# TAC Meeting – August, 2007
## Announcements from the Chair

Tonight the TAC plans to adopt its Pro/Con Analysis on Project Component Alternatives to be presented to the Board of Supervisors.

The members of this committee represent a broad sampling of the community of Los Osos and each of them has pursued our task both with diligence and an open mind. Except for Rob Miller, none of the committee members have a background in wastewater. Each, however, has credentials that have enabled them to honestly evaluate the components and bring an unbiased position to the table.

Together the TAC and its ad-hoc committees have spent the last five months, meeting two or more times each week studying the alternative solutions to each of the components of the wastewater system. During the course of this work we have received and studied information from many sources including; the Rough and Fine Screening Reports from the Project Team, the Ripley Report, the National Water Research Institute Report, community inputs, interview's with other system operators, visits to wastewater facilities, individual research and others sources.

We recognize that there are those in the community that have reached conclusions or have strong feelings on elements of the wastewater project and we respect your viewpoint. However, our task has not been to recommend a particular alternative but to rather to highlight the pros and cons of all of the alternatives as presented to us.

The findings of these efforts are included in this first report on project components from the TAC. Remember this is not a pro/con on complete projects – that comes next.

As a comment to the TAC members – the information that you provided for the summary was very well thought out and to the point. In the interest of having a concise summary for the Board of Supervisors, Karen Venditti and I took the liberty of editing the material to eliminate redundancies and reduce descriptive narrative. In the process we may have left out or misstated items and that needs to be resolved this evening. Keeping the summary to one page per wastewater component was a strong objective. I believe that some of the narrative that was supplied by the Engineering ad-hoc committee will fit well into our follow-up report on projects.

Public comments and questions will be taken after the TAC has discussed the report but prior to our vote. At that time only comments and questions pertaining to the Pro/Con report will be allowed. I will call for all slips to be submitted before we begin your comments. Once public comment begins, in order to keep our meeting on schedule, we will stop accepting new slips for that item, so please get your slips in to us if you wish to speak.

If you have any other comment or question relating to the TAC and it role there will be a second public input period at the end of the meeting.

Questions to the Project Team will be answered as time permits at the end of the meeting. Please be sure and fill out Public Input slips and hand them in to Diana of the project staff. If you wish to speak in both comment periods please submit two slips.

You may read the final Pro/Con Analysis on Project Components by visiting our website (http://www.slocounty.ca.gov/PW/LOWWP), select the TAC page and then the link to the Pro/Con Analysis Report. This final report will be online by Wednesday. We encourage your questions or comments on this report. Our e-mail address is LOWWP@co.slo.ca.us.

Presented by
Chairman Garfinkel
8/6/07

LOS OSOS WASTEWATER PROJECT
TECHNICAL ADVISORY COMMITTEE

San Luis Obispo County Department of Public Works

TAC

# PRO/CON ANALYSIS ON PROJECT COMPONENT ALTERNATIVES

~~Draft~~

**August 6, 2007**

# LOS OSOS WASTEWATER PROJECT TECHNICAL ADVISORY COMMITTEE

San Luis Obispo County Department of Public Works

| | |
|---|---|
| Date: | August 6, 2007 |
| To: | Jerry Lenthall, Chairperson, District 3<br>Harry Ovitt, Supervisor, District 1<br>Bruce Gibson, Supervisor, District 2<br>Katcho Achadjian, Supervisor, District 4<br>Jim Patterson, Supervisor, District 5 |
| From: | Los Osos Wastewater Project Technical Advisory Committee |
| CC: | Noel King, Director of Public Works<br>Paavo Ogren, Deputy Director of Public Works |

Subject: Pro/Con Analysis on Viable Components of the Los Osos Wastewater Project

Gentleman,

On March 20, 2007, your board appointed us to the newly formed Los Osos Wastewater Project Technical Advisory Committee with the direction to “As its ~~“~~‘First Priority~~”~~’, (make) recommendations on the ~~Pro’s~~Pros and ~~Con’s~~Cons of the “Viable Project Alternatives” developed by the Department of Public Works and consultants that comprise the “Project Team”.~~”~~

The TAC was divided into three subcommittees in order to create a comprehensive and unbiased pro/con analysis on the major elements of a wastewater system. The Engineering and Water Resource committee focused mainly on the technical aspects of the sewer components as they relate~~d~~ to the special circumstances in Los Osos. The Environmental committee concentrated on the ~~affects~~effects each component would have on our community ecosystem, both during construction and on an ongoing basis. The Financial committee carefully ~~researched~~reviewed the costs associated with building and operating each component and the associated financial risks.

Since our inception the thirteen members of this committee have met several times each week, both in public session and as individual committees, to analyze and critique both the Rough Screening Report and the Fine Screening Report submitted to us by the Project Team. Utilizing our own experience and the input that we have received from the community in public meetings, we have produced this report and respectfully submit it to your board.

After being introduced to the project with presentations by the Project Team on the Potential Viable Project Alternatives Rough Screening Analysis, the TAC concentrated on how we would conduct our pro/con analysis. As a first step we adopted Core Values that we felt needed to be addressed in any project for Los Osos. Although each working committee would approach their analysis with a different emphasis, common core values would focus deliberations on what we believed were the basic issues.

*Affordability* of any project is one of the major concerns (and probably the most important) to the community. The Prohibition Zone ~~residents who will be paying for the project are predominately~~demographics include middle to low~~er~~ income ~~people,~~households and a sizable monthly payment could become a major burden for them. ~~For some, any increase in their monthly cash outflow will be disastrous.~~

Los Osos with its location on sand dune ESHA and adjacent to the bay is rich in biodiversity and archeological sites, therefore impacts on its environment must be carefully weighed.

With Los Osos currently in a Level III severity state for water and the tremendous impact a wastewater project will have on the basin, it became apparent that, although the wastewater issue and water issue were intended to be separate, there is no practical way of accomplishing that.

In addition to the financial impacts of the project there needs to be consideration given to other community issues, such as construction disturbances, site location, and individual property landscape ~~destruction~~impacts.

The TAC also felt that it was important for the community to have the ability to control its future destiny and minimize the ~~affects~~effects of third party influences.

With these issues in mind, the TAC adopted the following list~~ed~~ of core values and the associated major criteria.

| CORE VALUES | MAJOR CRITERIA |
|---|---|
| **Affordability** | • Capital ~~costs, including:~~and construction~~, road impacts on lot~~ costs<br>• O&M costs~~, including: energy usage~~<br>• Financing factors<br>• Grant Eligibility<br>• Engineering and project management costs |
| **Environmental Stewardship** | • Environmental impacts~~, including: biological and archeological considerations~~<br>• Potential risks due to system failure<br>• Carbon footprint~~, including energy, fuels, air pollution, chemicals~~ |
| **Flexibility** | • Flexibility to meet future needs and opportunities, including: expansion, future higher regulations, regional opportunities, etc.<br>• Potential alternative energy opportunities |
| **Sustainability** | • Restoring and protecting our groundwater resources~~, including: mitigating~~<br>• Mitigating seawater intrusion and achieving groundwater balance in the basin<br>• Minimizing energy use<br>• Minimizing sludge production |
| **Community** | • Impacts on individual homeowners, residents, and business~~, including: construction nuisance, odor, noise~~es<br>• Stakeholder support<br>• ~~Compatibility with Los Osos Vision Plan~~<br>• Community acceptance |
| **Controllability** | • Risks of third party decisions, policies<br>• Financial risks associated with wastewater projects<br>• Design for maximum system control |

Each of the working committees then identified their specific criteria, which they used to evaluate each of the component alternatives presented (see Appendix~~:~~ A).

~~All TAC meetings were open to the public.~~ The TAC ~~carefully considered the many and varied public comments, and~~ made every effort to take a comprehensive and unbiased approach in this analysis. All TAC meetings were open to the public and the TAC carefully considered the many and varied public comments. We also recognize the concerns of many citizens regarding the assumptions and cost figures used in the draft Fine Screening; however, the purpose of this pro/con analysis was to make a broad comparison of the various components that make up a project. We trust that further investigation and value engineering will clarify assumptions that impact sizing and cost.

The following pages are a summary of the TAC pro/con analysis and a comparison of ~~component~~ costs for the components of the wastewater system. The complete pro/con analysis follows in Appendix B.

We appreciate being given this opportunity to serve our community and support the Board of Supervisor's efforts and decision-making process. We will continue to serve as directed.

William Garfinkel, TAC Chair — Rob Miller, TAC Vice-Chair

Engineering/Water Resources Committee
- John Brady
- Bob Semonsen
- John Fouche
- Russell Westmann

Finance Committee
- George Call
- James Furman
- Rob Shipe
- Karen Venditti

Environmental Committee
- Daniel Berman
- Marshall Ochylski
- Maria Kelly

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# EXECUTIVE SUMMARY OF PRO/CON ANALYSIS ON PROJECT COMPONENTS

# LOS OSOS WASTEWATER PROJECT – TECHNICAL ADVISORY COMMITTEE

## Executive Summary of Sites

The advantages of the out-of-town sites (Cemetery, Giacomazzi, Branin, which are adjacent to each other, as well as others) are that a larger site provides greater flexibility in treatment and biosolid technologies, and allows for alternative energy, regional solutions, future expansion and upgrades. They are in close proximity to agriculture for future water exchange and spray fields and/or wetlands that could be utilized as possible disposal options. They are also ~~outside of a low density residential area,~~ distant from community centers, and have a lower ~~right of wayway~~land acquisition cost. The ~~disadvantage is in the~~ disadvantages are the additional costs for piping wastewater from the collection area and the return of effluent to the community ground-water basin.

, and the sites are in the vicinity of a low density residential area.

The advantages of the Tri-W site are that it is central to the collection system and close to the proposed Broderson leach field. However, its downtown location (near library, church, community center) and the high density residential area require that the most expensive treatment technology site improvements and odor controls be employed, Also, there are higher traffic impacts to the community with the hauling of bio-solids offsite and the importation of materials. It has high construction costs, annual O&M, and ~~right of wayway~~land ~~acquisition costs~~value, along with the ~~a~~ ~~large~~largest carbon footprint. Its small size ~~lacks~~ limits flexibility for future expansion or upgrade.

| SITING | PROS | CONS |
|---|---|---|
| ~~Cemetery~~East of town sites | • ~~Adjacent to Giacomazzi: Potential of northern acreage for alternative energy, future expansion, upgrades~~<br>• No traffic impacts and are close to LOVR<br>• Minimal site improvements are required, as they are level and suitable for construction<br>• In-town community acceptance<br>• Class III (non-prime) ag land<br>• Low population density<br>• Proximity to spray fields and ag reuse ~~reduces cost of piping~~<br>• ~~Low population density~~<br>• ~~Sufficient acreage to build treatment facility~~ | • ~~Inadequate footprint to accommodate entire treatment facility~~<br>• ~~Questionable willingness of seller~~<br>• ~~Proximity to funeral events, visitors~~<br>• Increased cost and impacts to pipe influent from collection area and return treated effluent to Broderson<br>• Located in the vicinity of Falcon Ridge, a low density population area south of LOVR |
| ~~Giacomazzi~~Cemetery | • ~~Sufficient acreage to build treatment facility and adjacent to Branin and the Cemetery:~~<br>• ~~Flexibility~~ Adjacent to Giacomazzi: Potential of northern acreage for alternative energy, future expansion, upgrades<br>• ~~Screened from LOVR~~<br>• ~~Low population density~~<br>• ~~Willing seller~~<br>• ~~Community acceptance of out-of-town site~~<br>• ~~Proximity to spray fields and ag reuseSufficient acreage to build treatment facility~~ | • ~~Increased cost and impacts to pipe influent from collection area~~<br>• ~~Distance from potential Broderson leach field~~Inadequate footprint to accommodate entire treatment facility<br>• Questionable willingness of seller<br>• Proximity to funeral events, visitors<br>• Proximity to Falcon Ridge, a low density population area |
| ~~Branin~~Giacomazzi | • ~~Adjacent to Giacomazzi: Potential~~Sufficient acreage to build treatment facility and adjacent to Branin and the Cemetery:<br>• Flexibility for ~~wetland storage,~~ alternative energy, future expansion, upgrades<br>• ~~Proximity to spray fields and ag reuse~~Screened from LOVR<br>• ~~Low population density~~<br>• Willing seller<br>• ~~Community acceptance of out-of-town site~~<br>• Farther from Falcon Ridge than the Cemetery property<br>• Falcon Ridge is not in an apparent down wind position from this property | • ~~Inadequate footprint to accommodate some types of treatment facilities~~<br>• ~~Proximity to Warden Lake~~ |
| ~~Tri-W~~Branin | • ~~Already owned by CSD~~<br>• ~~Site of project already mitigated and tribal agreements in place, which may shorten construction time~~<br>• ~~Central location reduces cost of collection system~~<br>• ~~Proximity to potential Broderson leach fields~~Adjacent to Giacomazzi: Potential for wetland storage, alternative energy, future expansion, upgrades<br>• Farther from Falcon then the Cemetery property<br>• Falcon Ridge is not in an apparent down wind position from this property | • ~~Very high land value and mitigation requirements~~<br>• ~~Small acreage in downtown locations requires most expensive treatment and higher costs overall~~<br>• ~~Lacks flexibility for future expansion, upgrades, or alternative energy~~<br>• ~~High risk associated with system failure due to proximity to Bay~~<br>• ~~High population density, proximity to church, library, community center.~~<br>• ~~Traffic impacts in center of town~~<br>• ~~Greatest distance to spray fields and ag reuse~~<br>• ~~ESHA – sensitive dune habitat~~<br>• ~~Partial view obstruction of Morro Rock~~<br>• ~~Inconsistent with LO vision statement; lacks community~~ |

| | | |
|---|---|---|
| | | ~~acceptance~~<br>• Inadequate footprint to accommodate some types of treatment facilities<br>• Proximity to Warden Lake and Warden Creek |
| **Tri-W** | • Already owned by CSD<br>• Site of project already mitigated and tribal agreements in place, which may shorten construction time<br>• Central location reduces cost of collection system<br>• Proximity to potential Broderson leach fields | • Very high land value and mitigation requirements<br>• Small acreage and location in ~~downtown~~ center of town~~s~~ require most expensive treatment and higher costs overall<br>• Limited flexibility for future expansion, upgrades, or alternative energy<br>• Greater risk associated with system failure due to proximity to Bay<br>• Proximity to church, library, community center; high density population area<br>• Traffic impacts in center of town<br>• Greatest distance to spray fields and ag reuse<br>• ESHA – sensitive dune habitat<br>• Partial view obstruction of Morro Rock<br>• ~~Inconsistent with LO vision statement; lacks community acceptance~~Source of community divisiveness |

COMMENTS

- ~~All East of town sites have no traffic impacts and are close to LOVR. In addition minimal site improvements are required, they are level and suitable for construction Class III ag land.~~
- All sites are tributary to the Morro Bay National Estuary and pose a potential risk in the event of failure. Tri-W poses a higher risk due to the reduced intervening area and limited on-site storage
- NOTE: It was the unanimous opinion of the NWRI that an out of town site is better due to problematic issues with the downtown site.

## Executive Summary of Treatment Technologies ~~Pro/Con~~

With tertiary and denitrification treatment included, Oxidation Ditch~~ and ~~, BIOLAC, and Facultative Ponds are very similar in ~~cost, footprint and results.~~ construction costs and annual O&M. BIOLAC has lower capital costs than Oxidation Ditch, but they both have similar ~~annual O&M costs.~~ footprints and results. With Gravity collection they require a larger footprint and may cause greater impact on biological and archeological resources.

The advantages of Facultative ponds are that they have the lowest ~~capital cost and annual O&M. They also have the lowest~~ energy usage, and they minimize ~~the~~ costs relating to solids treatment and handling. The disadvantage is that ponds require ~~the largest~~a larger footprint~~ and produce methane in the process~~.

The advantage of MBR is that it produces the highest quality of effluent, allowing for greater flexibility in disposal options. It also requires the smallest footprint, which makes it ~~easier~~feasible to ~~control odors.~~enclose all aspects of the process. The disadvantages of MBR are that it is the most expensive technology, both in capital costs and annual O&M, and requires the highest energy ~~consumption and cost~~usage.

| TREATMENT | PROS | CONS |
|---|---|---|
| **Oxidation Ditch** | • Small footprint (8 acres)<br>• ~~Lower annual O&M with STEP~~ Energy usage - STEP 800,000 kWh/yr; Gravity 900,000 kWh/yr | ~~•~~ Higher capital costs than BIOLAC<br>• ~~Higher annual O&M with Gravity~~ |
| **BIOLAC** | • Lower capital costs than Oxidation Ditch-<br>• Small footprint (8-10 acres)<br>• Lower ~~annual O&M~~energy usage with STEP (800,000 kWh/yr) | ~~• Higher annual O&M with Gravity~~<br>• Higher energy usage with Gravity collection (1.1M kWh/yr) |
| **Ponds** | ~~• Lowest capital costs~~<br>~~• Lowest annual O&M~~<br>• Lowest energy usage (600,000 kWh/yr)<br>• Eliminates cost of solids treatment<br>• Greatly reduces solids production and disposal (dredging required once every 20 years) | • Requires larger footprint (16-20 acres)<br>• May require additional nitrification/denitrificaqtion treatment with STEP<br>• ~~Releases~~Further investigation is required to determine if ponds release methane gas (more powerful greenhouse gas than CO2)<br>• Greater construction impacts |
| **MBR** | • Requires smallest footprint (4 acres)<br>• Higher quality of effluent, suitable for discharge at Broderson leach field<br>• Enclosed facility controls odors | • ~~Extremely high~~Highest capital cost<br>• Highest annual O&M<br>• Highest energy usage (1.3M kWh/yr. EIR indicated 2.1M and expected to increase with time)<br>~~• Higher annual O&M~~<br>• High construction nuisance in center of town |

COMMENTS

- All four treatment methods are proven reliable and will meet the requirements of secondary treatment.
- ~~•~~ Tertiary treatment ~~required for all treatment methods.~~
- is likely to be required. If draft ground-water recharge regulations are applied in the future, then advanced treatment (beyond tertiary) may be required.
- ~~All four treatment methods require higher frequency of sludge removal with gravity.~~
- ~~(engineering) There is~~ With full tertiary and denitrification treatment included, there is only a small difference in construction costs and O&M between Oxidation Ditches, Biolac and Facultative Ponds.

- Treatment processes with elements open to the atmosphere have a higher odor potential in the event of system failure. However, such risks can be effectively mitigated through design redundancy and appropriate siting.
- All four treatment methods produce a greater volume of sludge with a gravity collection system.

## Executive Summary of Collection Systems ~~Pro/Con~~

The advantages of Gravity are that it has lower annual O&M costs and it has less impact on individual properties. The greatest concerns of Gravity are that it has higher capital costs~~;~~ and has greater impacts of construction, i.e. trenching up to ~~30~~23 feet, dewatering, and longer street closures~~; and greater risks associated with~~. There is also a greater potential for infiltration of groundwater and inflow of storm water (I/I~~ and system failure~~). Gravity collection will have ~~long term street~~permanent impacts due to lift stations and manhole maintenance. Also, Gravity collection results in significantly higher bio-solids handling at the treatment facility.

The advantages of STEP/ STEG are that it has lower capital costs; it provides primary treatment in the septic tank, thereby reducing the costs associated with ~~treatment and~~ solids; has less road impacts due to smaller pipe and shallow trenching or directional drilling; and ~~reduces~~may reduce the risk of archeological impacts and resultant delays. The greatest concerns are with higher annual O&M costs, and ~~short term and permanent~~ impacts on individual properties, both during construction and ongoing, including pumping of septic tanks with attendant odor and traffic.

| COLLECTION | PROS | CONS |
|---|---|---|
| **Gravity** | • Lower annual O&M costs for collection<br>• Less on-lot disturbance~~ to homeowner~~.<br>• No easement or access required on private property<br>• No requirement to haul septage within the collection area | • Higher capital costs<br>• Longer time to construct<br>• Impact on treatment costs (higher capital costs, and annual O&M)<br>• Increases cost of solids treatment and disposal<br>• ~~Higher risk of raw sewage spilling into Bay in event of system failure~~<br>• Increased risk of I/I over time; may require additional cost of monitoring/ repair program<br>• Requires deeper trenching and dewatering, resulting in need to protect water quality from disposal of collected water, significant soil erosion, traffic nuisance<br>• Higher risk of impacts on archeological resources may result in delays, additional cost<br>• 20 Pump stations have permanent impact, requiring additional footprint and odor control<br>• ~~Potential odor issues at manholes, lift stations~~<br>• Greater ~~amount of~~ road ~~restoration~~impacts resulting in longer closures and traffic nuisance<br>• Gravity collection pipes require cleaning every 2 years ("pigging out") with attendant odors |
| **STEP/STEG** | • Lower capital costs<br>• Shorter time to construct ~~street mains (9 months)~~<br>• Provides primary treatment in septic tank, thereby reducing down-line costs for treatment system and solids treatment/ disposal<br>• ~~Effluent contains minimal solids, reducing risk and cost of clean-up in event of system failure~~<br>• Shallow trenching and Horizontal Directional Drilling (HDD) where feasible, results in less road impacts and traffic nuisance, less risk to archeological resources and associated delays<br>• Requires no lift stations, reducing footprint requirements<br>• Minimal risk of I/I and resulting impact on ~~Load~~Flow | • Higher annual O&M costs for collection<br>• May require additional nitrification/denitrification treatment for disposal options<br>• If SRF loan is used, may require separate electrical connection premium<br>• ~~Permanent~~Construction and permanent impact on individual property, including footprint<br>• Increased risk of impact on archeological resources due to new septic tanks<br>• Nuisance and cost of regular pumping of septic tanks<br>• Potential odor issues of vents if not properly maintained (200-500 collection vents ~~scattered around~~located throughout community) ~~if not properly maintained~~<br>• Higher total on-lot capital costs; unknown amount is homeowner responsibility; may be affected by funding<br>• Individual properties have many active on-lot ~~component systems~~components including pumps, sensors, alarms that require periodic maintenance and have a greater risk of failure. |

COMMENTS

- Note that ~~97~~63% of trenching in town is less than 10 feet deep; 34% from 10 to 14 feet deep; 2% from 14 to 18 feet deep; and 1% from 18 to 23 feet deep (which is .4 mile).
- Both systems result in abandonment of existing septic tanks.
- On-lot costs may not be covered if SRF funding is used for a STEP system
- ~~(engineering)~~ Considering life cycle costs for construction and O&M, the two systems ~~appear~~ are comparable.

- It is recommended that the Project Team investigate the history of spills (based on miles and age) and characterize the inherent risks of both Gravity and STEP collection systems.

# LOS OSOS WASTEWATER PROJECT – TECHNICAL ADVISORY COMMITTEE

## Executive Summary of Solids Treatment and Disposal Pro/Con

While Sub-Class B solids require the lowest capital costs, they have the highest risk for disposal costs and more stringent regulations in the future. Composted Class A bio-solids are the preferred solution and should be the ultimate goal of any sewage treatment system. All lower classes of solids should be viewed as short-term measures with the intent to be upgraded inhave the future.

highest capital costs and annual O&M, but offer greater sustainability, flexibility, controllability, and are environmentally friendly.

Facultative ponds offer the least amount of solids generation and handling. It is recommended that, when ponds are dredged (every 15-20 years), further composting of solids be considered to produce Class A bio-solids.

Of note: Although solids treatment and disposal represent a very small portion of construction costs, they represent up to 42% of annual O&M costs. A STEP/STEG collection system significantly reduces the volume of bio-solids produced.

| BIO-SOLIDS | PROS | CONS |
|---|---|---|
| **Sub Class B** | • Lowest capital cost for treatment<br>• Low annual O&M<br>• Flexibility to be upgraded<br>• Low acreage requirements | • Produces greatest volume of sludge<br>• Most restrictive disposal option and highly dependent on availability of receiver sites<br>• Largest carbon footprint: Highesthighest hauling costs and traffic nuisance in center of town<br>• Produces lowest quality of sludge; may require additional treatment for disposal<br>• Risk of substantial increase in hauling costs and more stringent regulations |
| **Digested and/or Heat Dried Class B**<br><br>NOTE: Heat dried process is typically used to produce Class A bio-solids. Since it has higher capital costs and O&M, it has been eliminated in this comparison. | Produces lower volume of sludge<br>Lower hauling costs and traffic nuisance than Sub-Class B<br>Flexibility for future upgrade<br>Greater range of dispersaldisposal options<br>Smaller footprint<br>• Digestion is amenable to odor control<br>• Heat-dried reduces volume of solids and has potential to generate Class A bio-solids | Higher capital cost for treatment<br>Higher annual O&M<br>Limited disposal options<br>• Higher energy use for heat dried<br>Heat-dried has higher capital costs and O&M, requires complex operations, generates dust, and has higher potential for odors |
| **Composted Class A** | Produces lower volume of bio-solids, minimal hauling costs<br>Produces highest quality of bio-solids with greatest range of disposal options<br>• Potential regional solution; could generate revenue<br>Potential revenue generation | Higher capital costs<br>Higher annual O&M<br>Requires supply of bulking agent and adequate user demand<br>RegulationsFuture regulations may limit direct land application |
| **Facultative Ponds** | Requires no ongoing sludge treatment or disposal. Ponds would be dredged approximately every 20 years, with amortized costs of $30k- $50k per year. | |

COMMENTS

- Solar drying is low in construction costs but requires additional acerageacreage and may presents an odor issue-.

- STEP/ STEG collection system significantly reduces the volume of solids produced.
- Community may be willing to pay a higher cost to achieve a higher quality of bio-solids to ensure sustainability and controllability.

# LOS OSOS WASTEWATER PROJECT – TECHNICAL ADVISORY COMMITTEE

## Executive Summary of Effluent Reuse/ Disposal ~~Pro/Con~~

Since the groundwater basin is the sole source of water supply, the way ~~the~~treated wastewater ~~treatment plant~~ effluent is managed will have a major influence on the sustainable yield of the basin in terms of both volume and quality.

It appears that no one disposal option can provide benefits of seawater intrusion mitigation and accommodate the full requirements of the wastewater system - it will require an array of options to accomplish both. ~~We believe that leach fields at~~ Broderson should be part of any project in order to assure maximum recharge of the aquifer.

Due to the cost of land acquisition~~,~~ as well as water lost to the groundwater basin, disposal at spray fields are ~~considered a last resort, a back~~best viewed as a start-up plan ~~in the event that other disposal options are not available. We encourage the County to consider agricultural disposal at farms outside~~and emergency discharge option. In lieu of purchasing spray field property and installing associated transmission pipelines, the purchase of ag land within the basin ~~before considering spray fields at Tonini~~provides a water supply benefit, and may not result in a higher total project cost.

| DISPOSAL | PROS | CONS |
|---|---|---|
| **Spray Fields~~*~~**<br><br>Capacity 1190 AFY<br>Mitigation = -0- | • Greatest capacity (up to 1190 AFY); with start-up operations and emergency discharge.<br>• Lower treatment requirements (tertiary and denitrification treatment probably not required)<br>• Future flexibility<br>• Purveyor and/or third party participation not required | • Zero Seawater Intrusion (SWI) Mitigation<br>• ~~Negative~~Substantial, long-term negative impact on groundwater balance; no agricultural reuse/ exchange.<br>• Greatest footprint and highest land costs<br>• ~~Highest~~Higher capital costs for pipe to fields ~~and higher risks for trenching~~<br>• ~~Seasonal~~<br>• Potential environmental impacts of trenching pipelines<br>• Salt loading in soils |
| **Cemetery Reuse**<br><br>Capacity 50 AFY<br>Mitigation = 5 AFY | • ~~Proximity to out-of-town site reduces pipe costs~~ | • Limited capacity (50 AFY)<br>• Minimal SWI Mitigation factor<br>• ~~Seasonal~~<br>• ~~Higher treatment required – tertiary~~Tertiary and partial denitrification required<br>• Requires contract with end user |
| **Agricultural In-lieu**<br><br>Capacity 460 AFY<br>Mitigation = 46 AFY | • Potentially reduces pumping large volumes from aquifer<br>• ~~Proximity to Giacomazzi site reduces pipe costs~~<br>• Flexibility to upgrade to Ag Exchange | • Low SWI Mitigation<br>• ~~Higher treatment required – tertiary~~Tertiary and partial denitrification required<br>• Requires contract with end user, which may take time to obtain<br>• ~~Seasonal~~ |
| **Agricultural Exchange**<br><br>Capacity 460 AFY<br>Mitigation = 250 AFY | • Highest SWI Mitigation<br>• ~~Proximity to out-of-town site reduces pipe costs~~ | • ~~Seasonal~~<br>• ~~Higher treatment required – tertiary~~Tertiary and partial denitrification required<br>• Requires contract with end user, which may take time to obtain<br>• Requires purveyor participation |
| **Broderson**<br><br>Capacity 448 AFY<br>Mitigation = 100 AFY | • Moderate capacity (448 AFY without Harvest Wells)<br>• Moderate SWI Mitigation factor<br>• Purveyor participation not required<br>• Already owned by CSD<br>• Only ~~known~~ method studied to directly recharge upper aquifer | • High capital costs<br>• Distance from out-of-town site increases piping costs<br>• Higher treatment required - full ~~denitridication~~denitrification<br>• Construction impacts and costs from monitoring wells<br>• Large footprint and high land value ($4.7M)<br>• High risk of more stringent DHS regulations in future ~~(Total Organic Carbon concentration, and travel time/ distance to nearest production well) NWRI: If Broderson is used, it is important to evaluate compliance with new DHS Groundwater Recharge Reuse criteria.~~<br>• ~~EIR: Broderson is subject to land sliding once disturbed, due to sandy soils and 10% slope at southern portion of northern 40 acres~~<br>• ~~EIR: Leach field trenches pose significant risk of liquefaction~~<br>• ~~Higher capacity~~Capacity greater than 448 AF requires harvest wells, incurring additional capital costs, annual O&M, and purveyor participation<br>• Grading impacts on habitat (initial construction and reconstruction every 10 years<br>• |

COMMENTS

- The Finance Group recognizes the importance of mitigating Seawater Intrusion, but believes that associated costs should be paid for by the entire groundwater basin community.
- According to the most recent studies, it is possible to meet the demand for water using only the groundwater basin as the source of supply. However, this is highly dependent on the implementation of an agricultural exchange program of sufficient size and the use of the Broderson leach field.
- Cemetery and agricultural reuse options are in proximity to the east-of-town sites. These areas are located a great distance from drinking water supply wells, and irrigation of recycled water is applied at agronomic rates.
- All disposal options except Broderson require winter storage. The long detention time of treated wastewater and extended exposure to sunlight, provides a supplemental level of treatment.
- Liquefaction, water application rates, surface erosion, and landslide risks are community concerns. The availability of multiple disposal options will allow for the gradual ramp up, testing, and verification of performance at Broderson.
- NWRI: If Broderson is used, it is important to evaluate compliance with new DHS Groundwater Recharge Reuse criteria.
- The TAC recognizes the fact that water supply operations and wastewater disposal practices require a highly coordinated approach. However, the TAC believes that the wastewater and water purveyors should agree to manage the basin in a manner that will ensure costs are equitably shared.

# LOS OSOS WASTEWATER PROJECT – TECHNICAL ADVISORY COMMITTEE

# COMPARISON OF COMPONENT COSTS FROM FINE SCREENING ANALYSIS

## COLLECTION COST COMPARISON

| | Gravity | STEP/ STEG |
|---|---|---|
| **Total Construction and Homeowner Costs** (1) (2) | **$80.3M - $89.7M** | **$64.8M - $81.2M** (3) |
| **Annual Operations & Maintenance Costs** | **$450,000** (4) | **$745,000** (4) |

(1) ~~Not including~~Costs for installing separate electrical ~~premium.~~service/ panels are not included, but may be required for SRF funding
(2) Homeowners' on-lot costs are not part of gravity collection project costs, but are included here for comparison purposes only.
(3) Additional research is required to determine if STEP costs for overhead, profit and taxes are already included. If so, the total construction costs would be lower by $10.6M to $13.2M.
(4) STEP's ~~septic~~septage hauling costs ($150k) are included here. ~~Gravity's~~There is no septage hauling ~~costs are included in Bio-solids, Sub Class B costs~~for Gravity within the collection area.

## TREATMENT COST COMPARISON

| Treatment Technology | Total Capital Costs Level 2 Treatment | | Annual O&M Level 2 Treatment | | Energy Requirements (Kilowatt hours/ year) | | ~~Acerage~~Acreage Required | |
|---|---|---|---|---|---|---|---|---|
| | Gravity | STEP | Gravity | STEP | Gravity | STEP | Gravity | STEP |
| **Oxidation Ditches** | $22.6M | ~~$21.7M~~$23.1 M | $720,000-$790,000 | $~~60~~850,000-$~~760~~920,000 | 900,000 | 800,000 | 8 | 8 |
| **BIOLAC** | $19.9M | ~~$19.4M~~$20.8M | $730,000-$800,000 | $~~670~~830,000-$~~740~~900,000 | 1,100,000 | 800,000 | 10 | 8 |
| **Facultative Ponds** | ~~$22.8M~~$25.1M | ~~$21.7M~~$24.0M | ~~$695~~$910,000-$~~765~~980,000 | ~~$695~~$910,000-$~~765~~980,000 | 600,000 | 600,000 | 20 ~~(4)~~ | 20 ~~(4)~~ |
| **MBR – Tri-W** | $55.0M | NA | ~~$700~~ $1,200,000 | NA | 1,300,000 (3) | NA | 4 | NA |

~~Assumptions:~~
~~(1) Denitrification needed for 0.8 MGD side stream at peak winter flow.~~
~~(2) Full 1.4M flow treated to tertiary level for agriculture, urban reuse, and future regulations.~~

NOTE: Report uses 1.4mgd in all final cost calculations. STEP costs should be recalculated based on 1.2mgd.

Assumptions:
(1) Includes Denitrification for full flow.
(2) Full 1.4M flow treated to tertiary level for agriculture, urban reuse, and future regulations.
(3) Tri-W/ MBR energy usage may be higher. EIR indicated 2.1M kWh/yr, and expected that to increase.

## SOLIDS TREATMENT AND DISPOSAL COMPARISON

| BIO-SOLIDS Alternatives | Capital Costs | | Annual O&M | | Bio-solids Produced Tons/ year (2) | | Acres Required for Solar Drying | |
|---|---|---|---|---|---|---|---|---|
| | Gravity | STEP | Gravity | STEP | Gravity | STEP | Gravity | STEP |
| **Sub Class B** | $1.9M - $2.4M | $1.1M - $1.7M | $430k - $470k | $190k - $270k | 4,056 | 1,014 | 5.7 | 1.4 |
| **Digested Class B** | $4.2M - $4.7M | $2.4M - $3.4M | $420k - $460k | $220k - $310k | 3,103 | 776 | 4.4 | 1.1 |
| **Heat Dried B** | $5.4M - $6.2M | $3.1M - $4.8M | $600k - $640k | $340k - $480k | 1,043 | 261 | | |
| **Composted Class A** | $3.4M - $4.2M | $2.0M - $3.3M | $600k - $635k | $350k - $505k | | | | |
| **Facultative Ponds** | -0- | -0- | $ 40k - $ 50k | $ 30k - $ 40k | (1) | (1) | | |

(1) ~~(1)~~ Bio-solids will be dredged and hauled approximately every 20 years. STEP produces approximately 80% less solids than Gravity.
(2) Includes consideration of septage hauling to treatment plant

## EFFLUENT REUSE/ DISPOSAL COMPARISON

| Reuse/Disposal Level | Capital Costs | Annual O&M Costs | Land (Spray field) | Storage | Seawater Intrusion Mitigation |
|---|---|---|---|---|---|
| **Level 1a: Full Ag Reuse** | $12.7M - $14.3M | $100k - $190k | 170 acres = $5.1M | 290 AF | 140 AFY |
| **Level 1b: No Ag Reuse** | $12.8M - $15.6M | $125k - $275k | 280 acres = $8.4M | 210 AF | 90 AFY |
| **Level 2a: Full Ag Reuse** | $13.2M - $13.9M | $400k - $440k | 70 acres = $2.1M | 140 AF | 240 AFY |
| **Level 2b: No Ag Reuse** | $14.9M - $16.7M | $440k - $530k | 180 acres = $5.4M | 30 AF | 190 AFY |
| **Level 3a: With Full Ag Use** | $25.6M - $27.3M | < $400k (1) | 10 acres = $0.4M | 115 AF | |

| | | | | | |
|---|---|---|---|---|---|
| **and Broderson** | | | | | |

(1) (1) According to County staff, the O&M number in the Fine Screen needs to be revised downward.

(2) It is outside the scope of TAC's work to compare effluent disposal options which recharge the groundwater basin, and the cost of importing water. However, preliminary cost estimates for importing water are found in Appendix A of the Fine Screen Report. Other considerations include availability, reliability, quality, and environmental impacts associated with outside water sources.

# APPENDIX A

# CRITERIA FOR PRO/CON ANALYSIS

# AD-HOC COMMITTEE'S CRITERIA FOR PRO/CON ANALYSIS

## EFFULENT DISPOSAL/WATER RESOURCES

**Engineering & Water Resources**

- Level of control over disposal options, multi-faceted approach that does not depend on 3rd parties.
- Cost of various disposal options.
- Retain water in the basin for sustainability and increased yield.
- Seawater intrusion mitigated.
- Water Purveyors input and acceptance.
- Stakeholders input and acceptance.
- Energy

**Environment**

- Construction disturbance
- Impact on biological resources
- Community impact
- System failure
- Land use compatibility
- Surface water quality
- Effluent quality
- Aquifer recharge
- Saltwater intrusion

**Financial**

- Capital Costs:
  - Land acquisition
  - Construction costs
  - Road impacts
  - Cost for individual hook-up
  - Cost of future upgrades
  - Potential environmental mitigation costs
- Operations & Maintenance Costs
  - Energy requirements
  - Labor, materials, overhead
  - Cost of solids handling/ disposal
  - Projected schedule for repairs, replacements, and maintenance
- Financial Risk Factors
  - Construction risks associated with archeological and biological impacts
  - Costs relating to system failure risks
  - Cost of achieving groundwater balance
  - Cost of potential repairs resulting from natural disasters (earthquake, flood)
  - Risk of inflated costs and uncertainty of 3rd party handling and/or participation
- Funding Factors
  - Eligibility for best financing (rate, terms, engineering constraints, flexibility, timing)
  - Grant eligibility, attractiveness
  - Conducive to 3rd party financial participation
  - Potential for revenue generation

## TREATMENT TECHNOLOGY

**Engineering & Water Resources**

- Flexibility of treatment process to meet future needs and regulations.
- Demonstrated reliability of process.
- Effect of process on bio-solids production.
- Cost consideration, replacement, operation and maintenance.
- Energy.

**Environment**

- Construction disturbance
- Impact on biological resources
- Community impact
- System failure
- Impact on archaeological resources
- Energy use

**Financial**

- Capital Costs:
  - Land acquisition
  - Construction costs
  - Road impacts
  - Cost for individual hook-up
  - Cost of future upgrades
  - Potential environmental mitigation costs

**Financial**

- Operations & Maintenance Costs
  - Energy requirements
  - Labor, materials, overhead
  - Cost of solids handling/ disposal
  - Projected schedule for repairs, replacements, and maintenance
- Financial Risk Factors
  - Construction risks associated with archeological and biological impacts
  - Costs relating to system failure risks
  - Cost of achieving groundwater balance
  - Cost of potential repairs resulting from natural disasters (earthquake, flood)
  - Risk of inflated costs and uncertainty of 3rd party handling and/or participation
- Funding Factors
  - Eligibility for best financing (rate, terms, engineering constraints, flexibility, timing)
  - Grant eligibility, attractiveness
  - Conducive to 3rd party financial participation
  - Potential for revenue generation

## BIO-SOLIDS TREATMENT & DISPOSAL

**Engineering & Water Resources**

- Maintain control of disposal process.
- Flexibility of bio-solid process and disposal.
- Nuisance assessment of bio-solids process and disposal.
- Cost of process facilities, operations and maintenance, and ultimate disposal.
- Energy

**Environment**

- Volume
- Class
- Community impact
- Traffic

**Financial**

- Capital Costs:
  - Land acquisition
  - Construction costs
  - Road impacts
  - Cost for individual hook-up
  - Cost of future upgrades
  - Potential environmental mitigation costs
- Operations & Maintenance Costs
  - Energy requirements
  - Labor, materials, overhead
  - Cost of solids handling/ disposal
  - Projected schedule for repairs, replacements, and maintenance
- Financial Risk Factors
  - Construction risks associated with archeological and biological impacts
  - Costs relating to system failure risks
  - Cost of achieving groundwater balance
  - Cost of potential repairs resulting from natural disasters (earthquake, flood)
  - Risk of inflated costs and uncertainty of 3rd party handling and/or participation
- Funding Factors
  - Eligibility for best financing (rate, terms, engineering constraints, flexibility, timing)
  - Grant eligibility, attractiveness
  - Conducive to 3rd party financial participation
  - Potential for revenue generation

## TREATMENT PLANT SITE

**Engineering & Water Resources**

- Sufficient in size to meet environmental and potential future expansion needs.
- Minimize fluid transport costs.
- Minimize land costs, to include environmental mitigation costs.
- Site conditions with regards to constructability.

**Environment**

- Construction disturbance
- Community impact
- Impact on biological resources
- System failure risk
- Impact on archaeological resources
- Land use compatibility
- Growth Inducement

**Financial**

- Capital Costs:
  - Land acquisition
  - Construction costs
  - Road impacts
  - Cost for individual hook-up
  - Cost of future upgrades
  - Potential environmental mitigation costs
- Operations & Maintenance Costs
  - Energy requirements
  - Labor, materials, overhead
  - Cost of solids handling/ disposal
  - Projected schedule for repairs, replacements, and maintenance
- Financial Risk Factors
  - Construction risks associated with archeological and biological impacts
  - Costs relating to system failure risks
  - Cost of achieving groundwater balance
  - Cost of potential repairs resulting from natural disasters (earthquake, flood)
  - Risk of inflated costs and uncertainty of 3rd party handling and/or participation
- Funding Factors
  - Eligibility for best financing (rate, terms, engineering constraints, flexibility, timing)
  - Grant eligibility, attractiveness
  - Conducive to 3rd party financial participation
  - Potential for revenue generation

## COLLECTION SYSTEM

**Engineering & Water Resources**

- Life cycle costs.
- Design life.
- Property impact for both private and public properties.
- Reliability of System.
- Environmental impact of system.
- Infiltration and inflow potential.
- Energy.

**Environment**

- Construction disturbance
- Impact on biological resources
- Community impact
- System failure risk
- Impact on archaeological resources

**Financial**

- Capital Costs:
  - Land acquisition
  - Construction costs
  - Road impacts
  - Cost for individual hook-up
  - Cost of future upgrades
  - Potential environmental mitigation costs
- Operations & Maintenance Costs
  - Energy requirements
  - Labor, materials, overhead
  - Cost of solids handling/ disposal
  - Projected schedule for repairs, replacements, and maintenance
- Financial Risk Factors
  - Construction risks associated with archeological and biological impacts
  - Costs relating to system failure risks
  - Cost of achieving groundwater balance
  - Cost of potential repairs resulting from natural disasters (earthquake, flood)
  - Risk of inflated costs and uncertainty of 3rd party handling and/or participation
- Funding Factors
  - Eligibility for best financing (rate, terms, engineering constraints, flexibility, timing)
  - Grant eligibility, attractiveness
  - Conducive to 3rd party financial participation
  - Potential for revenue generation

# APPENDIX B

# PRO/CON ANALYSIS ON PROJECT COMPONENTS

# LOS OSOS WASTEWATER PROJECT – TECHNICAL ADVISORY COMMITTEE

# TAC PRO/CON ANALYSIS ON PROJECT COMPONENT ALTERNATIVES

## TREATMENT PLANT SITES

| CRITERIA | PROS | CONS |
|---|---|---|

## Cemetery

### ENGINEERING & WATER RESOURCES

| CRITERIA | PROS | CONS |
|---|---|---|
| **Sufficient in size to meet environmental and potential future expansion needs** | Site is large and preliminary review indicates all of the property is usable with the exception of the cemetery operation and its potential expansion area, as well as a known archaeological site. | The property is partially occupied by a business enterprise which may expand use on property. |
| | Adjacent to other candidate plant sites – potentially advantageous for future expansion options | A known archaeological site is located on the property |
| **Minimize fluid transport costs** | Located in close proximity to agricultural lands and the cemetery | Located away from collection system area |
| | Located mid-way between town and potential spray fields | Located distant from the potential Broderson leach field site |
| **Minimize land costs, to include environmental mitigation costs** | Due to non-urbanized land use, the land value is less. | A viable business enterprise currently occupies a portion of the property and may expand to include a larger portion of the property in the future |
| | | Site located within 500 feet of a low density residential neighborhood |
| **Site conditions with regards to constructability** | Site is level and soils are suitable for construction | |
| | Water table is not an apparent construction issue at this site | |

### ENVIRONMENTAL

| CRITERIA | PROS | CONS |
|---|---|---|
| **Construction impact** | Low population Density | Some Soil Erosion Potential |
| | Visual Screening | Proximity to Community Cemetery (Proximity greatest at Cemetery site) |
| | Construction Traffic out of town | Trenching to and from town |
| **Community impact** | Low population Density | Proximity to Community Cemetery |
| | Natural Screening | Future Cemetery expansion could increase proximity |
| **Impact on biological resources** | Minimal habitat value on site – some small areas of Sensitive Resources | Trenching to and from town, including crossing Los Osos Creek |
| | | Proximity to Warden Lake (Branin> Giacomazzi> Cemetery) |
| **System failure risk** | Site area adequate for on-site containment (Branin may be small, depends on treatment technology footprint) | Proximity to Warden Lake (Branin> Giacomazzi> Cemetery) |
| **Impact on archaeological resources** | | Limited information available: previously identified sites on portions of Cemetery and Branin |
| | | Trenching to and from town |
| **Energy Use** | Site areas generally large enough to provide potential for alternative energy options | Energy requirements for pumping sewage out of town and effluent back in. |
| **Land use plans and policies** | Compatible | |
| **Agriculture Land Use** | | Loss of Ag Land (Class III – not highly productive) |

# TREATMENT PLANT SITES

| CRITERIA | PROS | CONS |
|---|---|---|

## Cemetery

### FINANCIAL

| | | |
|---|---|---|
| **Capital Costs**<br>• Land Acquisition<br>• Cost of road impacts, repairs<br>• Cost implications to collection system, piping<br>• Flexibility for future expansion | | Cemetery occupies ~19A of 47.5; they require an additional 10A for expansion. Of the 17.5A remaining, ~8-9A are unusable (archeological area). This leaves ~8.5A (18%) usable land. |
| | | Willingness of seller is highly questionable |
| | | Higher cost for piping wastewater to treatment center |
| | | Construction nuisance (air quality, noise, traffic, visual impacts) due to proximity to cemetery |
| | | Cost to build intersection with LOVR |
| **Operation & Maintenance**<br>• Energy requirements | Lower cost to pipe effluent to spray fields and/or to farms for ag in-lieu or ag exchange | Ongoing nuisance to cemetery (air quality, odors, noise, traffic, visual impacts, light pollution) |
| | | Site allows little or no space for future expansion; upgrade in solids handling; wet winter or emergency storage; or cost-saving disposal or alternative energy options. |
| **Financial Risks**<br>▪ Potential costs relating to system failures | | No space for storage to mitigate system failure risks |
| | | Higher cost to pipe to Broderson leach field |
| **Funding Factors**<br>▪ Potential for revenue generation | | Insufficient acreage for revenue-generating options |

# TREATMENT PLANT SITES

| CRITERIA | PROS | CONS |
|---|---|---|

## Giacomazzi

### ENGINEERING & WATER RESOURCES

| | | |
|---|---|---|
| **Sufficient in size to meet environmental and potential future expansion needs** | Site is large and preliminary review indicates all of the property is useable | |
| | No apparent environmental issues present that would constrain development and expansion options | |
| | Adjacent to other candidate plant sites, this may be advantageous for future expansion options. | |
| **Minimize fluid transport costs** | Located in close proximity to agricultural lands and the cemetery | Located away from collection system area |
| | Located mid-way between town and potential spray fields | Located distant from the potential Broderson leach field site |
| **Minimize land costs, to include environmental mitigation costs** | Due to non-urbanized land use, the land value is less | |
| | Reduced potential for odor control | |
| | Construction traffic out of town | |
| **Site conditions with regards to constructability** | Site is level and soils are suitable for construction | |
| | Water table is not an apparent construction issue at this site | |

### ENVIRONMENTAL

| | | |
|---|---|---|
| **Construction impact** | Low population Density | Some Soil Erosion Potential |
| | Visual Screening | Proximity to Community Cemetery (Proximity greatest at Cemetery site) |
| | Construction Traffic out of town | Trenching to and from town |
| **Community impact** | Low population Density | Proximity to Community Cemetery |
| | Natural Screening | Future Cemetery expansion could increase proximity |
| **Impact on biological resources** | Minimal habitat value on site – some small areas of Sensitive Resources | Trenching to and from town, including crossing Los Osos Creek |
| | | Proximity to Warden Lake (Branin> Giacomazzi> Cemetery) |
| **System failure risk** | Site area adequate for on-site containment (Branin may be small, depends on treatment technology footprint) | Proximity to Warden Lake (Branin> Giacomazzi> Cemetery) |
| **Impact on archaeological resources** | | Limited information available: previously identified sites on portions of Cemetery and Branin |
| | | Trenching to and from town |
| **Energy Use** | Site areas generally large enough to provide potential for alternative energy options | Energy requirements for pumping sewage out of town and effluent back in. |
| **Land use plans and policies** | Compatible | |
| **Agriculture Land Use** | | Loss of Ag Land (Class III – not highly productive) |

### FINANCIAL

| | | |
|---|---|---|
| **Capital Costs**<br>• Land Acquisition<br>• Cost of road impacts, repairs<br>• Cost implications to collection system, piping<br>• Flexibility for future expansion | Approximately 16-18 of 38 acres (45%) are usable | - Cost to build intersection with LOVR<br>- Cost of piping wastewater to treatment plant |
| | Potentially willing seller | |
| | Allows for cost-reducing treatment and solids options (e.g. ponds, composting) | |
| | Moderate cost to improve road access | |
| | Lower cost to pipe effluent to spray fields and/or to farms for ag in-lieu or ag exchange | |
| | Allows for future expansion | |
| | Site allows for additional storage to mitigate system failure risks | |
| **Operation & Maintenance**<br>• Energy requirements | Proximity to farms for ag in-lieu or ag exchange | |
| | - Site allows space for future expansion; upgrade in solids handling; wet winter or emergency storage; cost-saving disposal, and/ or alternative energy options. | |
| **Financial Risks**<br>▪ Potential costs relating to system failures | Allows for storage to mitigate system failures | Higher cost to pipe to Broderson leach field |
| **Funding Factors**<br>▪ Potential for revenue generation | Space for potential revenue- generating projects | |
| | - Site is suitable for alternative energy, which may attract grants | |

# TREATMENT PLANT SITES

| CRITERIA | PROS | CONS |
|---|---|---|

## Branin

### ENGINEERING & WATER RESOURCES

| | | |
|---|---|---|
| **Sufficient in size to meet environmental and potential future expansion needs** | Adjacent to other candidate plant sites, this may be advantageous for future expansion options | Shape, slope and size of property limit development and expansion options |
| | | Proximity to sensitive environmental areas may limit development and expansion options |
| **Minimize fluid transport costs** | Located in close proximity to agricultural lands and the cemetery | Located away from collection system area |
| | Located mid-way between town and potential spray fields | Located distant from the potential Broderson leach field site |
| **Minimize land costs, to include environmental mitigation costs** | Due to non-urbanized land use, the land value is less | |
| | Less potential for odor control | |
| **Site conditions with regards to constructability** | A portion of the site is level and has soils that are suitable for construction | |
| | Water table is not an apparent construction issue at this site | |

### ENVIRONMENTAL

| | | |
|---|---|---|
| **Construction impact** | Low population Density | Some Soil Erosion Potential |
| | Visual Screening | Proximity to Community Cemetery (Proximity greatest at Cemetery site) |
| | Construction Traffic out of town | Trenching to and from town |
| **Community impact** | Low population Density | Proximity to Community Cemetery |
| | Natural Screening | Future Cemetery expansion could increase proximity |
| **Impact on biological resources** | Minimal habitat value on site – some small areas of Sensitive Resources | Trenching to and from town, including crossing Los Osos Creek |
| | | Proximity to Warden Lake (Branin> Giacomazzi> Cemetery) |
| **System failure risk** | Site area adequate for on-site containment (Branin may be small, depends on treatment technology footprint) | Proximity to Warden Lake (Branin> Giacomazzi> Cemetery) |
| **Impact on archaeological resources** | | Limited information available: previously identified sites on portions of Cemetery and Branin |
| | | Trenching to and from town |
| **Energy Use** | Site areas generally large enough to provide potential for alternative energy options | Energy requirements for pumping sewage out of town and effluent back in. |
| **Land use plans and policies** | Compatible | |
| **Agriculture Land Use** | | Loss of Ag Land (Class III – not highly productive) |

### FINANCIAL

| | | |
|---|---|---|
| **Capital Costs**<br>• Land Acquisition<br>• Cost of road impacts, repairs<br>• Cost implications to collection system, piping<br>• Flexibility for future expansion | Cost/ acre should be low due to site constraints | - Cost to build intersection with LOVR<br><br>- Approximately 8-10 of 43 acres (21%) are usable |
| | | Insufficient space for future expansion, and/or disposal/ reuse options |
| | | High risk of liquefaction and seismically-induced settlement – hydroconsolidation |
| | | Higher cost for piping wastewater to treatment center |
| | | Higher costs for road access and to build intersection with LOVR |
| **Operation & Maintenance**<br>• Energy requirements | Lower cost to pipe effluent to spray fields and/or to farms for ag in-lieu or ag exchange | |
| **Financial Risks**<br>▪ Potential costs relating to system failures | * Higher cost to pipe to Broderson leach field | |
| **Funding Factors**<br>▪ Potential for revenue generation | Potential wetlands for storage, which may attract grants | |

## Tri-W

### ENGINEERING & WATER RESOURCES

| CRITERIA | PROS | CONS |
|---|---|---|
| **Sufficient in size to meet environmental and potential future expansion needs** | | Site is small and constrained in terms of future expansion options |
| | | No room for expansion for ancillary operations, such as bio-solids treatment |
| **Minimize fluid transport costs** | Located within the collection system area | Located farthest away from the spray fields |
| | Located in close proximity to potential Broderson leach field | |
| **Minimize land costs, to include environmental mitigation costs** | LOCSD currently owns this property | Due to the proximity to near-by residence, engineered odor control features will be required |
| **Site conditions with regards to constructability** | Engineering work and preliminary site work already performed | Site requires higher construction costs |

### ENVIRONMENTAL

| CRITERIA | PROS | CONS |
|---|---|---|
| **Construction impact** | | High population density (Noise, dust…) |
| | | Downtown traffic |
| **Community impact** | Resource park (if still included) | High population density (noise, odor) |
| | | Partial visual obstruction of Morro Rock |
| **Impact on biological resources** | Site Graded & conditions mitigated | ESHA – Sensitive Dune Habitat |
| | No creek crossing for wastewater | |
| **System failure risk** | | Proximity to Estuary |
| | | Site size makes on-site containment more difficult |
| **Impact on archaeological resources** | Tribal agreements in place | |
| | Resources largely known (due to initial work on site) | |
| **Energy Use** | Less pumping of wastewater and effluent | Less potential for alternative energy (Site size limitation) |
| **Land use plans and policies** | Compatible | Inconsistent with LO vision statement |
| **Agriculture Land Use** | Non-Ag | |

### FINANCIAL

| CRITERIA | PROS | CONS |
|---|---|---|
| **Capital Costs**<br>▪ Land Acquisition<br>▪ Cost of road impacts, repairs<br>▪ Cost implications to collection system, piping<br>▪ Flexibility for future expansion | Citizens currently own the property | Only 36% usable land |
| | | Comparable land value estimated to be very high |
| | | Property currently under litigation |
| | Lower cost for collection piping to treatment center | Possible need to expand LOVR |
| | | Higher cost to pipe effluent to spray fields and/or to farms for ag in-lieu or ag exchange |
| | | Limited space for future expansion, upgrade of solids treatment, or energy alternatives |
| | | Proximity to church, library, community center, and residential areas |
| | | Road impacts due to heavy vehicle traffic through main thoroughfare |
| **Operation & Maintenance**<br>▪ Energy requirements | | Site necessitates treatment with high energy requirements |
| | | Site does not allow for alternative energy options |
| **Financial Risks**<br>▪ Potential costs relating to system failures<br>▪ Site impacts on cost to mitigate seawater intrusion | Lower cost to pipe to Broderson leach field | Limited space for storage to mitigate system failure risks |
| | | High financial risk in event of system failure due to proximity to Bay |
| **Funding Factors**<br>▪ Potential for revenue generation | | Limited acreage for revenue-generating options |

# TREATMENT TECHNOLOGY

| CRITERIA | PROS | CONS |
|---|---|---|

## Oxidation Ditch

### ENGINEERING & WATER RESOURCES

| | | |
|---|---|---|
| **Flexibility of treatment process to meet future needs and regulations** | Proven to reduce BOD | With STEP - 39 mg/l nitrogen |
| | Relatively small footprint, at 8 acre | |
| | Can add tertiary treatment at end of treatment train. Also, advanced oxidation and membrane treatment can be added as well following | |
| | With gravity - proven to reduce nitrogen levels to less than 10 mg/l | |
| **Demonstrated reliability of process** | Proven history | With STEP - additional Nitrate treatment required |
| **Effect of process on bio-solids production** | With STEP - reduce volume of sludge | With gravity - frequency of sludge removal |
| | With STEP - 10 – 30 day SRT | |
| | With gravity - 15 – 30 day SRT | |
| **Construction cost, replacement, operation and maintenance (1)** | With Step - construction $23.1 mil, O&M $920,000 | |
| | With gravity - construction $22.6 mil, O&M $790,000 | |
| **Energy** | With Step - $100,000 | |
| | With gravity - $110,000 | |

Note 1: used highest number from Table 4.19

### ENVIRONMENTAL

| | | |
|---|---|---|
| **Construction Impacts** | | |
| **Community Impact** | | |
| **Biological Impact (1)** | | |
| **Archeological Resources(1)** | | |
| **Energy Use kWh/yr (2)** | 800,000 Step Collection | 900,000 Gravity Collection |

(1)Table 4.18
(2) All impacts are high and PRO/CON is based on the comparison of higher vs. lower

### FINANCIAL

| | | |
|---|---|---|
| **Capital Costs**<br>▪ **Construction costs**<br>▪ **Road impacts**<br>▪ **Cost implications with collection system**<br>▪ **Costs of future upgrades** | Requires 8 acre site | Tertiary treatment required for agriculture or urban reuse (+$1.6 – 3.5M) |
| | Moderate cost for plant construction ($16-19.1M) | STEP system requires denitrification for discharge at Broderson, adding from $2.2M to $3.6M to construction costs |
| **Operation & Maintenance**<br>▪ **Energy requirements**<br>▪ **Maintenance, repair, & replacement costs**<br>▪ **Impact on cost of solids handling/ disposal** | Lower O&M with a STEP collection system ($570,000/ year) | Higher O&M costs with Gravity collection system ($690,000/ year) |
| | Lower energy usage with a STEP collection system (800,000 kWh/yr) | Tertiary treatment required for agricultural or urban reuse (+$30,000 - $100,000/ year) |

# TREATMENT TECHNOLOGY

| CRITERIA | PROS | CONS |
|---|---|---|

## Biolac

### ENGINEERING & WATER RESOURCES

| | | |
|---|---|---|
| **Flexibility of treatment process to meet future needs and regulations** | Proven to reduce BOD | With STEP - 37 mg/l nitrogen |
| | Can add tertiary treatment at end of treatment train. Also, advanced oxidation and membrane treatment can be added as well following tertiary treatment. | |
| | With STEP - relatively small footprint, at 8 acres | |
| | With gravity - relatively small footprint, at 10 acres | |
| | With gravity - proven to reduce nitrogen levels to less than 10 mg/l | |
| **Demonstrated reliability of process** | Proven history | With STEP - additional Nitrate treatment required |
| | With gravity - maintenance is lower than STEP | |
| **Effect of process on bio-solids production** | With STEP - reduce volume of sludge | With gravity - frequency of sludge removal |
| | With gravity - 30 – 70 day SRT | |
| **Construction cost, replacement, operation and maintenance (1)** | With STEP - construction $20.8 mil, O&M $900,000 | |
| | With gravity - construction $19.9 mil, O&M $800,000 | |
| **Energy** | With STEP - $100,00 | |
| | With gravity - $130,00 | |

Note 1: used highest number from Table 4.19

### ENVIRONMENTAL

| | | |
|---|---|---|
| **Construction Impacts** | | With gravity - largest footprint of systems other than ponds |
| **Community Impact** | | With gravity - size prohibits odor control |
| **Biological Impact (1)** | | With gravity - size required for treatment technology |
| **Archeological Resources(1)** | | With gravity - size required for treatment technology |
| **Energy Use kWh/yr (2)** | With STEP/STEG - 800,000 | With gravity - 1,100,000 |

(1)Table 4.18
(2) All impacts are high and PRO/CON is based on the comparison of higher vs. lower

### FINANCIAL

| | | |
|---|---|---|
| **Capital Costs**<br>▪ **Construction costs**<br>▪ **Road impacts**<br>▪ **Cost implications with collection system**<br>▪ **Costs of future upgrades** | Requires 8-10 acre site | Tertiary treatment required for agricultural or urban re-use (+$1.6 – 3.5M) |
| | Low to moderate cost for plant construction ($13.7 – 16.4M. These costs represent the *upper* end of the baseline value, and still result in a 20% savings over the Oxidation Ditch facility | |
| | Denitrification of flows for Broderson discharge included in cost of construction | |
| | Lower cost to expand/ upgrade simply by adding basin | |
| **Operation & Maintenance**<br>▪ **Energy requirements**<br>▪ **Maintenance, repair, & replacement costs**<br>▪ **Impact on cost of solids handling/ disposal** | Low O&M with a STEP collection system ($550,000/ year) | High O&M costs with Gravity collection system ($700,000/ year) |
| | Denitrification of flows for Broderson discharge included in cost of construction | Higher energy usage with a Gravity collection system (1,100,000 kWh/yr) |
| | Moderate energy usage with a STEP collection system (800,000 kWh/yr) | Tertiary treatment required for agricultural or urban reuse (+$30,000 - $100,000/ year) |

# TREATMENT TECHNOLOGY

| CRITERIA | PROS | CONS |
|---|---|---|

## Partially Mixed Facultative Ponds

### ENGINEERING & WATER RESOURCES

| | | |
|---|---|---|
| **Flexibility of treatment process to meet future needs and regulations** | Proven to reduce BOD | With STEP - 54 mg/l nitrogen |
| | Can add tertiary treatment at end of treatment train. Also, advanced oxidation and membrane treatment can be added as well following tertiary treatment | With gravity - 15 mg/l Nitrogen |
| | | With gravity - large acreage requirement (20) may limit flexibility in terms of adding additional treatment unit due to space limitation of plant site |
| **Demonstrated reliability of process** | Proven history | Additional Nitrate treatment required |
| **Effect of process on bio-solids production** | Reduce volume of sludge | |
| | With gravity - less frequency of sludge handling | |
| | With gravity - Very long SRT, sludge production much less than suspended activated sludge systems | |
| **Construction cost, replacement, operation and maintenance (1)** | With STEP - construction $20.7 mil, O&M $890,000 | |
| | With gravity - construction $25.6 mil, O&M $900,000 | |
| **Energy** | $70,000 | |

Note 1: used highest number from Table 4.19

### ENVIRONMENTAL

| | | |
|---|---|---|
| **Construction Impacts** | | Earth moving |
| | | Diesel |
| | | Noise |
| | | Dust |
| **Community Impact** | | Primary treatment ponds are not a community amenity |
| **Biological Impact (1)** | | Less energy but release methane gas which is a more powerful greenhouse gas than carbon dioxide |
| **Archeological Resources(1)** | | Size required for treatment technology |
| **Energy Use kWh/yr (2)** | 600,000 with both STEP or gravity | |

(1)Table 4.18

### FINANCIAL

| | | |
|---|---|---|
| **Capital Costs**<br>▪ **Construction costs**<br>▪ **Road impacts**<br>▪ **Cost implications with collection system**<br>▪ **Costs of future upgrades** | Low cost for plant construction ($13.1- 14.2M) | Requires 20 acre site |
| | | May require Nitrification to convert ammonia into nitrate before denitrification (+$1.0- 3.8M in construction costs). See (1) |
| | | Requires Denitrification of flows for Broderson discharge (+$2.2-3.6M in construction costs). |
| | | Tertiary treatment required for agricultural or urban reuse (+$2.1-4.0M) |
| **Operation & Maintenance**<br>▪ **Energy requirements**<br>▪ **Maintenance, repair, & replacement costs**<br>▪ **Impact on cost of solids handling/ disposal** | Lower O&M with a Gravity or STEP collection system ($510,000/ year) | May require Nitrification to convert ammonia into nitrate before denitrification (+$30,000- 90,000/ year). See (1) |
| | Lower energy usage with a Gravity or STEP collection system (600,000 kWh/yr | Requires Denitrification of flows for Broderson discharge (+$90,000- 250,000/ year). |
| | Reduces cost of solids handling/ disposal | Tertiary treatment required for agricultural or urban reuse (+$60,000- 130,000/ year) |
| | Reduces traffic for sludge removal | Life cycle cost of dredging ponds |

# TREATMENT TECHNOLOGY

| CRITERIA | PROS | CONS |
|---|---|---|

## MBR (Tri-W)

### ENGINEERING & WATER RESOURCES

| | | |
|---|---|---|
| **Flexibility of treatment process to meet future needs and regulations** | High quality effluent | Small acreage available (11) |
| **Demonstrated reliability of process** | Proven history | |
| **Effect of process on bio-solids production** | | Frequency of sludge removal |
| **Construction cost, replacement, operation and maintenance (1)** | | |
| **Energy** | | Highest |

Note 1: used highest number from Table 4.19

### ENVIRONMENTAL

| | | |
|---|---|---|
| **Construction Impacts** | | High Construction activity concentrated in town |
| **Community Impact** | Enclosed facility odor control | |
| **Biological Impact (1)** | Highest quality effluent | |
| **Archeological Resources(1)** | | |
| **Energy Use kWh/yr (2)** | Requested information | Requested information |

(1)Table 4.18

(2) All impacts are high and PRO/CON is based on the comparison of higher vs. lower

### FINANCIAL

| | | |
|---|---|---|
| **Capital Costs**<br>▪ **Construction costs**<br>▪ **Road impacts**<br>▪ **Cost implications with collection system**<br>▪ **Costs of future upgrades** | Requires 4 acre site | High construction cost ($55M) |
| | Tertiary treatment included which meets Title 22 for agricultural and urban reuse | Heavy vehicle traffic road impacts in center of town |
| | Denitrification of flows for Broderson discharge included | |
| **Operation & Maintenance**<br>▪ **Energy requirements**<br>▪ **Maintenance, repair, & replacement costs**<br>▪ **Impact on cost of solids handling/ disposal** | Tertiary treatment for agricultural and urban reuse included | Higher O&M with a Gravity collection system ($700,000/ year) |
| | | Costs with a STEP collection system not available at Tri-W |
| | | ***Need energy requirements for comparison** |

# LOS OSOS WASTEWATER PROJECT – TECHNICAL ADVISORY COMMITTEE

# TREATMENT TECHNOLOGY

### CONSTRUCTION COSTS

| **Treatment Technology** | **Construction** | | **Nitrification/ Denitrification** (1) | | **Tertiary Treatment**(3) | | **Total Cost Level 2 Treatment** | | **Acreage Required** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Gravity | STEP | Gravity | STEP | Gravity | STEP | Gravity | STEP | Gravity | STEP |
| **Oxidation Ditches** | $19.1M | $16.0M | Included | $2.2M | $3.5M | $3.5M | $22.6M | $21.7M | 8 | 8 |
| **BIOLAC** | $16.4M | $13.7M | Included | $2.2M | $3.5M | $3.5M | $19.9M | $19.4M | 10 | 8 |
| **Facultative Ponds** | $14.2M | $13.1M | $2.4M(2)<br>+2.2M .<br>$4.6M . | $2.4M(2)<br>+2.2M .<br>$4.6M . | $4.0M | $4.0M | $22.8M | $21.7M | 20 (4) | 20 (4) |
| **MBR – Tri-W** | $55.0M | NA | Included | NA | Included | NA | $55.0M | NA | 4 | NA |

### O&M COSTS

| **Treatment Technology** | **Annual Treatment O&M Cost** | | **Nitrification/ Denitrification** (5) | | **Tertiary Treatment**(3) | | **Annual O & M Level 2 Treatment** | | **Energy Requirements (Kilowatt hours/ year)** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Gravity | STEP | Gravity | STEP | Gravity | STEP | Gravity | STEP | Gravity | STEP |
| **Oxidation Ditches** | $690,000 | $570,000 | Included | $90,000 | $ 30,000-<br>$100,000. | $ 30,000-<br>$100,000. | $720,000-<br>$790,000 | $60,000-<br>$760,000 | 900,000 | 800,000 |
| **BIOLAC** | $700,000 | $550,000 | Included | $90,000 | $ 30,000-<br>$100,000. | $ 30,000-<br>$100,000. | $730,000-<br>$800,000 | $670,000-<br>$740,000 | 1,100,000 | 800,000 |
| **Facultative Ponds** | $510,000 | $510,000 | $35,000(5)<br>+90,000 .<br>$125,000 . | $35,000(5)<br>+90,000 .<br>$125,000 . | $ 60,000-<br>$130,000. | $ 60,000-<br>$130,000. | $695,000-<br>$765,000 | $695,000-<br>$765,000 | 600,000 | 600,000 |
| **MBR – Tri-W** | $700,000 | NA | Included | NA | Included | NA | $700,000 | NA | ***Numbers needed*** | NA |

(4) Assumes Denitrification only needed for Broderson Leachfield sized for 0.8 MGD side stream at peak winter flow.
(5) Requires Nitrification to convert Ammonia to Nitrate before Denitrification Process
(6) Assumes full 1.4M flow treated to tertiary level for agriculture, urban reuse, and future regulations.
(7) Ponds may only be possible on the Giacomazzi site.
(8) O&M costs assume 0.4MGD average Denitrification side stream flow.
NOTE: Report uses 1.4mgd in all final cost calculations. STEP costs should be based on 1.2mgd.

# LOS OSOS WASTEWATER PROJECT – TECHNICAL ADVISORY COMMITTEE

## COLLECTION SYSTEM

| CRITERIA | PROS | CONS |
|---|---|---|
| **ENGINEERING & WATER RESOURCES** | | |
| **STEP** | | |
| **Life cycle costs<br>Const. costs<br>O & M costs** | Lower construction costs | Higher operations and maintenance costs |
| **Construction impacts** | Smaller amounts of road restoration- 2ft wide vs several ft. | |
| | Shorter periods of road disturbance/ traffic control- could be ½ the time as compared to a gravity system in some areas | |
| | Shallower trenches-6' or less vs. a gravity system with an average trench depth of 8' and depths reaching 28' in some locations | |
| | Possibility of limited directional boring being used | |
| **Property impact for both private and public properties** | | Requires easements on private property |
| | | Requires access on private property |
| | | Higher on-site capital costs-approximately 3 times that of a gravity system |
| | | Higher level of private property disturbance – new septic must be installed (digging area) |
| | | Requires periodic (5 yr. max.) pumping of on-site septic tanks |
| **Reliability of system** | Very small chance for inflow and infiltration- mainly through septic tank risers and lids. | Many small pumps and support systems with possibility of failure |
| **Environmental impact of system** | Fewer impacts associated with small diameter pipe installation | Minor odor issues in conjunction with air release valves. However, this can be mitigated by installing carbon filtration treatment at the air release valves. |
| | Results in significant reduction of bio-solids volume | Boring and trenching occurs in the cultural resource zone |
| | Existing septic tanks will have to be abandoned or retrofitted for storm water disposal | Higher level of private property disturbance (digging) |
| **Infiltration and inflow potential** | Very small chance for inflow and infiltration. When it does occur mainly at septic tank risers lids | |
| **Energy** | | Many small sources (pumps and support electronics) of electrical use but comparable to gravity in total use |
| **Gravity** | | |
| **Life cycle costs<br>Construction costs<br>O&M costs** | Lower O&M costs | Higher construction costs |
| **Construction impacts** | | Greater amounts of road restoration |
| | | Longer periods of road disturbance/ traffic control- twice the time as compared to a STEP/STEG system |
| | | Deeper trenches, with an average trench depth of 8 feet and trench depths reaching up to 28 ft in some areas. |
| **Property impact for both private and public properties** | No easements on private property | |
| | No access required on private property | |
| | Lower on-site capital costs – approximately 1/3 that of step | |
| | Lower level of private property disturbance (digging) | |
| | No periodic pumping of septic tanks | |
| **Reliability of system** | Fewer pumps and support systems with possibility of failure | Greater chance for inflow and infiltration |
| **Environmental impact of system** | Lower level of private property disturbance (digging) | Greater impacts associated with large diameter pipe installation |
| | | Significantly greater amount of bio-solids |
| | | Minor odor issues in conjunction with manholes and pump stations but can be mitigated through installation of carbon filtration |
| | | Trenching occurs in the cultural resources zone. Wider areas of disturbance. Wider and deeper trenches will require shoring and dewatering in some areas. Water will have to be treated and disposed of. |
| | | Existing septic tanks will have to be abandoned or retrofitted for storm water disposal |
| **Infiltration and inflow potential** | | Greater possibility for inflow and infiltration.- primarily through manhole installations. |
| **Energy** | | Fewer, but larger sources (pumps and support electronics) of electrical use but comparable to step in total use |

# COLLECTION SYSTEM

| CRITERIA | STEP/STEG | Gravity |
|---|---|---|
| **ENVIRONMENTAL** | | |
| **Construction disturbance** | Excavation for new tank replacement est. @ 150 square feet | Excavation for installation |
| | Tank decommission est. @ 100 square feet | Tank decommission est. @ 100 square feet |
| | Higher on lot disturbances to residents | Street impact approximately 2 weeks for main installation |
| | Street impacts < significant; shallower & narrower trenches and increased potential for boring | Potential for 20+ feet excavation |
| **Impact on biological resources** | Dewatering less significant | Dewatering: the need to protect water quality with the disposal of collected water |
| **Community impact** | Permanent impacts<br>Easements requires homeowner cooperation<br>Manholes and controls in front yard of each home<br>Ongoing pumping of tanks, approx. 5 per day; associated truck traffic and odor | Permanent impacts<br>20 Lift stations throughout the community<br>Grinder pumps @ certain locations |
| | Pump on each tank | Truck traffic to plant |
| | Resident responsibility significant | Odor control @ lift stations |
| | Venting at high points of system< 200>500 | |
| **System failure risk** | Homeowner responsibility significant | |
| | Effluent has less volume; with suspended solids in pressurized line | Effluent throughout system |
| **Impact on archaeological resources** | 155 Square feet additional excavation | Increased volume of disturbance due to depth of pipe placement |
| | Assuming boring, less volume of disturbance | |
| **Energy Kwh/year** | 500,000- energy required to convey 1.2 mg/d to an out-of –town treatment facility | 500,000- energy required to convey 1.4 mg/d to an out-of – town treatment facility |

The environmental committee felt that the PRO/CON format was too limiting in bringing out a comprehensive comparison

# COLLECTION SYSTEM

## FINANCIAL

| CRITERIA | Collection System | PROS | CONS |
|---|---|---|---|
| **Capital Costs**<br>▪ **Land acquisition**<br>▪ **Construction costs**<br>▪ **Road impacts**<br>▪ **Cost for individual hook-up**<br>▪ **Cost of future expansion, upgrades** | GRAVITY | - Potential modest savings with combined gravity/ vacuum/ low pressure system. | - Higher construction cost range $69.4M to $77.7M.<br>- Construction costs do not include additional road restoration for out-of-town treatment sites<br>- Higher homeowner costs (approx. $6M higher than STEP)<br>- Unknown additional costs for land and easement to convey pipe to out-of-town site |
| | STEP/STEG | - Lower STEP construction cost range of $59.4M to $75.3M (vs. Gravity $69.4M to $77.7M) due primarily to open trenching; elimination of manholes pump stations, standby power; and minimal shallow access points. (Assumes that separate electrical connections are not required.)<br>- On-lot costs include new septic tanks and all work on private property up to house inlet. (Additional homeowner costs are detailed in following table.) | - Costs for new electrical connection for pump, etc. range from $1,900 to $3,000 per connection; could be much high for separate electrical connection. |
| **Operations, Maintenance & Repair**<br>▪ **Maintenance, repair, & replacement costs** | GRAVITY | - Lower annual O&M at $450,000/ year | |
| | STEP/STEG | | - Higher O&M at $750,000/ year |
| **Financial Risk Factors**<br>▪ **Financial risk relating to system failures and natural disasters** | GRAVITY | | - Additional cost of bell & spigot maintenance program to address risk of future leakage |
| | STEP/STEG | | |
| **Funding Factors**<br>▪ **Eligibility for best financing**<br>▪ **Grant attractiveness**<br>▪ **Potential for revenue generation** | GRAVITY | | |
| | STEP/STEG | | - SRF loan may require separate electrical connection, adding significant cost to system ($13.4M to $25.3M) STEP/STEG |

| **Construction Costs** | **Gravity** | | **STEP/ STEG** | |
|---|---|---|---|---|
| | **Low** | **High** | **Low** | **High** |
| Mobilization | $3.7M | $4.2M | $2.4M | $3.1M |
| Common facilities | $57.6M | $64.2M | $11.8M | $15.5M |
| On-lot facilities | -0- | -0- | $33.3M | $40.9M |
| Road restoration (1) | $5.2M | $5.2M | $1.3M | $2.6M |
| Conveyance to out-of-town site | $2.9M | $4.1M | Included | Included |
| Overhead, profit & taxes | Included | Included | $10.6M | $13.2M |
| **Total Construction Costs** | **$69.4M** | **$77.7M** | **$59.4M** | **$75.3M** |
| Premium electrical costs (2) | -0- | -0- | $13.4M | $25.3M |
| **Total Costs with electrical premium** (not incl. homeowner costs | **$69.4M** | **$77.7M** | **$72.8M** | **$100.6M** |
| Homeowner on-lot costs (3) | $10.9M | $12.0M | $5.4M | $5.9M |
| **Total Construction and Homeowner Costs** (not including electrical premium) (3) | **$80.3M** | **$89.7M** | **$64.8M** | **$81.2M** |
| **Operations & Maintenance Costs** | **Gravity** | | **STEP/ STEG** | |
| Labor | $140,000 | | $175,000 | |
| Energy requirements | $ 60,000 | | $ 60,000 | |
| Maintenance, Replacement | $250,000 | | $360,000 | |
| Septic hauling | $ -0- | | $150,000 | |
| Total O&M Costs | $450,000 | | $745,000 | |

(5) Road restoration for additional conveyance of gravity pipeline out of town not included.
(6) Separate electrical required if project is financed with SRF loan
(7) Homeowners' on-lot costs are not part of gravity collection project costs, but presented for comparison purposes only.

# SOLID DISPOSAL SYSTEMS

## ENGINEERING & WATER RESOURCES

| Criteria | Method | Pro | Con |
|---|---|---|---|
| **Maintain control and flexibility of disposal process.** | Sub-Class B Disposal | Only thickening and dewatering treatment is required. Since thickening and dewatering are required for all of the other bio-solids management alternatives, this option can be developed into a Class A or B operation in the future without decommissioning any of the initial project improvements. | Sub-Class B Bio-solids must receive further treatment for land application or must be disposed of at a landfill. Fine Screen report assumes disposal at composting facility. |
| | | | The acceptance criteria of disposal facilities may become more stringent with time, which may require additional future treatment of bio-solids. |
| | | | The percent solids achieved in this alternative is estimated to be less than 20%. Therefore, the local landfill could not accept this waste stream. |
| | | | This option produces the greatest mass of bio-solids at 4,056 tons/year for a gravity system or 1,014 tons/year for STEP/STEG system. |
| | | | All bio-solids would be shipped offsite for disposal. |
| | Digested Class B | Due to achieving Class B quality, the range of disposal options is much greater than for Sub-Class B bio-solids. | This option produces a large mass of bio-solids at 3,103 tons/year for a gravity system or 776 tons/year for STEP/STEG system (23.5% less than the Sub-Class B option). |
| | | Produces bio-solids with a 20% solids content and therefore meets the percent solids acceptance criteria at the local landfill. | All bio-solids would be shipped offsite for disposal. |
| | Heat Dried Class B | Due to achieving Class B quality, the range of disposal options is much greater than for Sub-Class B Bio-solids. | Operation of the system is relatively complex and would require a higher level of training for staff. |
| | | This option produces the least amount of bio-solids at 1,043 tons/year for gravity or 261 tons/year for STEP/STEG system. | |
| | | Produces bio-solids with a 90% solids content and therefore meets the percent solids acceptance criteria at the local landfill. | Heat Drying is typically utilized for producing Class A Bio-solids. |
| | | This process can potentially produce Class A Bio-solids | |
| | Composted Class B | Due to achieving Class B quality, the range of disposal options is much greater than for Sub-Class B Bio-solids. | Composting bio-solids will require the addition of a bulking agent for a carbon source and to increase porosity. Therefore, the process will require a reliable source of bulking agent to be brought to the plant. |
| | | This option produces a low mass of bio-solids, very similar to the Heat Dried Class B option, at 1,460 tons/year for gravity or 365 tons/year for STEP/STEG system. | |
| | | Produces bio-solids with a 50% solids content and therefore meets the percent solids acceptance criteria at the local landfill. | All bio-solids would be shipped offsite for disposal. |
| | | This process can potentially produce Class A Bio-solids, but would require increased process time and footprint at plant site. | |
| | Composted Class A | Due to achieving Class A quality, the range of disposal options is much greater than for Sub-Class B and Class B Bio-solids. | Although there is the potential for local use of Class A Bio-solids, the County currently has an Ordinance in place that limits bio-solids application to land to no greater than 1500 cubic yards per year. In addition, the Ordinance allows only Class A – Exceptional Quality to be applied to land in the County. |
| | | This option produces a low mass of bio-solids, very similar to the Heat Dried Class B option, at 1,327 tons/year for gravity or 332 tons/year for STEP/STEG system. | Composting bio-solids will require the addition of a bulking agent for a carbon source and to increase porosity. Therefore, the process will require a reliable source of bulking agent to be brought to the plant. |
| | | Produces bio-solids with a 55% solids content and therefore meets the percent solids acceptance criteria at the local landfill. | |
| | Digested/Composted Class A | Due to achieving Class A quality, the range of disposal options is much greater than for Sub-Class B and Class B Bio-solids. | Although there is the potential for local use of Class A Bio-solids, the County currently has an Ordinance in place that limits bio-solids application to land to no greater than 1500 cubic yards per year. In addition, the Ordinance allows only Class A – Exceptional Quality to be applied to land in the County. |

# SOLID DISPOSAL SYSTEMS

## ENGINEERING & WATER RESOURCES

| Criteria | Method | Pro | Con |
|---|---|---|---|
| **Maintain control and flexibility of disposal process. (continued)** | | This option produces a low mass of bio-solids, very similar to the Heat Dried Class B option, at 1,128 tons/year for gravity or 282 tons/year for STEP/STEG system. | Composting bio-solids will require the addition of a bulking agent for a carbon source and to increase porosity. Therefore, the process will require a reliable source of bulking agent to be brought to the plant. |
| | | Produces bio-solids with a 55% solids content and therefore meets the percent solids acceptance criteria at the local landfill. | The long term use of compost materials at one location has the potential to accumulate |
| **Nuisance assessment of bio-solids process and disposal** | Sub-Class B Disposal | If thickening is achieved by a Belt Filter Press, there will be a minimal footprint requirement, estimated at 0.1 acre. | If solar drying is used, the operation will require 5.7 acres of land for bio-solids produced from a gravity systems and 1.4 acres of land for bio-solids produced from a STEP/STEG system. |
| | | | Solar drying has a high potential to be odiferous and also has the potential to attract vectors. |
| | | | This option is not designed to reduce the potential pathogen content in the produced bio-solids. |
| | | | This alternative would require 4 to 5 truck trips per week leaving the plant. |
| | Digested Class B | This method is designed to reduce the potential pathogen content to very low levels so that any remaining pathogens in the bio-solids will die-off in soil within short timeframe. | If solar drying is used, the operation will require 4.4 acres of land for bio-solids produced from a gravity systems and 1.1 acres of land for bio-solids produced from a STEP/STEG system. |
| | | If thickening is achieved by a Belt Filter Press, there will be a minimal footprint requirement, estimated at 0.1 acre | Solar drying has a high potential to be odiferous and also has the potential to attract vectors. |
| | | | This alternative would require 3 to 4 truck trips per week leaving the plant. |
| | Heat Dried Class B | This method is designed to reduce the potential pathogen content to very low levels so that any remaining pathogens in the bio-solids will die-off in soil within short timeframe. | This alternative would require 1 to 2 truck trips per week leaving the plant. |
| | | | Process may generate dust, which may potentially be explosive or present exposure/health concern. |
| | | There will be a minimal footprint requirement for this alternative, estimated at 0.1 acre. | Exhaust gas may be odiferous, but can likely be mitigated through controls. |
| | | | Process is typically used to produce Class A Bio-solids. |
| | Composted Class B | This method is designed to reduce the potential pathogen content to very low levels so that any remaining pathogens in the bio-solids will die-off in soil within short timeframe. | Composting will require approximately 2.1 acre footprint for bio-solids produced from a gravity system and 0.7 acres for bio-solids produced from a STEP/STEG system. |
| | | | Storage of compost presents a potential fire hazard due to large volumes of carbonaceous materials. Sufficient moisture content, aeration and limited storage time reduces fire hazard. |
| | | | If not properly aerated, the compost operation can generate odors. |
| | | | Storm water infiltration into the compost windrows has the potential to produce compost leachate, which may require control. |
| | | | This alternative would require 1 to 2 truck trips per week leaving the plant. |
| | Composted Class A | This option is designed to produce bio-solids that are essentially pathogen free. | If not properly aerated, the compost operation can generate odors. |
| | | | Storm water infiltration into the compost windrows has the potential to produce compost leachate, which may require control. |
| | | | Storage of compost presents a potential fire hazard due to large volumes of carbonaceous materials. Sufficient moisture content, aeration and limited storage time reduces fire hazard. |
| | | | If Class A Bio-solids are locally used, additional provisions may be needed for winter storage in order to prevent odor production and to mitigate fire hazard. |

# SOLID DISPOSAL SYSTEMS

## ENGINEERING & WATER RESOURCES

| Criteria | Method | Pro | Con |
|---|---|---|---|
| **Nuisance assessment of bio-solids process and disposal** | Digested/Composted Class A | This option is designed to produce bio-solids that are essentially pathogen free. | If not properly aerated, the compost operation can generate odors. |
| | | | Storm water infiltration into the compost windrows has the potential to produce compost leachate, which may require control. |
| | | | Storage of compost presents a potential fire hazard due to large volumes of carbonaceous materials. Sufficient moisture content, aeration and limited storage time reduces fire hazard. |
| **Nuisance assessment of bio-solids process and disposal (continued)** | | | If Class A Bio-solids are locally used, additional provisions may be needed for winter storage in order to prevent odor production and to mitigate fire hazard. |
| **Cost of process facilities, operations and maintenance, and ultimate disposal** | Sub-Class B Disposal | Construction constitutes between **0.9** and 1.0% of total project construction costs for STEP/STEG | O&M costs constitutes between 10.0 and 12.18% of total project O&M costs for STEP/STEG |
| | | Construction constitutes between 1.32 and 1.48% of total project construction costs for Gravity | O&M costs constitutes between 16.03 and 28.86% of total project O&M costs for Gravity |
| | Digested Class B | Construction constitutes between 1.44 and 1.49% of total project construction costs for STEP/STEG | O&M costs constitutes between 10.45 and 12.74% of total project O&M costs for STEP/STEG |
| | | Construction constitutes between 2.17 and 2.43% of total project construction costs for Gravity | |
| | | Potential for revenue. | O&M costs constitutes between 15.82 and 28.38% of total project O&M costs for Gravity |
| | Heat Dried Class B | Construction constitutes between 1.74 and 1.94% of total project construction costs for STEP/STEG | O&M costs constitutes between 11.55 and 17.96% of total project O&M costs for STEP/STEG |
| | | Construction constitutes between 2.81 and 3.03% of total project construction costs for Gravity | O&M costs constitutes between 15.82 and 33.33% of total project O&M costs for Gravity |
| | | Potential for revenue. | Requires 1,400 to 1,700 BTU/ pound of water evaporated. |
| | Composted Class B | Construction constitutes between 1.24 and 1.64% of total project construction costs for STEP/STEG | O&M costs constitutes between **9.77** and 19.88% of total project O&M costs for STEP/STEG |
| | | Construction constitutes between 2.0 and 2.37% of total project construction costs for Gravity | O&M costs constitutes between 16.24 and 34.57% of total project O&M costs for Gravity |
| | | Potential for revenue | |
| | Composted Class A | Construction constitutes between 1.24 and 1.64% of total project construction costs for STEP/STEG | O&M costs constitutes between 10.22 and 20.81% of total project O&M costs for STEP/STEG |
| | | Construction constitutes between 2.0 and 2.37% of total project construction costs for Gravity | 29 and 36.14% of total project O&M costs for Gravity O&M costs constitutes between 17. |
| | | Potential for revenue. | |
| | Digested/Composted Class A | Construction constitutes between 1.79 and 2.24% of total project construction costs for STEP/STEG | O&M costs constitutes between 15.29 and 25.54% of total project O&M costs for STEP/STEG |
| | | Construction constitutes between 3.14 and **3.29**% of total project construction costs for Gravity | O&M costs constitutes between 25.00 and **41.76**% of total project O&M costs for Gravity |
| | | Potential for revenue. | |

# SOLID DISPOSAL SYSTEMS

## ENVIRONMENTAL

| CRITERIA | | PROS | CONS |
|---|---|---|---|
| **Volume** | Sub-Class B | | - Largest volume<br>- Most expensive hauling costs |
| | Class B | | - Largest volume<br>- High hauling costs |
| | Composted Class A (all treatment alternatives) | + Minimal volume<br>+ Minimal hauling cost | |
| | ~~Faculatative~~Facultative Ponds | + Reduced volume<br>+ Low hauling cost | |
| **Class** | Sub-Class B | | - Worst quality<br>- Most restrictive disposal options (Dependant on outside parties for disposal*)<br>- Odor problems (Especially if solar drying is used) |
| | Class B | | - Poor quality<br>- Restrictive disposal options (Dependant on outside parties for disposal)<br>- Odor problems |
| | Composted Class A (all treatment alternatives) | + Best quality<br>+ Least restrictive disposal options (Not dependant on outside parties for disposal) | - Least restrictive disposal options (Not dependent on outside parties for disposal) |
| | ~~Faculatative~~Facultative Ponds | | - Unknown future disposal options (Dependant on outside parties for disposal) |
| **Community impact** | Sub-Class B | + Least expensive construction cost<br>+ Future flexibility<br>+ Relatively low annual O&M<br>+ Low acreage requirements | - Largest carbon footprint (High diesel consumption) |
| | Class B | + Moderate construction cost<br>+ Future flexibility[1]<br>+ Moderate annual O&M<br>+ Low acreage requirements | - High carbon footprint (High diesel consumption)<br>- Availability of adequate green waste for use as a compost bulking agent |
| | Composted Class A (all treatment alternatives) | + Least expensive construction cost<br>+ Sustainability<br>+ Best regional solution | - Highest annual O&M<br>- High acreage requirements<br>- Availability of adequate green waste for use as a compost bulking agent |
| | ~~Faculatative~~Facultative Ponds | + Least expensive construction costs<br>+ Lowest annual O&M<br>+ Moderate sustainability<br>+ Reduced carbon footprint (Low diesel consumption)<br>+ Minimal odor | - High acreage requirements |
| **Traffic** | Sub-Class B | | - High wear and tear on road infrastructure from truck traffic |
| | Class B | | |

[1] Flexibility for off-site recycling and disposal increases from Digested through Heat Dried to Composted Class B Bio-solids.

# LOS OSOS WASTEWATER PROJECT – TECHNICAL ADVISORY COMMITTEE

## SOLID DISPOSAL SYSTEMS

### FINANCIAL

| SOLIDS CLASS | PROS | CONS |
|---|---|---|
| **Sub-Class B**<br>▪ **Capital Costs**<br>▪ **O&M**<br>▪ **Financial Risks** | - Lowest construction costs:<br>$1.9M - $2.4M for Gravity, $1.1M-$1.7M for STEP<br>- O&M costs:<br>$430,000-$470,000 for Gravity; $190,000-$270,000 for STEP<br>- Flexibility to be upgraded | - Higher hauling costs<br>- Most restrictive disposal option<br>- Risk of third party cost escalations and future disposal restrictions |
| **Composted A:**<br>**Assumes Gravity Belt Thickening, BFP, Windrow composting**<br>▪ **Capital Costs**<br>▪ **O&M**<br>▪ **Financial Risks** | - Construction costs: from $900,000 to $1,800,000 higher than Sub Class B<br>- O&M costs: from $160,000 to $235,000 higher than Sub Class B<br>- Greatest range of options for recycling/ disposal | - Requires willing compost users; risk of hauling<br>- Composting requires larger amount of land |
| **Ponds**<br>▪ **Capital Costs**<br>▪ **O&M**<br>▪ **Financial Risks** | - Lowest O&M costs<br>- Least amount of sludge handling, hauling, and least associated risks | - Land requirements are included in Treatment |

* A complete table with all classes of solids is available. However, due to the relatively small cost differential between various levels of solids treatments, the Finance Working Group has chosen to compare Sub Class B and Composted A, thereby eliminating Digested Class B, Heat Dried Class B, and Composted B in the comparison above.

### TAC Financial Working Group- Working Cost Table

| **SOLIDS TREATMENT COMPONENTS** | **CAPITAL COSTS** (1) (2) | | **O & M COSTS** (1) (3) | |
|---|---|---|---|---|
| | **Gravity** | **STEP** | **Gravity**<br>**3,900 lbs/day** (1) | **STEP**<br>**1,000 lbs/day** (5) |
| **Thickening**<br>• Assumes Gravity Belt | $900,000- $1,100,000 | $520,000- $830,000 | $170,000- $180,000 | $100,000- $140,000 |
| **Dewatering**<br>• Assumes Belt Filter Press | $1,600,000- $2,200,000 | $900,000- $1,700,000 | $270,000- $300,000 | $160,000- $240,000 |
| • Option: Solar Bed | $1,000,000- $1,300,000 | $650,000- $900,000 | $70,000- $100,000 | $40,000- $80,000 |
| **Digestion**<br>• Assumes Aerobic | $2,300,000 | $1,200,000- $1,600,000 | $50,000 | $30,000- $35,000 |
| **Heat Dried**<br>• Assumes Indirect | $2,900,000 | $1,700,000- $2,200,000 | $100,000 | $60,000- $80,000 |
| **Composting**<br>• Assumes Windrows | $1,000,000 | $600,000- $800,000 | $155,000 | $90,000- $120,000 |
| **Hauling** (4)<br>• Sub-Class B | $190,000 | $ 47,000 | $190,000 | $ 47,000 |
| • Digested Class B | $130,000 | $ 33,000 | $130,000 | $ 33,000 |
| • Heat Dried Class B | $ 44,000 | $ 11,000 | $ 44,000 | $ 11,000 |
| • Composted Class B | $ 61,000 | $ 15,000 | $ 61,000 | $ 15,000 |
| • Composted Class A | $ -0- | $ -0- | $ -0- | $ -0- |
| **Ponds** (6) | | | $40,000- $50,000 | $30,000- $40,000 |

(1) Based on Tables 5.3; 5.5; 5.7; 5.9; 5.11; and 5.15
(2) Includes 30% contingency
(3) Based on a 20 to 40 percent reduction in costs for reduced solids loading with a STEP/ STEG collection system.
(4) Based on Table 5.12 and 5.13. **(Check numbers!)**
(5) Average solids production of Extended Aeration MLE, BIOLAC, and Oxidation Ditch
(6) Includes dredging and hauling every 20 years, in 20 equal annual installments, escalated at 5% per year until 2027.

# SOLID DISPOSAL SYSTEMS

## FINANCIAL

| SOLIDS TREATMENT COMBINATIONS | CAPITAL COSTS | | O & M COSTS (3) | |
|---|---|---|---|---|
| | Gravity | STEP | Gravity | STEP |
| **Sub Class B**<br>• Assumes Gravity Belt Thickening, Solar Drying | $1.9M - $2.4M | $1.1M - $1.7M | $430,000- $470,000 | $190,000- $270,000 |
| **Digested Class B**<br>• Assumes Gravity Belt, Aerobic Digestion, Solar Drying | $4.2M - $4.7M | $2.4M - $3.4M | $420,000- $460,000 | $220,000- $310,000 |
| **Heat Dried Class B**<br>• Assumes Gravity Belt, BFP, Indirect Heat Drying | $5.4M - $6.2M | $3.1M - $4.8M | $600,000- $640,000 | $340,000- $480,000 |
| **Composted Class B**<br>• Assumes Gravity Belt, BFP, Windrows | $3.5M - $4.3M | $2.0M - $3.3M | $660,000- $700,000 | $370,000- $520,000 |
| **Composting**<br>• Assumes Gravity Belt, BFP, Windrows | $3.4M - $4.2M | $2.0M - $3.3M | $600,000- $635,000 | $350,000- $505,000 |
| **Ponds** (1) | - - | - - | $ 40,000- $ 50,000 | $ 30,000- $ 40,000 |

(1) Includes dredging and hauling. ~~Based~~based on $600,000 (escalated at 5% per year until 2027) in equal annual installments over 20 years.

# EFFLUENT REUSE/DISPOSAL SYSTEMS

## ENGINEERING & WATER RESOURCES

| Criteria | Option | Pro | Con |
|---|---|---|---|
| **Level of control over disposal options, multi-faceted approach that does not depend on 3rd parties** | Level 1A<br>Spray Fields (680 AFY)<br>Agricultural Reuse (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (290 AF) | The spray field, conservation program and storage features are under the direct control of the wastewater purveyor. | The cemetery and agricultural reuse programs will require contracts with the end users. |
| | Level 1B<br>Spray Fields (1190 AFY)<br>Conservation (160 AFY)<br>Storage (210 AF) | The spray field, conservation program and storage features are under the direct control of the wastewater purveyor. | The cemetery and agricultural reuse programs will require contracts with the end users. |
| | Level 2A<br>Spray Fields (232 AFY)<br>Broderson, ½ (448 AFY)<br>Agricultural Reuse (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (140 AF) | The spray field, Broderson Leach Field, conservation program and storage features are under the direct control of the wastewater purveyor.<br>The Broderson Leach Field property is already owned by the wastewater purveyor. | The cemetery and agricultural reuse programs will require contracts with the end users. |
| | Level 2B<br>Spray Fields (742 AFY)<br>Broderson, ½ (448 AFY)<br>Conservation (160 AFY)<br>Storage (30 AF) | All elements are under the direct control of the wastewater purveyor.<br>The Broderson Leach Field property is already owned by the wastewater purveyor. | |
| | Level 3A<br>Spray Fields (Minimal AFY)<br>Broderson, 3/4 (680 AFY)<br>Harvest Wells (232 AFY offset)<br>Agricultural Reuse (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (115 AF) | The spray field, Broderson Leach Field, conservation program and storage features are under the direct control of the wastewater purveyor.<br>The Broderson Leach Field property is already owned by the wastewater purveyor. | The cemetery and agricultural reuse programs will require contracts with the end users.<br>The use of harvest wells will require the participation of the water purveyors.<br>There is uncertainty associated with operating the Broderson Leach Field at ¾ ~~capacity.~~capacities. |
| | Level 3B<br>Spray Fields (680 AFY)<br>Agricultural Reuse (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (290 AF)<br>Water Purveyor Shift (400 AF) | The spray field, conservation program and storage features are under the direct control of the wastewater purveyor. | The cemetery and agricultural reuse programs will require contracts with the end users.<br>Requires water purveyor participation. |
| **Retain water in the basin for sustainability and increased yield/seawater intrusion mitigation** | Level 1A<br>Spray Fields (680 AFY)<br>Agricultural Reuse (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (290 AF) | Conservation, when coupled with reduced pumping from western lower zone wells, provides a seawater intrusion mitigation factor of 0.55.<br>Export of effluent out of the basin to spray fields is a favorable option as a short term situation associated with start-up operations and emergency discharge. | In the long term, export of effluent outside of the groundwater basin will have a detrimental effect on the sustainable yield of the groundwater basin. This option exports 686 AFY out of the groundwater basin. |
| | | Agricultural reuse and cemetery reuse of recycled water translates to decreased pumping from the eastern lower zone wells, which provides a seawater intrusion mitigation factor of 0.10.<br>This option reduces the seawater intrusion rate by 140 AFY. | Without the Broderson Leach Field, the project has no means for directly recharging the upper zone of the groundwater basin. |
| | Level 1B<br>Spray Fields (1190 AFY)<br>Conservation (160 AFY)<br>Storage (210 AF) | Conservation, when coupled with reduced pumping from western lower zone wells, provides a seawater intrusion mitigation factor of 0.55. .<br>Export of effluent out of the basin to spray fields is a favorable option as a short term situation associated with start-up operations and emergency discharge. | In the long term, export of effluent outside of the groundwater basin will have a detrimental effect on the sustainable yield of the groundwater basin. This option exports 1190 AFY out of the groundwater basin. |
| | | This option reduces the seawater intrusion rate by 90 AFY. | Without the Broderson Leach Field, the project has no means for directly recharging the upper zone of the groundwater basin. |

# EFFLUENT REUSE/DISPOSAL SYSTEMS

## ENGINEERING & WATER RESOURCES

| Criteria | Option | Pro | Con |
|---|---|---|---|
| **Retain water in the basin for sustainability and increased yield/seawater intrusion mitigation (continued)** | Level 2A<br>Spray Fields (232 AFY)<br>Broderson, ½ (448 AFY)<br>Agricultural Reuse (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (140 AF) | Conservation, when coupled with reduced pumping from western lower zone wells, provides a seawater intrusion mitigation factor of 0.55. | A limited volume of effluent is exported out of the basin to spray fields. This option exports 232 AFY. |
| | | Export of effluent out of the basin to spray fields is a favorable option as a short term situation associated with start-up operations and emergency discharge. | |
| | | Agricultural reuse and cemetery reuse of recycled water translates to decreased pumping from the eastern lower zone wells, which provides a seawater intrusion mitigation factor of 0.10 | |
| | | The Broderson Leach Field will recharge the upper zone of the groundwater basin and will provide a seawater intrusion mitigation factor of 0.22 | |
| | | This option reduces the seawater intrusion rate by 240 AFY. | |
| | Level 2B<br>Spray Fields (742 AFY)<br>Broderson, ½ (448 AFY)<br>Conservation (160 AFY)<br>Storage (30 AF) | Conservation, when coupled with reduced pumping from western lower zone wells, provides a seawater intrusion mitigation factor of 0.55. | In the long term, export of effluent outside of the groundwater basin will have a detrimental effect on the sustainable yield of the groundwater basin. This option exports 742 AFY out of the groundwater basin. |
| | | Export of effluent out of the basin to spray fields is a favorable option as a short term situation associated with start-up operations and emergency discharge. | |
| | | The Broderson Leach Field will recharge the upper zone of the groundwater basin and will provide a seawater intrusion mitigation factor of 0.22 | |
| | | This option reduces the seawater intrusion rate by 190 AFY. | |
| | Level 3A<br>Spray Fields (Minimal AFY)<br>Broderson, 3/4 (680 AFY)<br>Harvest Wells (232 AFY offset)<br>Agricultural Exchange (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (115 AF) | Conservation, when coupled with reduced pumping from western lower zone wells, provides a seawater intrusion mitigation factor of 0.55. | |
| | | Cemetery reuse of recycled water translates to decreased pumping from the eastern lower zone wells, which provides a seawater intrusion mitigation factor of 0.10. | |
| | | Agricultural Exchange, when coupled with decreased pumping from the western lower zone wells, provides a seawater intrusion mitigation factor of 0.55. | |
| | | The Broderson Leach Field will recharge the upper zone of the groundwater basin and will provide a seawater intrusion mitigation factor of 0.22 | |
| | | The export of effluent out of the groundwater basin is minimized. | |
| | | This option reduces the seawater intrusion rate by 600 AFY. | |

# EFFLUENT REUSE/DISPOSAL SYSTEMS

## ENGINEERING & WATER RESOURCES

| Criteria | Option | Pro | Con |
|---|---|---|---|
| **Retain water in the basin for sustainability and increased yield/seawater intrusion mitigation (continued)** | Level 3B<br>Spray Fields (680 AFY)<br>Agricultural Exchange (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (290 AF)<br>Water Purveyor Shift (400 AF) | Conservation, when coupled with reduced pumping from western lower zone wells, provides a seawater intrusion mitigation factor of 0.55. | In the long term, export of effluent outside of the groundwater basin will have a detrimental effect on the sustainable yield of the groundwater basin. This option exports 680 AFY out of the groundwater basin. |
| | | Cemetery reuse of recycled water translates to decreased pumping from the eastern lower zone wells, which provides a seawater intrusion mitigation factor of 0.10. | Without the Broderson Leach Field, the project has no means for directly recharging the upper zone of the groundwater basin |
| | | Agricultural Exchange, when coupled with decreased pumping from the western lower zone wells, provides a seawater intrusion mitigation factor of 0.55. | |
| | | Export of effluent out of the basin to spray fields is a favorable option as a short term situation associated with start-up operations and emergency discharge. | |
| | | With a water purveyor shift in pumping to the upper zone, coupled with all of the other measures of this option, the seawater intrusion rate is reduced by 550 AFY. | |
| **Cost of various disposal options and energy consumption.** | Level 1A<br>Spray Fields (680 AFY)<br>Agricultural Reuse (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (290 AF) | Construction Cost:<br>$12,700,000 to $14,300,000 | This option will lead to the need to import water from outside the basin. Importation of water will have a construction cost of $3,900,000 and an operations and maintenance cost of $1200 per AF. |
| | | Operations and Maintenance Cost:<br>$100,000 to $190,000 per year | This option will require a higher level of treatment. |
| | Level 1B<br>Spray Fields (1190 AFY)<br>Conservation (160 AFY)<br>Storage (210 AF) | Construction Cost:<br>$12,800,000 to $15,600,000 | This option will lead to the need to import water from outside the basin. Importation of water will have a construction cost of $3,900,000 and an operations and maintenance cost of $1200 per AF. |
| | | Operations and Maintenance Cost:<br>$125,000 to $275,000 per year | |
| | Level 2A<br>Spray Fields (232 AFY)<br>Broderson, ½ (448 AFY)<br>Agricultural Reuse (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (140 AF) | Construction Cost:<br>$13,200,000 to $13,900,000 | This option will lead to the need to import water from outside the basin. Importation of water will have a construction cost of $3,900,000 and an operations and maintenance cost of $1200 per AF. |
| | | Operations and Maintenance Cost:<br>$400,000 to $444,000 per year | This option will require a higher level of treatment. |
| | Level 2B<br>Spray Fields (742 AFY)<br>Broderson, ½ (448 AFY)<br>Conservation (160 AFY)<br>Storage (30 AF) | Construction Cost:<br>$14,900,000 to $16,700,000 | This option will lead to the need to import water from outside the basin. Importation of water will have a construction cost of $3,900,000 and an operations and maintenance cost of $1200 per AF. |
| | | Operations and Maintenance Cost:<br>$440,000 to $530,000 per year | This option will require a higher level of treatment. |
| | Level 3A<br>Spray Fields (Minimal AFY)<br>Broderson, 3/4 (680 AFY)<br>Harvest Wells (232 AFY offset)<br>Agricultural Reuse (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (115 AF) | Construction Cost:<br>$25,600,000 to $27,300,000 | This option will lead to the need to import water from outside the basin. Importation of water will have a construction cost of $3,900,000 and an operations and maintenance cost of $1200 per AF. |
| | | Operations and Maintenance Cost:<br>Approximately $410,000 per year | This option will require a higher level of treatment. |
| | Level 3B<br>Spray Fields (680 AFY)<br>Agricultural Reuse (460 AFY)<br>Conservation (160 AFY)<br>Cemetery Reuse (50 AFY)<br>Storage (290 AF)<br>Water Purveyor Shift (400 AF) | Construction Cost:<br>$26,000,000 to $29,800,000 | This option will lead to the need to import water from outside the basin. Importation of water will have a construction cost of $3,900,000 and an operations and maintenance cost of $1200 per AF. |
| | | Operations and Maintenance Cost:<br>$130,000 and up per year | This option will require a higher level of treatment. |

# EFFLUENT REUSE/DISPOSAL SYSTEMS

**ENVIRONMENTAL**

| METHODS | | PROS | CONS |
|---|---|---|---|
| **Spray Fields** [1] | Disposal Capacity (1,190 AFY) | Community owned asset | Cost to purchase land |
| | Saltwater Mitigation (0 AFY) | Tertiary treatment not required | Loss of water (no exchange/reuse) |
| | | Denitrification not required | Seasonal |
| | | Purveyor's cooperation not required | Salt loading in soils |
| | | Future flexibility | Chlorination preferred |
| | | | Trenching for pipeline to spray fields (degree of impact dependent on treatment plant location) |
| | | | Unknown future regulatory requirements |
| **Cemetery In Lieu** | Disposal Capacity (50 AFY) | Minimal saltwater intrusion mitigation | Seasonal |
| | Saltwater Mitigation (5 AFY) | Purveyors' cooperation not required | Partial denitrification required |
| | | If located adjacent to treatment plant minimal trenching impacts | Tertiary treatment required |
| | | | Unknown future regulatory requirements |
| **Urban Reuse (Shallow Wells)** [2] | Disposal Capacity (63 AFY) | Minimal saltwater intrusion mitigation | Seasonal |
| | Saltwater Mitigation (35 AFY) | No off-site trenching impacts | |
| | | Purveyors' cooperation not required | |
| **AG Reuse** | Disposal Capacity (460 AFY) | Minimal saltwater intrusion mitigation | Seasonal |
| | Saltwater Mitigation (46 AFY) | Purveyors' cooperation not required | Partial denitrification required |
| | | | Tertiary treatment required |
| | | | Farmers' cooperation required |
| | | | Trenching for pipeline (degree of impact dependent on treatment plant location) |
| | | | Unknown future regulatory requirements |
| **AG Exchange** | Disposal Capacity (460 AFY) | Highest saltwater intrusion mitigation | Seasonal |
| | Saltwater Mitigation (250 AFY) | | Partial denitrification required |
| | | | Tertiary treatment required |
| | | | Purveyors' cooperation required |
| | | | Farmers' cooperation required |
| | | | Trenching for pipeline (degree of impact dependent on treatment plant location) |
| | | | Unknown future regulatory requirements |
| **Leachfields/Percolation Ponds (Broderson)** | Disposal Capacity (448 AFY) | Significant saltwater intrusion mitigation | Full denitrification required |
| | Saltwater Mitigation (100 AFY) | Tertiary treatment not required | Construction impacts and costs from monitoring wells |
| | | Purveyor participation not required[3] | Grading impacts on habitat (Initial construction and rehabilitation every 10 to 15 years) |
| | | | Negative community perception |
| | | | Unknown future regulatory requirements |

1 - Undetermined natural habitats impacts and visual impacts.
2 - A purple pipe system was deemed to be infeasible because of significantly higher construction costs and environmental impacts and required cooperation by the purveyors without significant additional benefits.
3 - Without harvest wells.
4 – Energy Consumption of various alternatives will be added at a later date.

# EFFLUENT REUSE/DISPOSAL SYSTEMS

## FINANCIAL

| Seawater Intrusion Mitigation Level | Configuration/ Capacity | PROS | CONS |
|---|---|---|---|
| **Level 1a:**<br>**Full Ag Reuse** | Spray Fields (170 acres) 680 AF<br>Ag Reuse 460 AF<br>Conservation 160 AF<br>Cemetery 50 AF<br>Total capacity 1,350 AF<br>Storage (290 AF) | Total Mitigation = 140 AFY (1)<br>Total Capital Cost = $12.7M - $14.3M<br>Total O&M Cost = $100k- $190k / yr<br>Potential for additional Mitigation of 207 AF with Ag Exchange | 680 AF water is permanently lost to ground water basin.<br>Slow ramp-up period to develop agreements with farmers<br>Cost to transport effluent 10,500 ft =$1.4M<br>Land acquisition costs (6) = $5.1M<br>Requires more storage |
| **Level 1b:**<br>**No Ag Reuse** | Spray Fields (280 acres) 1190 AF<br>Conservation 160 AF<br>Storage (210 AF) | Total Mitigation = 90 AFY<br>Total Capital Cost: $12.8M- $15.6M | 1190 AF water is permanently lost to groundwater basin.<br>Land acquisition costs = $8.4M<br>Higher O&M Costs = $125k - $275k/ yr<br>Fails to utilize opportunity for agricultural in-lieu or exchange<br>Cost to transport effluent 10,500 ft= $1.4M<br>Requires more storage |
| **Level 2a:**<br>**Full Ag Reuse** | Spray Fields (70 acres) 232 AF<br>Broderson 448 AF<br>Ag Reuse 460 AF<br>Cemetery 50 AF<br>Conservation 160 AF<br>1,300 AF<br>Storage (140 AF) | Total Mitigation = 240 AFY<br>Potential for additional Mitigation of 207 AF with Ag Exchange<br>Total capital cost = $13.2M - $13.9M (comparable to Level 1a)<br>Land acquisition costs = $2.1M<br>Less acres required for spray fields than Level 1a, 1b, or 2b<br>Requires less storage than Level 1a or b projects | 232 AF water is permanently lost to groundwater basin<br>Higher O&M = $400k - $440k/ yr<br>Cost to transport effluent 10,500 ft = $1.4M |
| **Level 2b:**<br>**No Ag Reuse** | Spray Fields (180 acres) 742 AF<br>Broderson 448 AF<br>Conservation 160 AF<br>Total capacity 1,350 AF<br>Storage (30 AF) | Total Mitigation = 190 AFY<br>Requires less storage than any other project<br>No ramp-up time required as for ag exchange | 742 AF water is permanently lost to groundwater basin<br>Higher capital cost = $14.9M-$16.7M<br>Land acquisition costs = $5.4M<br>Higher O&M cost = $440k- $530k/ yr<br>Cost to transport effluent 10,500 ft = $1.4M<br>Lower mitigation than less expensive projects<br>Fails to utilize opportunity for mitigation through agricultural in-lieu or exchange |
| **Level 3a:**<br>**With Broderson** | Spray Fields (10 acres) -0- (2)<br>Broderson 680 AF<br>Harvest as offset (3)<br>Ag Exchange 460 AF<br>Conservation 160 AF<br>Cemetery 50 AF<br>Total capacity 1,350 AF<br>Storage (115 AF) | Total Mitigation = 600 AFY<br>Maximizes potential for mitigation with ag exchange<br>O&M costs <$400k/ yr, comparable to Level 2a | Higher capital costs = $25.6M-$27.3M<br>Land acquisition costs = $0.4M<br>Slow ramp-up period to develop agreements with farmers<br>Requires purveyor participation in shift in 400 AF of water production<br>Cost to transport effluent 10,500 ft = $1.4M<br>Requires more storage |
| **Level 3b:**<br>**Without Broderson** | Spray Fields 680 AF<br>Ag Exchange 460 AF<br>Cemetery 50 AF<br>Conservation 160 AF<br>Shift in water production (4)<br>Total capacity 1,350 AF<br>Storage (290 AF) | Total Mitigation = 550 AF<br>Maximizes potential for mitigation with ag exchange | Higher Capital Costs = $26.0M - $29.8M (5)<br>Land acquisition costs = $20.4M<br>High O&M costs= $130k -$1,100,000/ yr (5)<br>Cost to transport effluent (10,500 ft)=$1.4M<br>Slow ramp-up period to develop agreements with farmers<br>Requires purveyor participation in shift or water importation<br>Requires greatest storage, as much as Level 1a project<br>Fails to utilize opportunity for mitigation through use of Broderson |

(1) Mitigation: Ag in-lieu = 46; Conservation = 90; Cemetery = 5
(2) None during normal precipitation years
(3) Offsets pumping 232 AF/ year
(4) Shift in water production of 400 AF could involve upper aquifer pumping, water importation, or other strategies.
(5) Upper range of costs ~~are~~is for water importation.
(6) Land acquisition costs based on $30,000 per acre due to large size of parcel to be purchased.

# EFFLUENT REUSE/DISPOSAL SYSTEMS

**FINANCIAL**

**COST/ BENEFIT ANALYSIS OF EFFLUENT REUSE/ DISPOSAL ALTERNATIVES**

| Reuse/Disposal Level | Capital Costs | Annual O&M Costs | Land (Spray field) | Storage | Seawater Intrusion Mitigation |
|---|---|---|---|---|---|
| **Level 1a: Full Ag Reuse** | $12.7M - $14.3M | $100k - $190k | 170 acres = $5.1M | 290 AF | 140 AFY |
| **Level 1b: No Ag Reuse** | $12.8M - $15.6M | $125k - $275k | 280 acres = $8.4M | 210 AF | 90 AFY |
| **Level 2a: Full Ag Reuse** | $13.2M - $13.9M | $400k - $440k | 70 acres = $2.1M | 140 AF | 240 AFY |
| **Level 2b: No Ag Reuse** | $14.9M - $16.7M | $440k - $530k | 180 acres = $5.4M | 30 AF | 190 AFY |
| **Level 3a: With Full Ag Use and Broderson** | $25.6M - $27.3M | < $400k (1) | 10 acres = $0.4M | 115 AF | |

(1) According to County staff, the O&M number in the Fine Screen needs to be revised downward.

| ALTERNATIVE | Mitigation Factor | PROS | CONS |
|---|---|---|---|
| **Spray fields (Tonini)** | **-0-** | Capacity up to 1190 AFY | -0- Seawater Intrusion Mitigation. Water is lost to groundwater basin. - $ |
| | | Unlikely that tertiary treatment is required – save $3.5M in construction and $30,000- $100,000/ year in O&M costs | Need up to 270 acres to dispose of 1190 AFY: land acquisition cost - $5.1M |
| | | Unlikely that denitrification treatment is required – save $4.6M from ponds construction | Construction Costs, incl. 10,500 feet pipe - $5.2M |
| | | | $O&M Costs |
| | | | Possible loss of agricultural viability |
| | | | Requires winter storage - $2.8M |
| **Urban Reuse:**<br>- Cemetery<br>- Middle School, Other | .55 = 5 AFY<br>.55 = 35 AFY<br>40 AFY | Capacity 50 AFY | Cost to transport effluent to town |
| | | Capacity 63 AFY | Requires Tertiary treatment – add $3.5M to construction costs, and $30,000- $100,000/ year in O&M costs |
| | | | Requires some nitrification/ denitrification |
| | | | Urban in-lieu requires purveyor participation |
| **Agricultural Reuse (In-Lieu** using treated wastewater instead of pumping from lower aquifer) | .1 = 46 AFY | Capacity 460 AFY | Cost to transport effluent to farms $900k |
| | | Reduces pumping from lower aquifer | Requires storage + $16k |
| | | | Requires tertiary treatment – add $3.5M to construction costs, and $30,000- $100,000/ yr in O&M costs |
| | | | Requires some nitrification/ denitricication |
| | | | Slow ramp-up period to develop agreements with farmers |
| **Agricultural Exchange** (using treated wastewater on fields; sending water pumped from wells to town for potable use) | **.55 = 253 AFY** | Capacity 460 AFY | Cost to transport well water back to town |
| | | Replaces pumping from lower aquifer at west end: highest mitigation factor | Requires tertiary treatment |
| | | | Requires some nitrification/ denitricication |
| | | | Slow ramp-up period to develop agreements with farmers |
| | | | Requires purveyor participation |
| **Broderson**<br>- Leachfield<br>- Percolation Pond | .22 = 100AFY at 448 AFY<br>Less at 896 AFY | Capacity: 448 AFY without harvest wells | NWRI: If Broderson is used, it is important evaluate compliance with new DHS Groundwater Recharge Reuse criteria.. |
| | | Capacity 896 AFY with harvest wells | Cost for environmental mitigation of percolation ponds could be substantial |
| | | Best location to recharge lower aquifer | Cost to develop leachfield = $2.4M |
| | | Tertiary treatment not required - saves $3.5M in construction costs, and $30,000- $100,000 per year in O&M costs | Cost to transport effluent to town (piping & pump) $4.4M |
| | | | Value of Broderson land $4.7M |
| | | | Harvest wells, treatment & water main $3.1M |
| | | | Requires full nitrification/ denitricication – add $2.2M to construction costs and $90k - $250k per year for O&M costs for STEP |
| | | | Requires purveyor participation |
| | | | Percolation ponds problems include potential flow releases of effluent, permanent loss of sensitive habitat, odor issues, vector propagation |

# EFFLUENT REUSE/DISPOSAL SYSTEMS

## FINANCIAL

| | | | |
|---|---|---|---|
| **Storage:** Need up to 30 acres<br>- Wells<br>- Constructed Wetlands | **- 0 -** | /NWRI: winter storage will be required for land application (incl. spray fields) and for -0- discharge.<br>Constructed wetlands could enhance community | Construction wetlands on Broderson will add to construction costs |

* Cost figures found in Table A1

### Other Strategies to Achieve Balance of Water Resources in the Groundwater Basin

| | | | |
|---|---|---|---|
| **Conservation** | **.55 = 90 AFY** | Equivalent to disposal capacity of 160 AFY | Cost to retrofit 5,000 toilets ($200 ea) $1.3M |
| **Storm water Runoff Detention** (1) | **.55 = xx AFY** | Low construction costs<br>Maximum mitigation factor | Requires CSD, water ~~purveyors~~purveyor's support. |

(1) Requires purveyor support and cooperation

# ~~APPENDIX A: CRITERIA FOR PRO/CON ANALYSIS~~

## ~~EFFULENT DISPOSAL/WATER RESOURCES~~

**~~Engineering & Water Resources~~**

- ~~Level of control over disposal options, multi-faceted approach that does not depend on 3rd parties.~~
- ~~Cost of various disposal options.~~
- ~~Retain water in the basin for sustainability and increased yield.~~
- ~~Seawater intrusion mitigated.~~
- ~~Water Purveyors input and acceptance.~~
- ~~Stakeholders input and acceptance.~~
- ~~Energy~~

**~~Environment~~**

- ~~Construction disturbance~~
- ~~Impact on biological resources~~
- ~~Community impact~~
- ~~System failure~~
- ~~Land use compatibility~~
- ~~Surface water quality~~
- ~~Effluent quality~~
- ~~Aquifer recharge~~
- ~~Saltwater intrusion~~

**~~Financial~~**

- ~~Capital Costs:~~
  - ~~Land acquisition~~
  - ~~Construction costs~~
  - ~~Road impacts~~
  - ~~Cost for individual hook-up~~
  - ~~Cost of future upgrades~~
  - ~~Potential environmental mitigation costs~~
- ~~Operations & Maintenance Costs~~
  - ~~Energy requirements~~
  - ~~Labor, materials, overhead~~
  - ~~Cost of solids handling/ disposal~~
  - ~~Projected schedule for repairs, replacements, and maintenance~~
- ~~Financial Risk Factors~~
  - ~~Construction risks associated with archeological and biological impacts~~
  - ~~Costs relating to system failure risks~~
  - ~~Cost of achieving groundwater balance~~
  - ~~Cost of potential repairs resulting from natural disasters (earthquake, flood)~~
  - ~~Risk of inflated costs and uncertainty of 3rd party handling and/or participation~~
- ~~Funding Factors~~
  - ~~Eligibility for best financing (rate, terms, engineering constraints, flexibility, timing)~~
  - ~~Grant eligibility, attractiveness~~
  - ~~Conducive to 3rd party financial participation~~
  - ~~Potential for revenue generation~~

## ~~TREATMENT TECHNOLOGY~~

**~~Engineering & Water Resources~~**

- ~~Flexibility of treatment process to meet future needs and regulations.~~
- ~~Demonstrated reliability of process.~~
- ~~Effect of process on bio-solids production.~~
- ~~Cost consideration, replacement, operation and maintenance.~~
- ~~Energy.~~

**~~Environment~~**

- ~~Construction disturbance~~
- ~~Impact on biological resources~~
- ~~Community impact~~
- ~~System failure~~
- ~~Impact on archaeological resources~~
- ~~Energy use~~

**~~Financial~~**

- ~~Capital Costs:~~
  - ~~Land acquisition~~
  - ~~Construction costs~~
  - ~~Road impacts~~
  - ~~Cost for individual hook-up~~
  - ~~Cost of future upgrades~~
  - ~~Potential environmental mitigation costs~~
- ~~Operations & Maintenance Costs~~
  - ~~Energy requirements~~
  - ~~Labor, materials, overhead~~

~~Cost of solids handling/ disposal~~

~~Projected schedule for repairs, replacements, and maintenance~~

~~Financial Risk Factors~~
- ~~Construction risks associated with archeological and biological impacts~~
- ~~Costs relating to system failure risks~~
- ~~Cost of achieving groundwater balance~~
- ~~Cost of potential repairs resulting from natural disasters (earthquake, flood)~~
- ~~Risk of inflated costs and uncertainty of 3rd party handling and/or participation~~

~~Funding Factors~~
- ~~Eligibility for best financing (rate, terms, engineering constraints, flexibility, timing)~~
- ~~Grant eligibility, attractiveness~~
- ~~Conducive to 3rd party financial participation~~
- ~~Potential for revenue generation~~

## ~~BIO-SOLIDS TREATMENT & DISPOSAL~~

**~~Engineering & Water Resources~~**

~~Maintain control of disposal process.~~
~~Flexibility of bio-solid process and disposal.~~
~~Nuisance assessment of bio-solids process and disposal.~~
~~Cost of process facilities, operations and maintenance, and ultimate disposal.~~
~~Energy~~

**~~Environment~~**

~~Volume~~
~~Class~~
~~Community impact~~
~~Traffic~~

**~~Financial~~**

~~Capital Costs:~~
- ~~Land acquisition~~
- ~~Construction costs~~
- ~~Road impacts~~
- ~~Cost for individual hook-up~~
- ~~Cost of future upgrades~~
- ~~Potential environmental mitigation costs~~

~~Operations & Maintenance Costs~~
- ~~Energy requirements~~
- ~~Labor, materials, overhead~~
- ~~Cost of solids handling/ disposal~~
- ~~Projected schedule for repairs, replacements, and maintenance~~

~~Financial Risk Factors~~
- ~~Construction risks associated with archeological and biological impacts~~
- ~~Costs relating to system failure risks~~
- ~~Cost of achieving groundwater balance~~
- ~~Cost of potential repairs resulting from natural disasters (earthquake, flood)~~
- ~~Risk of inflated costs and uncertainty of 3rd party handling and/or participation~~

~~Funding Factors~~
- ~~Eligibility for best financing (rate, terms, engineering constraints, flexibility, timing)~~
- ~~Grant eligibility, attractiveness~~
- ~~Conducive to 3rd party financial participation~~
- ~~Potential for revenue generation~~

## ~~TREATMENT PLANT SITE~~

**~~Engineering & Water Resources~~**

~~Sufficient in size to meet environmental and potential future expansion needs.~~
~~Minimize fluid transport costs.~~
~~Minimize land costs, to include environmental mitigation costs.~~
~~Site conditions with regards to constructability.~~

**~~Environment~~**

~~Construction disturbance~~
~~Community impact~~
~~Impact on biological resources~~
~~System failure risk~~
~~Impact on archaeological resources~~
~~Land use compatibility~~
~~Growth Inducement~~

**~~Financial~~**

~~Capital Costs:~~
- ~~Land acquisition~~
- ~~Construction costs~~
- ~~Road impacts~~
- ~~Cost for individual hook-up~~
- ~~Cost of future upgrades~~
- ~~Potential environmental mitigation costs~~

~~Operations & Maintenance Costs~~
- ~~Energy requirements~~
- ~~Labor, materials, overhead~~
- ~~Cost of solids handling/ disposal~~
- ~~Projected schedule for repairs, replacements, and maintenance~~

~~Financial Risk Factors~~
- ~~Construction risks associated with archeological and biological impacts~~
- ~~Costs relating to system failure risks~~
- ~~Cost of achieving groundwater balance~~
- ~~Cost of potential repairs resulting from natural disasters (earthquake, flood)~~
- ~~Risk of inflated costs and uncertainty of 3rd party handling and/or participation~~

~~Funding Factors~~
- ~~Eligibility for best financing (rate, terms, engineering constraints, flexibility, timing)~~
- ~~Grant eligibility, attractiveness~~
- ~~Conducive to 3rd party financial participation~~
- ~~Potential for revenue generation~~

## ~~COLLECTION SYSTEM~~

**~~Engineering & Water Resources~~**
- ~~Life cycle costs.~~
- ~~Design life.~~
- ~~Property impact for both private and public properties.~~
- ~~Reliability of System.~~
- ~~Environmental impact of system.~~
- ~~Infiltration and inflow potential.~~
- ~~Energy.~~

**~~Environment~~**
- ~~Construction disturbance~~
- ~~Impact on biological resources~~
- ~~Community impact~~
- ~~System failure risk~~
- ~~Impact on archaeological resources~~

**~~Financial~~**

~~Capital Costs:~~
- ~~Land acquisition~~
- ~~Construction costs~~
- ~~Road impacts~~
- ~~Cost for individual hook-up~~
- ~~Cost of future upgrades~~
- ~~Potential environmental mitigation costs~~

~~Operations & Maintenance Costs~~
- ~~Energy requirements~~
- ~~Labor, materials, overhead~~
- ~~Cost of solids handling/ disposal~~
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- ~~Construction risks associated with archeological and biological impacts~~
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- ~~Cost of achieving groundwater balance~~
- ~~Cost of potential repairs resulting from natural disasters (earthquake, flood)~~
- ~~Risk of inflated costs and uncertainty of 3rd party handling and/or participation~~

~~Funding Factors~~
- ~~Eligibility for best financing (rate, terms, engineering constraints, flexibility, timing)~~
- ~~Grant eligibility, attractiveness~~
- ~~Conducive to 3rd party financial participation~~
- ~~Potential for revenue generation~~

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