does present a number of conclusions regarding the impacts or benefits of specific project technologies that may not be supported by the analysis currently being developed for the Project EIR, and the presenters of the issues document have recognized that their conclusions have been presented without the benefit of reviewing the environmental analysis. The County intends to review the issues and conclusion presented in the context of the environmental analysis and expects agreement on some points and disagreement on others. A point-by-point response to this issues document will be developed and released prior to the completion of the environmental review process.

> **Project Mission Statement:** To evaluate and develop a wastewater treatment system for Los Osos, in cooperation with the community water purveyors, to solve the Level III water resource shortage and groundwater pollution, in an environmentally sustainable and cost effective manner, while respecting community preferences and promoting participatory government, and addressing individual affordability challenges to the greatest extent possible.

Statement of Key Environmental Issues for the Collection System of the Los Osos Wastewater Treatment Project

Presented to the Board of Supervisors of San Luis Obispo County
September 9, 2008
by
San Luis Bay Chapter of the Sufrider Foundation, SLO Green Build, Santa Lucia Chapter of the Sierra Club, the Terra Foundation, Los Osos Sustainability Group and the Northern Chumash Tribal Council

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Northern Chumash Tribal Council

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Statement of Key Environmental Issues
Los Osos Wastewater Treatment Project: Collection System

EXECUTIVE SUMMARY

Central to the missions of our groups is sustainability – protecting, preserving, and restoring for future generations the environmental, social, and economic gifts and opportunities we enjoy. Integral to this larger mission is protecting the past, the cultural resources of the California Native American Chumash, and, preserving and enhancing local watersheds, on which other vital systems depend, including coastal ecosystems. We agree that selecting the appropriate collection alternative for the LOWWP, a major component of the project, is key to the project's sustainability.

To achieve sustainability the collection system for the LOWWP should:

- Provide the greatest possible protection against overflows and other releases of partially treated or untreated wastewater from the system, which could pollute Morro Bay Estuary and other sensitive coastal ecosystems (e.g. Sweet Springs Nature Preserve).
- Provide the greatest possible protections to the groundwater of the Los Osos water basin.
- Avoid environmental impacts related to construction and installation of the system to the greatest extent possible, including the impacts of open trenching, e.g., dewatering, soil stabilization, and street reconstruction.
- Avoid impacts to Native American Chumash sites to the greatest extent possible.
- Provide the most energy-efficient solution and enable the use of clean, renewable energy sources, avoiding environmental impacts related to non-renewable energy production (e.g., GHG emissions).

The project's environmental sustainability is ultimately tied to its social and economic sustainability. Therefore, we believe that the project should be as affordable as possible to promote the project's sustainability.

Considering the site-specific characteristics of Los Osos – proximity to Morro Bay National Estuary (a State Marine Reserve), a Prohibition Zone, hilly terrain, sandy soil prone to shifting and liquefaction, high ground water, and sites of cultural significance to the California Native American Chumash – we agree that a STEP/STEG collection system is the most environmentally appropriate alternative. Based on our review of the LOWWP project reports and our own research, a STEP/STEG collection system affords significantly greater protections to the groundwater, sensitive ecosystems, and culturally significant sites in the area than either a conventional gravity collection system or a low pressure-conventional gravity combined system (LPCS) – while also providing other benefits important to a sustainable project.

We thank Chairman Patterson for the opportunity to provide input on this important matter, and the Board for its support for sustainability as stated in the LOWWP *Mission Statement*. This report contains our analysis of STEP and gravity collection systems, and conclusion regarding the collection system we see as the environmentally appropriate solution to meet the complex needs of Los Osos.

INTRODUCTION

After the August 5, 2008, San Luis Obispo County Board of Supervisors Los Osos Wastewater Treatment Project (LOWWP) Update, Chairman Patterson requested that local environmental groups prepare an informational document that analyzes the environmental benefits and impacts of the collection systems under consideration for Los Osos and include a recommendation for an environmentally preferred system. The following is the work product of the San Luis Bay Chapter of the Surfrider Foundation, Santa Lucia Chapter of the Sierra Club, SLO Green Build, Los Osos Sustainability Group, The Terra Foundation, and Northern Chumash Tribal Council.

The collective mission of our organizations is to preserve, enhance, and protect the biological health of our coastal environment and its contributing watersheds as well as the cultural resources of the California Native American Chumash. We are aligned with the statement of Jonathan Todd, CEO of the natural resources planning firm Todd Ecological, Inc., that the fate of the bay is dependent upon the town's having a managed wastewater system.[1] Los Osos' proximity to the least tidal area of the bay makes a sewer system a necessity. The consideration of the type of collection system and the treatment plant's location is also vital to the protection of the coastal environment and watershed.

We appreciate Chairman Patterson's request that we *differentiate* between the two primary collection systems being considered, STEP/STEG and conventional gravity combined with low pressure. We recognize that the Draft EIR has not yet been released nor has the NWRI Independent Peer Review occurred. We are specifically responding to Chairman Patterson's request for input at this time and hope that the following will raise issues that will receive further evaluation in the environmental review process.

BACKGROUND

Los Osos is located on the "Back Bay" of the Morro Bay National Estuary. A portion of the community, about 5,000 residences, has been designated a "Prohibition Zone" by the Central Coast State Regional Water Quality Control Board. This portion of the community, much of it adjacent to the bay, is the site of the LOWWP. The terrain in the Prohibition Zone is hilly with sandy soil, so the area is prone to ground movement and liquefaction with earthquakes or severe weather conditions. Due to the hydrogeology of the basin, many areas have high groundwater, even in the higher elevations, while the Prohibition Zone's location makes the groundwater basin (and collection system) prone to the effects of seawater intrusion – a factor particularly relevant with predicted sea level rises due to global warming trends. Having been a district of Chumash villages for thousands of years, Los Osos is situated on top of land that is of great sacred and cultural significance to the California Native American Chumash. Further, socio-economic factors come into play. A significant percentage of residents are retired, on fixed incomes, with most of the community middle and lower income. For these reasons, constructing a wastewater project in Los Osos requires a balance of environmental, cultural, social, and economic considerations in order to decide the most appropriate collection system solution. The solution must be in accord with the balanced metrics of Environmental, Social, and Financial Sustainability.[2]

A key consideration is the fact that the portion of the Morro Bay Estuary adjacent to Los Osos and the Prohibition Zone was recently designated a State Marine Reserve. The

Department of Fish and Game has stated Marine Reserves "shall be maintained to the extent practicable in an undisturbed and unpolluted state," and that "Take is not limited to fishing activities…. The high level of protection created by an SMR [State Marine Reserve] is based on the assumption that no other appreciable level of take or alteration of the ecosystem is allowed (e.g., sewage discharge…)." [3]

Alex Hinds, former SLO County Director of Planning and Building, noted, "As wetlands continue to disappear, Morro Bay's international significance continues to grow. Morro Bay supports many birds protected by international treaty and provides a secure harbor for offshore marine fisheries." [4] Unlike the recent CMC 20,000 gallon raw sewage spill into Morro Bay, a spill from Los Osos would not have 6 miles or 10 minutes of dilution provided by creek waters before impacting the bay. The impact would be to the part of the bay with the least tidal flux. Therefore, it is imperative to build a collection system that offers the greatest protection to the bay.

DISCUSSION

In our analysis of the two collection systems, we have identified several key issues relating to wastewater collection and have examined each collection system within the context of these issues:

1. I/I (Inflow/Infiltration) and Exfiltration

In line with our mission to preserve, enhance, and protect the biological health of our coastal environment and its contributing watersheds, one of our primary concerns is I/I (Inflow/Infiltration) and exfiltration. I/I is water leaking into a collection system; exfiltration is sewage or effluent leaking out. Both occur where a system is not sealed (water tight). Some main sources of I/I are rainwater (during storms), seawater (in locations near a bay or open ocean), and groundwater (in high groundwater areas). A system prone to I/I is also prone to exfiltration because both originate from leaks in a system. Peaks in I/I can lead to SSOs (Sanitary System Overflows), while significant exfiltration can pollute ground water and surface waters (through subsurface percolation and seeps). SSOs and exfiltration are leading causes of ground and surface water pollution in the United States.[5]

Contamination from raw sewage leaks would violate protection measures afforded by the bay's designation as an SMR and would be detrimental to the health of the bay, local wildlife, and the fishing industry. Prevention of sewage spills and unregulated discharges that would degrade coastal water quality or harm marine resources is consistent with Sections 30230 and 30231 of the Coastal Act, as well as Section 2852(d) of the California Fish and Game Code.

By demarcating part of Los Osos a "Prohibition Zone", it appears that the CCRWQCB identified what they see as the "low-lying area." As such, the structural integrity of the collection system, be it STEP or conventional gravity, is key to preventing I/I and exfiltration into the groundwater basin and SMR. Furthermore, future sea level rise could cause additional I/I and exfiltration issues that need to be considered. Conservative global warming predictions estimate sea level rise to be between 8 inches to two feet by 2050.[6] This will only be 35 years into the LOWWP's lifespan. It has also been predicted that the rise in tides will bring larger coastal storm events, which further affirms the need for a sealed pipe solution that minimizes I/I and exfiltration and avoids capacity stressors to the system.

STEP/STEG Collection System:

The STEP/STEG collection system (hereafter referred to as STEP) by design is a sealed pipe solution, with pipes laid (on average) at 4 feet deep following the natural topography. Because of the shallowness of the pipe (compared to gravity pipe being between 7'-23' deep) there is ease in leak detection, clean up and repairs. The matter transported through the pipes is effluent, not biosolids sewage as with gravity, thus reducing the impacts of leaks polluting the groundwater. Furthermore, there is a greater soil interface with STEP, which creates a barrier to pathogen transport. Any excessive pumping due to leaks would be known immediately through the nearly real-time feedback information of STEP pump activity; if there were a pipe rupture or pinhole leak, it would be detected early on.[7] STEP systems do not require manholes, further reducing potential I/I that would result from runoff or storm events.

The most likely place for I/I issues in a STEP collection system is between the STEP tank and connection to the house. Prevention of I/I at this location can occur with maintenance and monitoring just as with on-lot monitoring of I/I with a gravity collection system.[8] As noted in the Technical Memorandum, "Flows and Loads", I/I within a STEP collection system "presumably would be much lower than that estimated for a gravity collection system." [9] Per Dr. Tchobanoglous' comments in the *Release of Draft Fine Screening Report*: all existing septic tanks must be replaced if a STEP system is used. This is to assure a watertight system from the beginning.[10]

Conventional Gravity Collection System:

A conventional gravity (combined with low pressure) collection system (hereafter referred to as gravity) can also be fusion welded, but the LOWWP Project Team has not indicated a firm position on the scope and extent of sealing. This is best summarized by an excerpt from the Technical Memorandum, "Flows and Loads", which states, "If a gravity collection system is selected, only a system that was constructed of fusion-welded PVC piping could be operated with as little I/I as the other types of systems." [11] The LOWWP *Fine Screening Analysis* points out that an active maintenance program can reduce I/I in a gravity collection system, but the maintenance would be more expensive than for STEP.[12] More detailed concerns include the following:

- A conventional gravity system means 45+ miles of pipe laid will have approximately 12,000 unfused joints (this figure does not include the additional 5,000 connections to homes nor the lateral joints every 20 feet from the main to the residences).[13] Even with the newer PVC pipe, gravity bell and spigot joints are known for loosening over time and will be laid at a *minimum* of 7 feet in depth (pipes will be laid 7'-9' deep in 63% of the roads, 10'-14' deep in 34% of the roads, 14'-18' deep in 2% of the roads and 18'-23' deep in 1% of the roads – compared to 4 feet for STEP), making leaks more difficult to detect and expensive to repair.[14] According to the LOWWP *Fine Screening Analysis*, Section 1.3, there is a higher risk of ground water pollution with gravity than with STEP because of the bell and spigot joints loosening over time. Exfiltration from the loosened joints would further pollute Los Osos' drinking water as well as have damaging impacts to the bay.[15]

- The sandy soils of Los Osos make conventional gravity bell and spigot pipes particularly vulnerable to earthquakes, increasing the chances of I/I and exfiltration.
- 807 manholes (each with 2-4 unfused manhole penetrations) are proposed for the gravity collection system, where STEP has none.[16] Here, too, is an opportunity for I/I and exfiltration: rainwater that would have recharged the aquifer is taken to the treatment plant for treatment instead, and, in a major storm event, this load on the collection system can cause sewage to be pushed up through these openings. Again, STEP is a sealed system so these issues are negligible. Furthermore, the STEP tank is designed with a 1-2 day emergency holding capacity for a storm event.
- For Los Osos, a conventional gravity collection system requires 20 pump stations, which also makes the system more susceptible to I/I and exfiltration due to surges and/or system failures (pumps and valves). Larger conventional gravity pipe (8" diameter) allows for greater I/I, whereas STEP's 3-4" diameter pipe is more restrictive simply because of the size. As the NWRI Independent Advisory Review stated December 4, 2006, "The economic benefits to reduced inflow and infiltration (I/I) achieved by the use of small-diameter effluent pressure collection should be considered in the cost estimate for alternative treatment technologies." [17]
- It is our understanding that at present 5% of the gravity collection pipe will be laid in groundwater thus requiring dewatering to install it. This will also make the pipe more susceptible to causing groundwater pollution from exfiltration.
- Unlike a STEP tank, which settles out greases through pretreatment, gravity collection pipes carry greases to the treatment plant. As stated by the State Water Sources Control Board, grease blockages (along with manhole structure failures, pump station mechanical failures and excessive storm or ground water I/I) are a major cause of SSOs.[18] SSOs may pollute surface and ground waters, threaten pubic health, adversely affect aquatic life, and impair the recreational use and aesthetic enjoyment of surface waters.[19]
- The newer PVC gravity pipe has a maximum allowable exfiltration rate, which indicates that exfiltration is assumed and already calculated into the system's design.[20]

Summary:

The LOWWP *Fine Screening Analysis* estimates the average wet weather flow for a LOWWP conventional gravity system will be 200,000 gallons/day more than for a STEP system due to I/I. The LOWWP Technical Memorandum "Loads and Flows" estimates a gravity system's peak storm flows will be 800,000 gallons/day more than STEP (2.5 million gallons/day versus 1.7 million gallons/day). These peak flows make a gravity system more susceptible to controlled or uncontrolled releases of partially treated or untreated sewage.[21] The Regional Water Quality Control Board notes, "Communities need to address overflows during sewer system master planning and facilities planning," and, based upon these findings, a collection system that uses sealed pipes would be environmentally preferable to minimize I/I, exfiltration, and associated releases of sewage as well as to allow for diagnosis and repair of breaks or leaks in the system as they develop.[22] Therefore, we see STEP as the environmentally preferred collection system technology as regards this key issue.

2. Soil Disturbance – General

Soil disturbance is a key issue with two separate components: General, and, California Native American Chumash Sites. This section addresses the general issues of soil disturbance, runoff pollution, road and traffic disruption and personal property disruption. The size and depth of soil displaced for gravity pump stations and for the 45+ miles of deep trenches for gravity pipe to be laid or for placing STEP tanks into the ground on properties will be analyzed.

STEP/STEG Collection System:

STEP tanks require soil displacement approximately 8'W x 14'L x 8'D (approximately 23 cubic yards) to accommodate the 1,500 gallon tank measuring 6'W x 11'L x 6.25'D.[23] To reduce disturbance of personal property in the case of a STEP collection system, boring (as opposed to trenching) can be used to connect the lateral pipe to the STEP tank. There is very little road/traffic disturbance for boring the 4-inch diameter opening for inserting STEP pipe in roads, and it can be laid within 12-18 months. To further reduce soil disturbance, with 75% of the septic systems in front yards, STEP tanks can go where septic tanks are now with site enlargement. STEP tanks are approximately 50% larger than the preexisting septic tanks.[24] Boring avoids the significant impacts and mitigations associated with excavation, runoff pollution, and dewatering open trenches in high groundwater areas (e.g., disposing of the polluted water).

On-lot disturbance for monitoring and maintenance is equivalent to other utilities' on-lot disturbance (e.g. electricity, water, and gas) though usually only once/year instead of once/month.

Conventional Gravity Collection System:

For gravity, pipes will be laid 7'-9' deep in 63% of the roads, 10'-14' deep in 34% of the roads, 14'-18' deep in 2% of the roads and 18'-23' deep in 1% of the roads.[25] It is estimated that the width of the 7'-8' feet deep trenches will be a minimum of 6 feet for the trenches spanning 45+ miles.[26] A gravity collection system will also require disturbance of personal property in the form of trenching the lateral connection to the house and the decommissioning of the septic tanks.

There will be additional gravity collection soil disturbance for building 12 Pocket pump stations (10'L x 10'W x 10'D), 6 Duplex pump stations (10'L x 10'W x 10'D), and 2 Triplex pump stations (12'L x 12'W x 12'D). Additionally, Duplex and Triplex stations require a standby power station that will also add to soil disturbance.[27]

Open trenching requires shoring, restabalizing soils, and reconstructing streets for the 45+ miles of trenching as well as for the 20 pump stations. Unlike STEP, the soils removed are hauled away and new material brought in that can be compacted and stabilized to allow maintenance of the required pipe grades. The trenches must be dug deeper than the actual pipe level to allow room for the new compactable material.

On-going monitoring and maintenance will be an on-lot disturbance to prevent on-lot gravity I/I and exfiltration.

Summary:

Conventional gravity trenching will greatly impact roads/traffic for a minimum estimated time of two years.[28] The reduced time to bore for STEP pipe means lower construction costs and fewer impacts to roads and traffic. Based on the similarity of width and depth, the calculations of mileage length required to install 5,000 STEP tanks (compared to the 45+ miles of gravity pipe trenching) is less than 14 miles and is only 7 miles if STEP tanks are placed where the septic tanks are now.[29] The cubic yard soil disturbance estimates are 440,000cy for gravity versus 260,000cy for STEP.[30] We understand that the County is considering trenching the STEP lateral pipe with 4-feet deep trenches (but bore the 45+ miles for STEP mains). This trenching of the laterals appears unnecessary when horizontal boring can be utilized and displaces significantly less soil. Based on our analysis, we disagree with the statement on soil disturbance made by TAC member David Dubink during a meeting of the LOWWP Technical Advisory Committee estimating that STEP and conventional gravity collection systems will displace an approximately equal amount of soil, and instead find that STEP/STEG will displace less soil.

3. Soil Disturbance – Native American Chumash Sacred Sites

The town of Los Osos, the Valley of the Bears, was built on an ancient Chumash district, multiple villages occupied for thousands of years.[31] In 1990, over 60 new Chumash archaeological sites were recorded in the area of Los Osos.[32] Because of this, the aforementioned environmental groups support the Northern Chumash Tribal Council (NCTC) in their position that "the least amount of ground disturbance in Los Osos is the best." [33] Ancient Chumash sites are to "remain avoided whenever possible and complete data recovery when we have to disturb or destroy a site. Ancestral burials need to be avoided at all cost, and a plan in place for unavoidable encounters." [34]

Section 30244 of the Coastal Act also provides protections to archaeological and paleontological resources as identified by the State Historic Preservation Office requiring reasonable mitigation. Development would not likely be prohibited based on the presence of these resources, but steps to minimize impacts to these resources should be part of the development plan.

STEP/STEG Collection System:

The LOWWP *Fine Screen* Section 3.3.2 addresses the impacts of STEP/STEG stating, "Archeological impacts will occur, but determination of extent will be made complicated by subsurface installation (horizontal boring)," meaning damage to a site could occur for approximately 50' before evidence of damage is revealed.

As stated in the previous section, a minimum of 75% of the STEP tanks should be able to be located where there are currently septic tanks, creating less soil disturbance on properties and reducing the risk to California Native American Chumash cultural resources. For roadways, STEP is seen as preferred because the planned depth is 4' for horizontal boring that follows the natural topography. The LOWWP Technical Advisory Committee (TAC) in the *Pro-Con Analysis* showed that STEP is believed to pose less risk.[35]

When discussing the complexity of these issues, Fred Collins, Tribal Administrator for the Northern Chumash Tribal Council (NCTC), said, "With the data available today and with not having any meaningful communication with the County concerning this project, NCTC has determined after meeting with local environmental group members that if the

STEP system and Gravity System were to be compared for soil disturbance and if both systems disturb the same amount of cubic soil, the surface 100 centimeters disturbance that the Gravity system would displace would be much more than the STEP system, therefore NCTC is supporting the STEP system. When you add the advantage of boring which is very accurate and with proper Archaeological planning and research using every means known (which includes Test Pits, Core Drilling, Ground Penetration Radar, Knowledge of the Chumash Elders, Geomorphology, Geology, Paleontology and Ground Disturbance Chumash/Archaeological Monitoring), the STEP system will be much more efficient and protect California Native American Chumash Cultural Resources in an effective way that will be the future for project planning." [36]

If culturally significant sites are encountered in the installation of STEP tanks, greater flexibility and time is afforded to provide for proper care of the sites in accordance with cultural traditions. Furthermore, STEP pipe can be directed around preexisting buried utility lines and archeological sites.[37]

Conventional Gravity Collection System:

The LOWWP *Fine Screening Analysis* states in Section 3.3.1, "Archaeological resources are located throughout the community and will require pipeline route relocation, or possible reburials" if conventional gravity is implemented, resulting in additional delays, costs and need for Change Orders.

For the NCTC, their greatest concern is the 45+ miles of gravity collection trenching as was confirmed by the LOWWP Technical Advisory Committee's *Pro/Con Analysis* which states that gravity collection poses a "higher risk of impacts on archeological resources." [38] With deep and wide trenching, sites and burials could be uncovered within the entire 45+ miles of trenched roads for gravity collection pipe because of Los Osos being a district with multiple Chumash village sites for thousands of years.[39] With gravity systems, downhill slopes must be maintained at all times, therefore, an encountered site must be excavated and burials moved. Collins stated that with gravity collection, "this could be one mass grave relocation project." [40] This also means the project would be stopped in those places where cultural resources are found delaying the project and increasing the cost.[41]

Summary:

The information provided above substantiates that the STEP collection system construction would create the least amount of soil disturbance and minimize impacts as they pertain to the California Native American Chumash cultural resources in Los Osos.[42]

4. Energy Usage

Energy usage is important to consider within the LOWWP collection system because 20% of energy used in California is for the movement and treatment of water.[43] Section 30253(4) of the Coastal Act requires that new development minimize energy consumption. The goal of AB 32 is to meet 1990 levels of energy usage by 2020 and an additional 80% reduction below that by 2050. The present septic tanks in Los Osos require zero energy, and this means any sewer project will *increase* energy use in Los Osos unless it is also designed to *generate* energy. Smart design, such as incorporating solar energy via photovoltaics and capturing methane, can reduce carbon emissions associated with other forms of energy.

STEP/STEG Collection System:

Dana Ripley, CEO of Ripley Pacific Company, estimates the overall power consumption would be 68% less with STEP collection and trickling filter secondary treatment than with the gravity collection/MBR design concept.[44] Based on the 2006 rate, "the total power cost for collection, treatment, and distribution of the gravity/MBR design is approximately $960,000 per year assuming an effluent production volume of 1,455 acre-feet per year. The alternative STEP/trickling filter design option would have an annual power budget of approximately, $310,000 per year." [45] In a meeting on August 3, 2007, Greg Nishi, Account Representative for PG&E in San Luis Obispo, expressed to Dr. Mary Fullwood, Chuck Cesena and Dana Ripley that when comparing the STEP design of 2006 to the conventional gravity midtown project, STEP was significantly less demanding in energy usage and would qualify for a rebate to reward the project for its low-energy usage as well as adaptability in utilizing solar power, photo voltaics, for the ½ horsepower (hp) effluent pumps required for 95% of the residences. These low-energy pumps only run approximately 20 minutes/day.[46] It is easier to install solar with STEP collection than with gravity's larger municipal collection system pumps (5 hp and above) at the pump stations. The NWRI Independent Advisory Review stated December 4, 2006, "The economic benefits of septic treatment [i.e., STEP tank treatment] should be considered in the cost estimates for alternative treatment technologies. Such an analysis should also include the economic benefit of reduced biosolids production." [47] Because a STEP system allows natural processing (primary treatment) of solids on site in the STEP tanks, it reduces the total septage in the system by 75%, thus reducing the energy needed to treat and/or dispose of solids.[48] Lastly, the energy-free STEG component, a STEP tank that relies on gravity instead of pressure, has not been calculated into the STEP collection system design estimates because, as described by Dana Ripley, "We wanted to begin with a conservative starting point on energy consumption and defer the whole STEG issue to the detailed design stage. This is when we will have the resources to do the hydraulic grade profile based on final pipeline routing." [49]

Conventional Gravity Collection System:

As stated in the LOWWP *Fine Screening Analysis*, the energy usage of the gravity collection system is estimated at 500,000 kwh/year based on energy required to convey 1.4 mgd to an out-of-town treatment facility. STEP is estimated at 425,000 kwh/year based on energy required to convey 1.2 mgd to an out-of-town treatment facility.[50] If the Low Pressure alternative is utilized in the high groundwater areas it will add approximately 400 2 hp grinder pumps to the gravity system.

Summary:

Since our findings regarding energy usage – which are reflective of industry-based comparative reporting – conflict with the information in the *Fine Screening Analysis* – which concluded that the energy usage of STEP and gravity collection systems would be equivalent – further evaluation of the energy usage information on both collection systems is needed. However, even if after further scrutiny and analysis, energy usage is found to be equivalent, the fact that STEP can easily utilize solar makes it favorable and likely to be rewarded by rebates and/or grants in this time of transition to renewable, low-carbon energy sources by the State of California.

5. Water Conservation

Since water conservation is becoming a necessity for the State of California, and a key focus of the Morro Bay National Estuary Program (MBNEP), the Central Coast Regional Water Quality Control Board (CCRWQCB), San Luis Obispo County, and, the Los Osos Community Services District (LOCSD) – to name a few entities developing water conservation programs and Low-Impact Development (LID) practices, manuals and policy clearinghouses – it is only prudent to select the wastewater treatment option that facilitates the implementation of these measures.

STEP/STEG Collection System:

For STEP, the average wet weather flows are estimated at 1.2 million gallons per day (mgpd) with average peak storm flows estimated at 1.7 mgpd. According to wastewater systems experts, the STEP collection system enables greater water conservation and related energy-savings from reduced water and wastewater pumping.[51]

There may be places where installation of STEP tanks will be in high groundwater areas and will require dewatering. However, dewatering would be limited to an 8 foot single spot compared to an 18 foot extended trench in highly permeable sandy soils with gravity sewers.[52]

Conventional Gravity Collection System:

For gravity, the average wet weather flows are estimated to be 1.4 mgpd, 200,000 gallons per day (gpd) greater than for STEP.. The average peak storm flows are 800,000 gpd greater than STEP at 2.5 mgpd.[53]

The high levels of I/I associated with gravity reduce beneficial recharge of the basin's ground water by diverting rainwater into the collection system. I/I represents a substantial source of recharge (200,000 to 800,000 gpd during wet weather).

Gravity collection systems require greater volumes of water than STEP collection systems to function properly (to flush solids through the system), therefore, they set limits on the levels of conservation achievable by individuals and the community.[54]

The LOWWP *Fine Screening Analysis* states, "a viable project could not result in an increase of the groundwater balance deficit, maintaining the existing basin balance (i.e. level 1) was considered the minimum viable project." Dewatering the trenches to lay gravity pipelines will use a considerable amount of water depleting the aquifer. This water will be polluted in the process and will need to be disposed of elsewhere (thus also a carbon footprint/GHG concern). The dewatering of a Sewer Line Project in Salinas, California, for example, required pumps running around the clock for three weeks before the crew could work on the drained area. The pumps used for that specific project pumped a combined 12,000 gallons per minute in order to dewater the trenches. Because of the impact this would have on Los Osos' groundwater basin and the potential for drawing in seawater intrusion, we ask that the matter of dewatering be fully evaluated.[55]

Summary:

Because of its ability to operate with reduced flows, the STEP collection system stands out as the superior collection system to facilitate increased water conservation measures.[56] As Ronald Crites and Dr. Tchobanogrous state,

> Although the use of conventional gravity-flow sewers for the collection of wastewater continues to be the accepted norm for sewerage practice in the United State, alternative collection systems…are becoming increasingly popular. In some areas the use of conventional gravity sewers is becoming counterproductive because the use of water conservation devices continues to increase. The minimum flows required for gravity-flow sewers to operate make them problematic where development occurs slowly in a large development or where water conservation reduces the wastewater flows significantly. In many cases, the water used to flush conventional gravity-flow collection systems for the removal of accumulated solids far exceeds the water saved through water conservation measures.[57]

6. Greenhouse Gas Emissions

Greenhouse gas emissions contribute to the rate of global climate change. The Intergovernmental Panel on Climate Change (IPCC) asserts that "most of the observed increase in globally averaged temperatures since the mid-twentieth century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations." [58] The California Global Warming Solutions Act of 2006 (AB 32) requires reduction of greenhouse gas emissions below 1990 levels by the target year of 2020.

The complexity and depth of the issue of Greenhouse Gas Emissions as they pertain to collection systems construction, operation and maintenance is beyond the scope of this document and will be addressed more fully upon the release of the Draft EIR and the analytical report by the NWRI Independent Peer Review. Below, we have provided a brief overview of greenhouse gas issues generally pertaining to the collection systems, regardless of size, etc.

STEP/STEG Collection System:

The LOWWP Tech Memo on Green House Gas Emissions raised significant concern for the emissions of methane by the STEP collection system. We acknowledge their concern as methane is released at the high points within the collection system; however, with innovation the gas could be captured and turned into an asset. This is already being done in 20% of all conventional wastewater treatment plants in the U.S. and typically supplies 30-50% of the plants' energy needs. For instance, Dana Ripley of Ripley Pacific Company recently shared the following:

> Anaerobic pretreatment followed by aerobic polishing can be a potential net energy producer, compared to conventional systems. Even with anaerobic solids digestion, conventional systems are net energy consumers. This is an intriguing concept since the STEP interceptor tanks are in fact already the "anaerobic pretreatment." The only missing element is collection of the biogas (50-75% methane) for energy production. I am currently working on a biogas collection system (from STEP tanks) for a project in the Central Valley and the concept just may have application in Los Osos. I discussed this concept with Dr. Tchobanoglous last Saturday, and we both feel that it is technically and economically doable. We would simply mimic the biogas collection systems used for about three decades in landfills, and apply it to the interceptor tanks. This is still on the drawing boards, but we hope to have it far enough along later this year that we include it in our team's response to the County's RFP.

> We know there is no (known) precedent for this for STEP tanks, however there is plenty of precedent for collection of similar biogas from dispersed landfill gas wells. Theoretically, if it works, the whole tertiary wastewater system could power itself and potentially produce an excess for sale to the grid.[59]

Regarding greenhouse gas emissions associated with operation of the collection system, we note that the advantage of primary treatment and holding at the STEP tank utilizes natural organisms to digest raw sewage, reducing demand and volume on treatment process and solids disposal, thus reducing pumping.

Because the collection system is integral to the treatment system, we must address the issue of methanol which is being recognized by the LOWWP as the only carbon source treatment solution for treating the high nitrate levels of effluent for a STEP treatment plant. As Bill Cagle, National Accounts, Orenco Systems Inc. stated, "Other sources used for de-nitrification include acetic acid, glucose, benzoic acid, and micro-C" without as great an impact on the environment.[60] Micro C, for instance, is derived from renewable agricultural products that are abundant in the United States while methanol (the current industry standard) is derived from non-renewable natural gas.[61] With an Agricultural Exchange/Reuse program, denitrification is unnecessary because the treated water containing nitrates could be used on selected crops eliminating the need for nitrate fertilizers. Lastly, after reviewing the County's figures for methanol, Greg Dolan, Vice President of the Methanol Institute, stated, "Based on actual operating experience, we show that methanol manufacturing plants emit 3.8 lbs of CO2 per gallon of methanol, versus the 15.6 lbs quoted in the County report." [62]

Conventional Gravity Collection System:

The LOWWP Technical Memorandum, "Project Alternatives Greenhouse Gas Emissions Inventory" does not address the GHG emissions of the gravity collection system but focuses on treatment. However, it does address GHG emissions as they pertain to construction. Gravity's GHG emission levels are approximately 20-25% higher than the GHG emissions estimated for the construction of a STEP system.[63]

Like STEP, Gravity treatment also requires denitrification and this can be eliminated through the use of Ag Exchange.

Summary:

STEP systems have associated methane emission issues; however, with the implementation of a methane capturing solution, this problem could be mitigated and provide further benefits in the form of an energy source for the wastewater project. Conventional gravity collection systems also contribute greenhouse gas emissions because the systems employ pumping, which is one of the greatest producers of GHG. To better understand the amount of greenhouse gasses that each collection system would contribute, we believe that GHG Emissions issues warrant further analysis beyond that provided in the LOWWP Technical Memorandum, "Project Alternatives Greenhouse Gas Emissions Inventory."

7. Biosolids

Biosolids are a key environmental issue because the quantity and quality of biosolids dictate the likelihood of creating a small community composting facility, thereby allowing the liability of biosolids to become an asset.

STEP/STEG Collection System:

The primary treated biosolid from a STEP system yields itself more effectively to the future development of a small community biosolids composting facility that can transform the biosolids liability into a compost matter asset. At present, the new tertiary conventional gravity wastewater treatment plant at the California Men's Colony (CMC), one the same size as that proposed for Los Osos, 1.2mgd, produces 600 tons of biosolids per year which are hauled to Kern County twice/year. The expense for Kern County to receive the biosolids is $24,000/year and this does not include the cost of fuel/trucking or GHG emissions. Kern County is then turning the biosolids into compost and selling the CMC liability as their asset.[64]

STEP tank pretreatment reduces biosolids mass by 75% creating a more suitable matter and quantity to compost.[65]

Additionally, STEP collection systems provide short-term emergency storage in the STEP tank in the event of a major storm or if there is an on-lot system failure, thereby minimizing the risk of spills to the bay.

Conventional Gravity Collection System:

A conventional gravity collection system pumps the biosolid as well as effluent through 45+ miles of pipe, and, as stated in the I/I and Exfiltration section, places the bay at greater risk during a major storm event or system/power failure (at the 20 pump stations).[66] We have recently seen the damage caused by a gravity system failure with the CMC spill of 20,000 gallons of sewage going into the bay in 10 minutes.[67]

The gravity collection system estimated solids volume is averaged at 4,000 lbs/day dry weight, meaning 730 tons/yr dry weight compared to STEP's 1,000 lbs/day dry weight, or 182.5 tons/yr dry weight. Gravity biosolids, therefore, are 75% greater in mass with associated impacts for hauling, GHG emissions, and land impacts.[68]

Summary:

The STEP collection system estimated solids volume is 75% less than that of gravity and therefore we believe that the pumping of primary treated biosolids every 5-10 years from a STEP system will be less in volume than the biosolids removed from a gravity system.[69] Presently, the new CMC tertiary gravity sewer system, one the size planned for the LOWWP (1.2mgd), hauls 1,200 tons of solids annually to Kern County.[70] Depending on whether the LOWWP biosolids would need to be trucked out of the county or whether they are composted locally, the increased frequency of biosolid removal from STEP tanks could be viewed negatively or positively. However, the *Pro/Con Analysis* states that the STEP collection system "provides primary treatment in septic tanks, thereby reducing down-line costs for treatment system and solids treatment and disposal." [71] We believe a STEP system yields itself more effectively to the future development of a small community biosolids composting facility for the above-stated reasons.

8. Odors

Odors are an environmental-cultural-aesthetic issue. To live, play and work in a community, one hopes not to engage foul odors coming from a sewer system.

STEP/STEG Collection System:

The LOWWP Fine Screen Analysis states, "Odor control measures will be required at high points throughout the system where air within the piping is released to prevent air bubbles from forming. Odor control will consist of carbon media canisters that remove the odorous compounds such as hydrogen sulfide from the air as it passes through the media. The canisters and air release valves on the pressurized main lines would be enclosed in a small (approx. 3 by 4 by 4 feet) buried vault. STEP tanks would be vented to roof level, similar to existing septic tanks." [72]

Conventional Gravity Collection System:

For gravity, the potential collection system odors would occur at the 807 manholes and 20 pump stations located throughout the community, however, the LOWWP *Fine Screen Analysis* has inadequately addressed gravity collection system odor issues and we request there be further analysis.[73]

Summary:

Rob Miller, Principal Engineer, Wallace Group, and, Vice Chair on the LOWWP Technical Advisory Committee, has noted that both collection systems have potential odor sources. For STEP they are slightly higher, but both can be managed.[74]

9. Economic Sustainability

The collection system's economic sustainability is integral with balanced metrics of Environmental, Social, and Financial Sustainability." [75] The LOWWP collection system should be as affordable as possible to promote its sustainability. Ultimately, a project's environmental sustainability is tied to its social and economic sustainability.

STEP/STEG Collection System:

The LOWWP *Fine Screening Analysis* found that the STEP/STEG collection system would be the least costly.[76] Further refinement in costs, with further review and actual project bids, we believe, will reveal greater costs savings of a STEP/STEG collection system. As Jonathan Todd stated,

> I do feel that any sewering is better then none. The fate of the bay depends on it. That said, conventional gravity sewers are not the most cost effective or environmental solution for Los Osos. I believe that a small diameter pressure system will suit the community best.[77]

Determining the number of STEG units (without pumps) needed for the STEP/STEG collection system will further reduce the cost of the collection system and its energy usage impact. STEP tanks placed in the 25% of backyards which already have their septic tanks located there would also decrease energy demands as well as the expense of the collection system (eliminating the need for 2 hp grinder pumps).[78] Reevaluating the notion that STEP tanks must be pumped every five years will also reduce the cost and GHG emissions from pumping. STEP tank primary treatment reduces biosolids by 75% that of conventional gravity (182.5 dry weight tons/year instead of 730 dry weight tons/year) and the health and

effectiveness of the STEP tank is dependent upon the biosolids ecosystem where an average pumping of every 10 years is adequate.[79] Furthermore, because of the significant reduction in biosolids, hauling costs are reduced and creating a small community composting facility is more viable.

The cost of the entire STEP/STEG system can be further reduced during treatment through Ag-Exchange, wherein certain crops could utilize the treated water containing nitrates (thus eliminating the need for fertilizer). Cost reductions, reduced energy usage, and reduced GHG emissions would occur by replacing methanol with a less toxic and dangerous carbon source denitrification solution. Every gallon of MicroC used (instead of methanol) saves the energy equivalent of heating 0.5 US households per day or providing electricity for 0.7 US households per day. MicroC requires only one third the overall energy input as methanol. The manufacturing and distribution of MicroC is far less energy-intensive than methanol and results in an overall energy savings of 72,000 BTU for each gallon of methanol replaced by MicroC.[80]

Conventional Gravity Collection System:

The potential need to seal (fuse weld) bell-and-spigot joints in significant portions of a gravity collection system to achieve minimum environmental safeguards (e.g., against earthquakes, I/I and exfiltration, to meet CCRWQCB Prohibition Zone zero discharge requirements, and future sea level rises with predicted increases in storm and tidal energy) have yet to be factored in to the cost of a gravity system. However, the LOWWP *Fine Screening Analysis* does address the cost of loosening bell-and-spigot joints: "Properly installed bell-and-spigot sewers will be watertight at first, and then slowly lose their integrity as the surrounding soils shift, compressing the pipes, and compromising their seals at the joints. The water-tightness of a bell-and-spigot sewer can be preserved if a maintenance program is conducted on an ongoing basis to detect and repair leaks. This program would add to the cost of a gravity sewer compared to a STEP/STEG sewer with similar levels of I/I." [81]

The gravity collection system estimated solids volume is averaged at 4,000 lbs/day dry weight, meaning 730 tons/yr dry weight compared to STEP's 1,000 lbs/day dry weight, or, 182.5 tons/yr dry weight. Gravity, therefore, has a 75% greater impact on hauling fees and associated GHG emissions.[82]

The costs of the gravity system can be reduced through Ag-Exchange, wherein certain crops could utilize the treated water containing nitrates (thus eliminating the need for fertilizer).

Summary:

At present, the LOWWP *Fine Screening Analysis* has determined that the STEP system is the least expensive without factoring in the above-stated environmentally enhancing solutions that would reduce the cost of the STEP system even further. In contrast, the LOWWP *Fine Screening Analysis* has not factored in the cost of fuse welding gravity collection system pipes in the high groundwater areas or factored in fuse welding gravity collection system pipes in the areas that will be impacted by an 8 inches to 2 feet sea level rise prediction within the lifespan of the LOWWP.[83] Based on the economic benefits, that the LOWWP *Fine Screening Analysis* shows STEP as potentially $25 million less expensive than gravity in construction costs, it further substantiates the conclusion that STEP is the environmentally sustainable preferred solution.[84]

CONCLUSION

Morro Bay is the only major California estuary south of San Francisco that is not significantly altered by human activities and, based on the factors outlined above, we believe that a STEP collection system will best assist the bay's protection and stands out as the environmentally appropriate collection system for Los Osos.

We are very pleased to have had the opportunity to make this assessment upon Chairman Patterson's request. We look forward to seeing these issues will be addressed within the scope of the upcoming NWRI Independent Peer Review and to participating in the future stages of the LOWWP and the soon-to-be-released Draft EIR. We close with a statement by Chumash Elder, Fred Collins,

> It is time for the community of Los Osos to come together and get this job done. As we go into the future, we want our great-grandchildren to be able to enjoy the Back Bay as it once was, and they will possibly study this challenge as one where all people came together to accomplish a great task.[85]

Submitted by:

The San Luis Bay Chapter of the Surfrider Foundation

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Surfrider Foundation is a non-profit environmental organization dedicated to the protection and enjoyment of the world's waves, oceans, and beaches for all people, through conservation, activism, research and education.

The Santa Lucia Chapter of the Sierra Club

http://santalucia.sierraclub.org/

The mission of the Sierra Club is to explore, enjoy and protect the wild places of the earth; To practice and promote the responsible use of the earth's ecosystems and resources; To educate and enlist humanity to protect and restore the quality of the natural and human environment; and to use all lawful means to carry out these objectives.

SLO Green Build

SLO Green Build is a non-profit group of architects, builders, community planners and area residents dedicated to increasing the use of green building on the Central Coast. We help local governments, building professionals and homeowners design, construct and remodel homes and facilities using sustainable building practices and materials.

http://www.slogreenbuild.org/

Los Osos Sustainability Group

The mission of the Los Osos Sustainability Group is to participate locally in the worldwide effort to protect, preserve, restore, and expand for future generations the environmental, social, and economic gifts and opportunities enjoyed by current generations.

The Terra Foundation

www.terrafoundation.org (under construction)

The Terra Foundation works toward creating and enhancing connection with the earth through community education and stewardship of the land.

Northern Chumash Tribal Council

http://northernchumash.org/

NCTC mission is to offer a foundation for the Chumash people of San Luis Obispo County to bring our culture and heritage back to life, create dignity with the people, educate the public that the Chumash have always been here we have not gone anywhere and we will always be here, one continuum. We are the Chumash of over 20,000 years of habitation in San Luis Obispo County.

[1] "As you know, I do feel that any sewering is better then none. The fate of the bay depends on it. That said conventional gravity sewers are not the most cost effective or environmental solution for Los Osos. I believe that a small diameter pressure system will suit the community best." - Jonathan Todd, CEO, John Todd Ecological Design, Inc. Email correspondence with Dr. Mary Fullwood, August 7, 2008. Also see http://www.toddecological.com/

[2] For further elaboration on the tri-metrics of Sustainability see, for example, Assemblyman Sam Blakeslee, "Redefining the Rules and Roles of Environmental Politics", *Santa Lucian*, July/Aug. 2008 (p. 9). http://santalucia.sierraclub.org/lucian/lucian.html.

[3] California Department of Fish and Game. *Master Plan for Marine Protected Areas,* April 13, 2007 (p. 52).

[4] Alex Hinds, former SLO County Director of Planning and Building. *Resolution Supporting the Proposal of the Central Coast National Marine Sanctuary Designation*. Submitted to Joseph Uravitch, Chief, Marine and Estuarine Management Division, Office of Ocean and Coastal Resource Management, National Ocean Service/NOAA on December 24, 1990.

[5] The United States Environmental Protection Agency (USEPA) estimates that there are at least 40,000 sewage overflows each year. (State of California Regional Water Quality Control Board Central Coast Region Staff Report for Special Meeting of November 19, 2004.)

[6] Larry Allen, Executive Director, SLO County Air Pollution Control District. Panel presentation, *Faith, the Environment and You* hosted by Congesswoman Lois Capps at First Presbyterian Church, San Luis Obisop, CA, August 6, 2008.

[7] Dana Ripley, Ripley Pacific Company. Personal communication with Dr. Mary Fullwood, August 29, 2008.

[8] We would like the NWRI Independent Peer Review panel to address this issue and clarify the actual vulnerability of STEP systems at the point of connection and the tank.

[9] SLO County LOWWP Development. *Technical Memorandum: Flows and Loads*. Final Draft, February 2008, pp. 7 and 10.

[10] http://www.slocounty.ca.gov/Assets/PW/LOWWP/document%2Blibrary/Dr.%2BT%24!27s%2Bcomments.pdf

[11] SLO County LOWWP Development. *Technical Memorandum: Flows and Loads*. Final Draft, February 2008, pp. 7 and 10.

[12] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, p. 1-9. For instance, the Rocky Mountain Institute stated that in 2004 the maintenance cost of hydroflush cleaning services averaged $512 per mile hydroflushed per year and television inspection services averaged $4,600 per mile TV-inspected per year. See *Valuing Decentralized Wastewater Technologies: A Catalogue of Benefits, Costs, and Economic Analysis Techniques*, 2004, p. 107.

[13] Section 3.3, SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007 states "over 45 miles of pipelines" will be required for the LOWWP.

[14] LOWWP Technical Advisory Committee *Pro/Con Analysis on Project Component Alternatives*, August 6, 2007, p. 4. The Rocky Mountain Institute stated that in 2004 the maintenance cost of television inspection services averaged $4,600 per mile TV-inspected per year. See *Valuing Decentralized Wastewater Technologies: A Catalogue of Benefits, Costs, and Economic Analysis Techniques*, 2004, p. 107.

[15] Exfiltration pollutes ground water and surface water (e.g., seeps to bay), and is assumed to be a major cause of pollution and beach closures (see EPA Exfiltration and Beach Closure reports).

[16] See Table 3.1, SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007.

[17] National Water Research Institute (NWRI) *Final Report of the Independent Advisory Panel on Reviewing the Los Osos Wastewater Management Plan Update*, December 4, 2006, Section 3.2.8, p. 5.

[18] State Water Resources Control Board Order No. 2006-0003, *State General Waste Discharge Requirements for Sanitary Sewer Systems*, May 2, 2006, p. 1.
[19] Ibid.
[20] See, for instance, Seacoast Utility Authority, Palm Beach County, Section IV – Sanitary Sewer System.
[21] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, 1-11; and, SLO County LOWWP Development, *Technical Memorandum: Flows and Loads*. Final Draft, February 2008, p. 11.
[22] California Regional Water Quality Control Board Central Coast Region, *Staff Report for Special Meeting of November 19, 2004*, p. 1. SLB Surfrider's "Statement of Key Environmental Issues: LOWWP 7/17/07."
[23] Dana Ripley, Ripley Pacific Company. Personal communication with Dr. Mary Fullwood, August 17 and 19, 2008.
[24] See Table 3.4, SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007. This figure can be 100% if STEP tanks also go in the 25% of septic locations in backyards.
[25] LOWWP Technical Advisory Committee *Pro/Con Analysis on Project Component Alternatives*, August 6, 2007, p. 4.
[26] Rob Miller noted, "Where very deep trenching is required, the width depends heavily on the method of construction. There are costly ways to keep the trench impact narrow, but it requires specialized shoring equipment." Rob Miller, Principal Engineer, Wallace Group and Vice Chair, LOWWP Technical Advisory Committee. Personal communication with Dr. Mary Fullwood, August 11, 2008.
[27] See Table 3.1, SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007.
[28] This estimate is based on the contract estimate for the previously proposed conventional gravity midtown project which is now being considered in relation to alternative systems and locations.
[29] See Table 3.4, SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007. This figure can be 100% if STEP tanks also go in the 25% of septic locations in backyards.
[30] Dana Ripley, Ripley Pacific Company. Personal communication with Dr. Mary Fullwood, September 1, 2008.
[31] Fred Collins, Administrator, Northern Chumash Tribal Council. Direct communication with Dr. Mary Fullwood, August 9, 2008.
[32] Alex Hinds, former SLO County Director of Planning and Building. *Resolution Supporting the Proposal of the Central Coast National Marine Sanctuary Designation*. Submitted to Joseph Uravitch, Chief, Marine and Estuarine Management Division, Office of Ocean and Coastal Resource Management, National Ocean Service/NOAA on December 24, 1990.
[33] Fred Collins, Administrator, Northern Chumash Tribal Council. Direct communication with Dr. Mary Fullwood, August 9, 2008.
[34] Northern Chumash Tribal Council statement submitted to the SLO County Board of Supervisors and LOWWP Project Team, June 19, 2007.
[35] LOWWP Technical Advisory Committee *Pro/Con Analysis on Project Component Alternatives*, August 6, 2007, p. 4.
[36] Additional notes: Core drilling – do core drilling every 100ft to see at which depth is it safe to bore without encountering a site. When near a site, core every 20-50ft to be cautious. If four feet shows evidence of a site but at five feet hitting nothing than bore that section at 5', 10'. Gravity V-trenching, 8ft deep in sandy soil can easily be 25ft wide. Fred Collins, Administrator, Northern Chumash Tribal Council. Direct communication with Dr. Mary Fullwood, August 9, 2008.
[37] Ronald Crites and George Tchobanogrous, *Small and Decentralized Management Systems.* New York: McGraw-Hill, 1998, p. 348; and, LOWWP Technical Advisory Committee *Pro/Con Analysis on Project Component Alternatives*, August 6, 2007, p. 4.

[38] LOWWP Technical Advisory Committee *Pro/Con Analysis on Project Component Alternatives*, August 6, 2007, p. 4. Section 3.3, SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007 states "over 45 miles of pipelines" will be required for the LOWWP.
[39] Fred Collins, Administrator, Northern Chumash Tribal Council. Direct communication with Dr. Mary Fullwood, August 9, 2008.
[40] Ibid.
[41] Ronald Crites and George Tchobanogrous, *Small and Decentralized Management Systems.* New York: McGraw-Hill, 1998, p. 348; and, LOWWP Technical Advisory Committee *Pro/Con Analysis on Project Component Alternatives*, August 6, 2007, p. 4.
[42] Collins concluded, "NCTC is working on the Nacimiento Water Pipeline as Chumash Consultants and observing the accuracy of boring technologies and it is amazing, it is truly the way of the future. The Chumash Community has always stood on the principle of Chumash Site avoidance, always keep our sites in-place, undisturbed, because for us our Ancestors Energies are still present, as this is our truth. So for us that write words and make appearances for the protection of our ancient civilization, we who are the Guardians, would be very happy if this project would be conducted with our Spiritual Understanding in consideration, which will help with the destruction that we will have to face and endure. STEP System Boring allows for the least amount of soil displacement and is the best way to go." Fred Collins, Administrator, Northern Chumash Tribal Council. Direct communication with Dr. Mary Fullwood, August 9, 2008.
[43] Larry Allen, Executive Director, SLO County Air Pollution Control District. Panel presentation, *Faith, the Environment and You* hosted by Congesswoman Lois Capps at First Presbyterian Church, San Luis Obisop, CA, August 6, 2008.
[44] Dana Ripley, *Tech Memo #8: Energy Intensity of Collection and Treatment Alternatives*, Los Osos Wastewater Management Plan Update, July 24, 2006, p. 5.
[45] Ibid.
[46] Dana Ripley stated, "I am now assuming that 95% of effluent pumps will be ½ hp. There may be a few isolated instances where a ¾ hp or 1 hp pump may be needed for larger STEP tanks. Email correspondence with Dr. Mary Fullwood, August 19, 2008.
[47] National Water Research Institute (NWRI) *Final Report of the Independent Advisory Panel on Reviewing the Los Osos Wastewater Management Plan Update*, December 4, 2006, Section 3.2.7, p. 5.
[48] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, p. 5-4, Table 5.1; and, LOWWP Technical Advisory Committee *Pro/Con Analysis on Project Component Alternatives*, August 6, 2007, p. 4.
[49] Dana Ripley, CEO, Ripley Pacific Company. Email correspondence with Dr. Mary Fullwood, August 26, 2008.
[50] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, pp., 3-25 & 3-26.
[51] Ronald Crites and George Tchobanogrous, *Small and Decentralized Management Systems.* New York: McGraw-Hill, 1998, p. 8.
[52] Dana Ripley, CEO, Ripley Pacific Company. Email correspondence with Dr. Mary Fullwood, August 29, 2008.
[53] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007,1-9.
[54] Ronald Crites and George Tchobanogrous, *Small and Decentralized Management Systems.* New York: McGraw-Hill, 1998, p. 8.
[55] See http://www.wwdmag.com/Self-performed-Dewatering-Enhances-California-Sewer-Line-Project-article2339
[56] Larry Allen has stated, "20% of energy use in California is water pumping. Water conservation reduces pumping." Larry Allen, Executive Director, SLO County Air Pollution Control District. Panel presentation, *Faith, the Environment and You* hosted by Congesswoman Lois Capps at First Presbyterian Church, San Luis Obisop, CA, August 6, 2008.

[57] Ronald Crites and George Tchobanogrous, *Small and Decentralized Management Systems.* New York: McGraw-Hill, 1998, p. 8.
[58] "Summary for Policymakers." *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Intergovernmental Panel on Climate Change (2007-02-05).
[59] Dana Ripley, Ripley Pacific Company. Email correspondence with Dr. Mary Fullwood, August 7, 2008.
[60] Bill Cagle, National Accounts, Orenco Systems Inc. Personal email correspondence, August 15, 2008.
[61] See www.eosenvironmental.com
[62] Greg Dolan, Vice President, Methanol Institute. Exchange with Bill Cagle, National Accounts, Orenco Systems, Inc., July 7, 2008. See www.methanol.org
[63] LOWWP Technical Memorandum, "Projects Alternatives Greenhouse Gas Emissions Inventory, June 2008, p. 14.
[64] John Kellerman, Plant Manager, California Men's Colony Wastewater Treatment Plant. Scheduled tour for SLB Surfrider and SL Sierra Club, March 7, 2008.
[65] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, p. 5-4, Table 5.1.
[66] See Table 3.1, SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007.
[67] http://www.sanluisobispo.com/news/local/story/260066.html
[68] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, p. 5-4, Table 5.1.
[69] LOWWP Technical Advisory Committee *Pro/Con Analysis on Project Component Alternatives*, August 6, 2007, p. 3. Note: if conventional gravity is selected, we favor treatment Ponds over the other treatment options, e.g., Oxidation Ditch, MBR.
[70] SLB Surfrider and SL Sierra Club CMC Sewer Tour lead by John Kellerman, Plant Manager, March 7, 2008.
[71] LOWWP Technical Advisory Committee *Pro/Con Analysis on Project Component Alternatives*, August 6, 2007, p. 4.
[72] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, pp. 3-8 and 3-9.
[73] LOWWP Technical Advisory Committee *Pro/Con Analysis on Project Component Alternatives*, August 6, 2007, p. 4. SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, p. 3-27.
[74] Rob Miller, Principal Engineer, Wallace Group and Vice Chair, LOWWP Technical Advisory Committee. Personal communication with Dr. Mary Fullwood, August 8, 2008.
[75] For further elaboration on the tri-metrics of Sustainability see, for example, Assemblyman Sam Blakeslee, "Redefining the Rules and Roles of Environmental Politics", *Santa Lucian*, July/Aug. 2008 (p. 9). http://santalucia.sierraclub.org/lucian/lucian.html.
[76] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, pp. 3-23 and 3-24, Tables 3.17 and 3.18, and, p. 7-8, Table 7.4.
[77] Jonathan Todd, CEO, John Todd Ecological Design, Inc. Email correspondence with Dr. Mary Fullwood, August 7, 2008.
[78] For single family units, the grinder pumps would be 2 hp, for larger commercial properties, grinder pumps would be 5 hp and up. Dana Ripley, Ripley Pacific Company. Email correspondence with Dr. Mary Fullwood, August 25, 2008.
[79] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, p. 5-4, Table 5.1.
[80] See www.eosenvirnmental.com

[81] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, p. 1-9.
[82] Ibid., p. 5-4, Table 5.1.
[83] Larry Allen, Executive Director, SLO County Air Pollution Control District. Panel presentation, *Faith, the Environment and You* hosted by Congesswoman Lois Capps at First Presbyterian Church, San Luis Obisop, CA, August 6, 2008.
[84] SLO County LOWWP *Viable Project Alternatives Fine Screening Analysis* August 2007, pp. 3-23 and 3-24, Tables 3.17 and 3.18. Dana Ripley noted the STEP design for the LOWWP is 15-20% complete and believes the costs of a STEP/STEG system remain comparable to those listed in the 2006 LOCSD *Los Osos Wastewater Management Plan Update*, p. 9. Dana Ripley, Ripley Pacific Company. Email correspondence with Dr. Mary Fullwood, August 25, 2008.
[85] Fred Collins, Administrator, Northern Chumash Tribal Council statement submitted to the SLO County Board of Supervisors and LOWWP Project Team, June 19, 2007.