collisions to decelerate a fast neutron to its slow or thermalized state. Hydrogen, however has a mass identical to that of the fast neutron, which means that collisions with hydrogen will result in a significant transfer of velocity from the fast neutron. The detector counts the number of thermalized neutrons it receives over a given time period. These counts can be correlated directly with hydrogen concentrations since the probability that these thermalized neutrons are the result of collisions with hydrogen is much greater than that from other collisions. This is a measure of soil pore-liquid volume, since the most common source of hydrogen in the geologic environment is soil pore-liquids.

Neutron moderation is well suited for vadose zone monitoring because it is a precise, nondestructive technique that gives real-time results over a spatially continuous transect, is inexpensive to operate, and can be automated. Commercially available moisture probes measure the hydrogen density in a generally spherical volume around the probe which can be integrated along an access tube for a cylindrical monitoring zone.

Figure 1 shows the general site location. Figure 2 depicts the Broderson site, and the proposed pilot shallow wells. And finally, Figure 3 is a schematic of the proposed shallow wells and neutron probe access tube configuration in cross section.

4.2 Shallow Wells Installation

M&E will subcontract a licensed driller to install two shallow wells at the Broderson site. The locations are presented on Figure 2. Based on site conditions, the shallow wells will be situated no less than 100 feet south of the Highland Avenue residential property lines. The borings will be drilled using a truck mounted bucket auger rig. The borings will be drilled with a 5-foot diameter bucket, with one to a depth of 40 feet, and the other to a depth of 55 feet below ground surface (bgs). The drillers will install the discharge pipe in the center of the boring. The shallow well will consist of an 8" diameter Schedule 40 PVC casing with 0.080" slots. The screened interval will extend from 55 to 5 feet bgs. The remainder of the shallow well will consist of 8" diameter Schedule 40 PVC casing, which will extend from 5 feet bgs to 3 feet above ground surface. A sounding tube will be installed in the boring approximately 1.5 feet off center. The sounding tube will consist of 2" Schedule 40 PVC casing with 0.020" slots. The screened interval will extend from 55 to 5 feet bgs. The remainder of the sounding tube will consist of 2" diameter Schedule 40 PVC casing, which will extend from 5 feet bgs to 1 foot above ground surface. After installation of the casings, the boring will be backfilled with 1/4" pea gravel. The gravel pack will extend from 55 to 5 feet bgs. The surface seal will consist of a neat cement grout, which will extend from 5 feet bgs to ground surface.

The surface completions will be fitted with a 90° elbow and reducer coupling which will permit the shallow wells to be placed on-line with the water sources. The water sources will consist of either a Cal Cities fire hydrant and/or the Cal Cities Highland Well (Highland Well). A flow control valve and flow meter/totalizer will be placed in the water line so that the water flow into the shallow wells can be measured and/or calculated.

4.3 Neutron Probe Access Tube Installation

In order to track the moisture front of the injected water through the vadose zone, M&E will install two neutron probe access tubes in the vicinity of each shallow well. The access tubes will be placed 5 feet and 40 feet away from each shallow well. The borings for the access tubes will be drilled using a truck mounted drill rig equipped with either solid stem auger or air rotary drilling

capabilities. Each boring will be drilled to a depth of 80 to 120 feet bgs. Each access tube will consist of steel pipe with an inside diameter of at least 2 inches. The access tube will extend from total depth to 1 foot above ground surface. The annulus between the boring wall and access tube will be backfilled with native material. The access tubes will be protected at the surface by cementing a locking well monument around the tube stick up.

4.4 Pilot Test

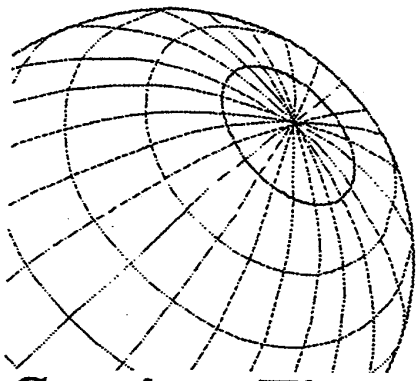
Prior to beginning the pilot test, baseline soil moisture profiles will be established in the four neutron probe access tubes. Due to the close proximity of observation well MW-8 to the western shallow well, this well will also be logged with the neutron probe and used as a neutron probe sampling point for the duration of the pilot test. Neutron counts will be collected at 2-foot intervals in each of the five locations. Measurements will be collected twice at each depth: once as the probe is lowered down each access tube and again as the probe is removed from the access tube. The two readings at each depth will then be averaged. In addition, the water level in observation well MW-8 will also be recorded.

The pilot test will commence by discharging water into each shallow well at a constant rate. The target rate at which water will be added to each shallow well is 75 gpm. The flow rate will be checked periodically and adjusted accordingly. If water from the Highland Well is used, the well will be pumped at 75 gpm for three hours prior to adding water to the shallow wells. This pre-pumping is necessary because the Highland Well produces sand during start up. Water will be gravity fed into each shallow well for 14 days.

During the test, data will be collected periodically. This data will consist of the following:

- Time since test start up;
- The cumulative volume of water added to each shallow well;
- The rate at which water is added to the shallow well;
- Shallow wells water levels obtained from the sounding tubes;
- The water level in observation well MW-8; and
- Neutron counts from the 4 neutron probe access tubes, plus observation well MW-8.

Data sets will be collected twice during the first day, once per day on days 2 through 5, and then every third day until day 14 (days 8, 11, and 14).



Section Five

SCHEDULE

This study will be rapidly paced. The San Luis Obispo County Supervisors authorized this study on May 7, 1997, and allocated a 60-day time frame. M&E anticipates the following schedule:

WEEK	DATE	ACTION
1	May 8-15	Preparation of Work Plan
2	May 15-22	Approval of Work Plan
3	May 15-June 10	Site Access Approvals, Including Landowner, County Engineering and Planning Departments and U.S. Fish & Wildlife Service
4	June 16-23	Drilling and Installation of Shallow Wells and Monitoring System
5	June 23-30	Start of Infiltration Test
6	June 30-July 8	Conclusion of Infiltration Test
7	July 8-15	Analysis of Data
8	July 8-22	Preparation of Summary Report
9	July 25	Submittal of Summary Report

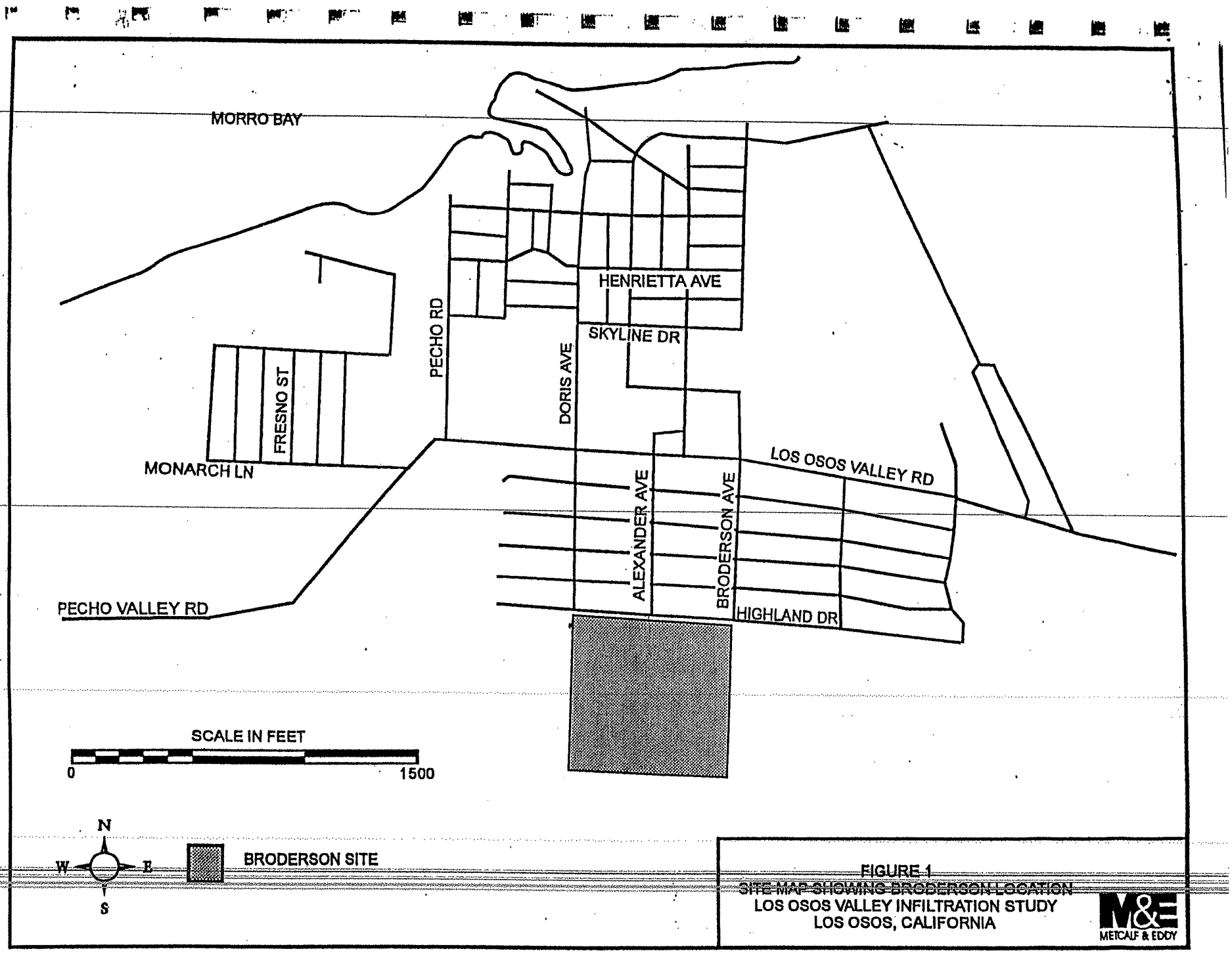


FIGURE 1
SITE MAP SHOWING BRODERSON LOCATION
LOS OSOS VALLEY INFILTRATION STUDY
LOS OSOS, CALIFORNIA

METCALF & EDDY

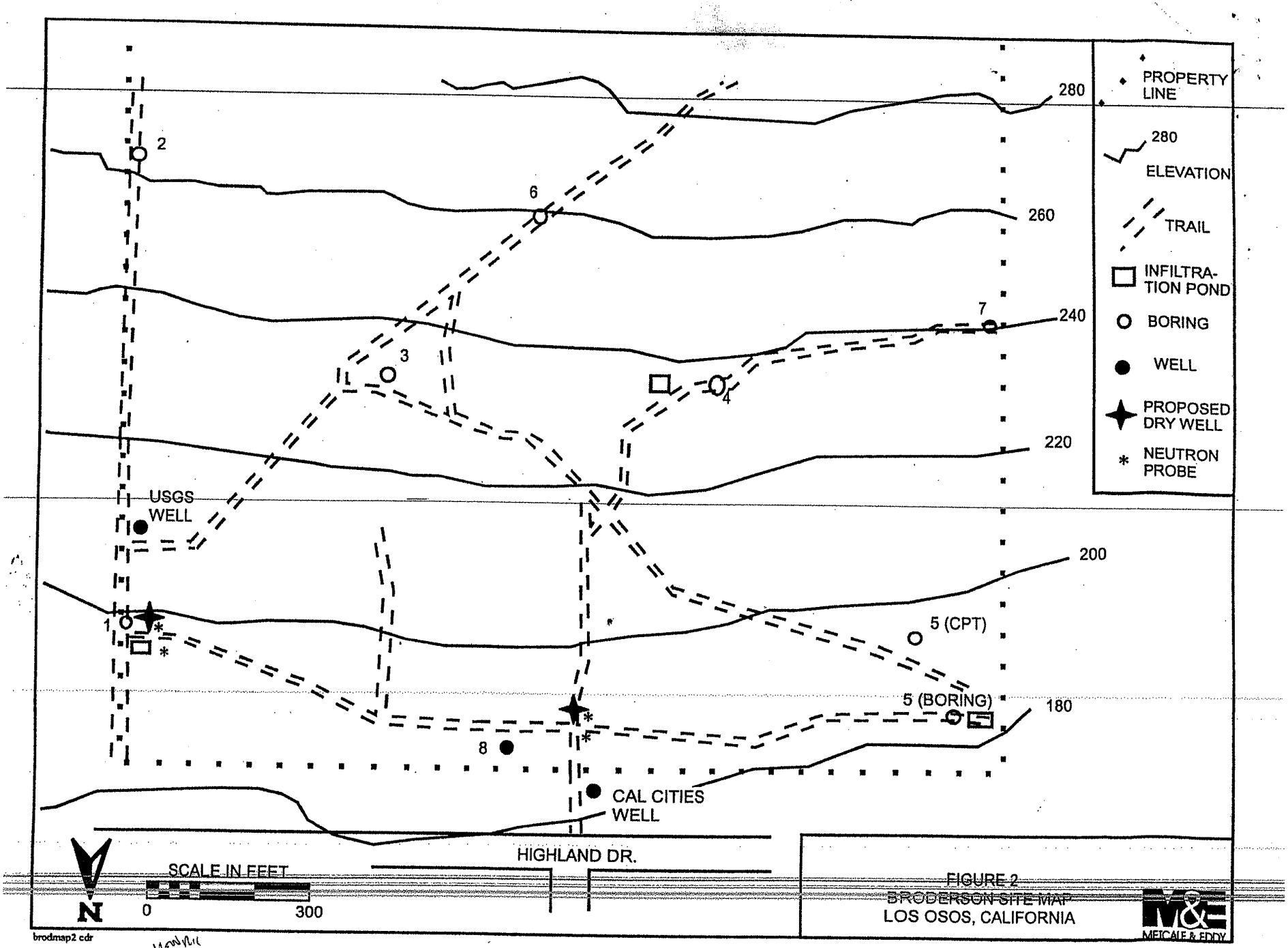


FIGURE 2
BRODERSON SITE MAP
LOS OSOS, CALIFORNIA

METCALF & EDDY

Page Number 000704

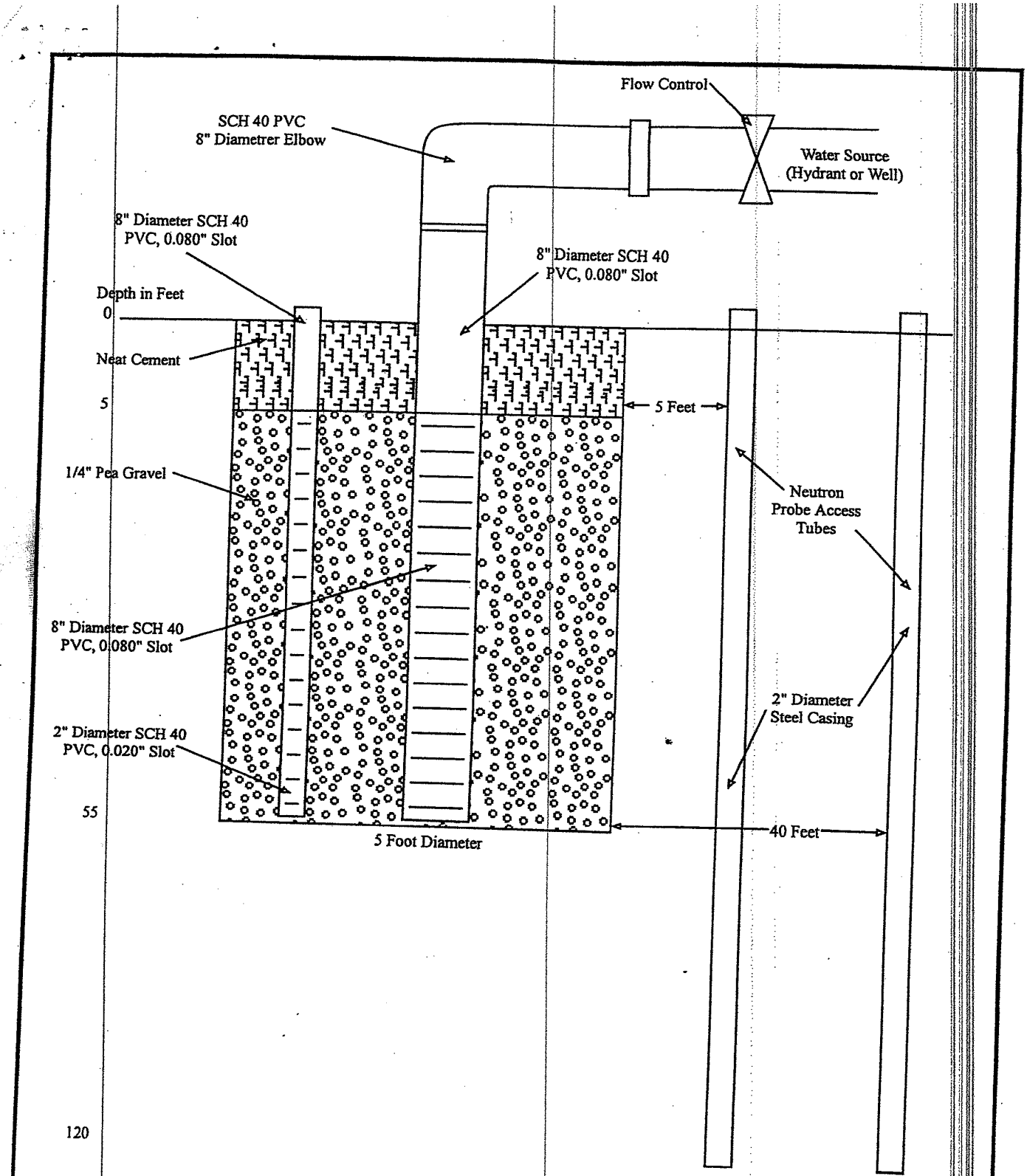
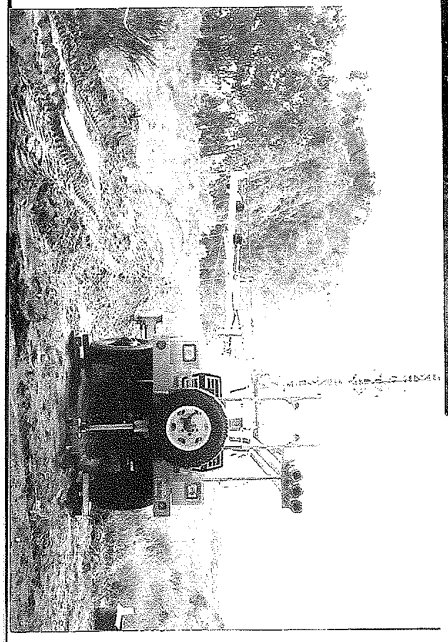
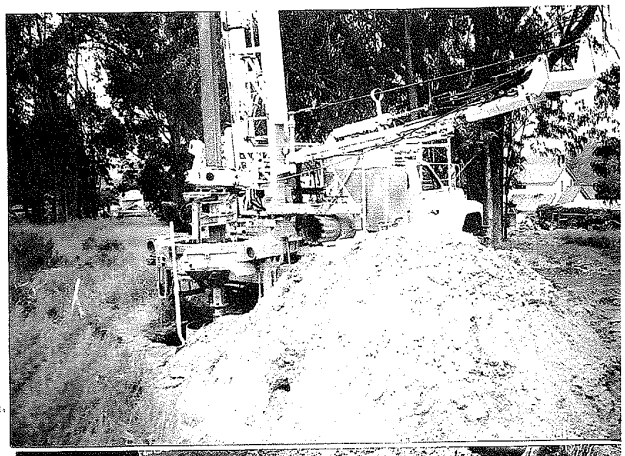
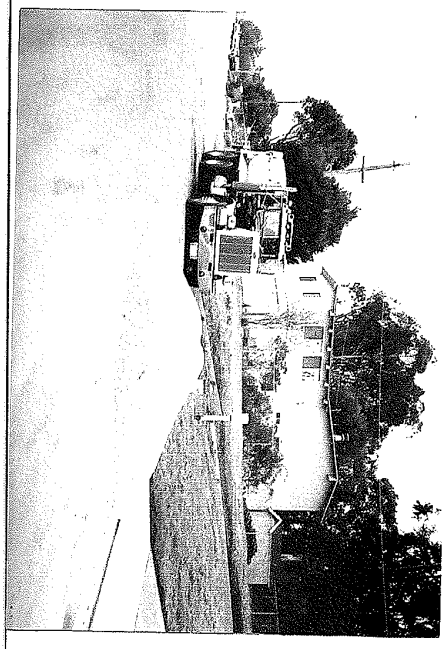


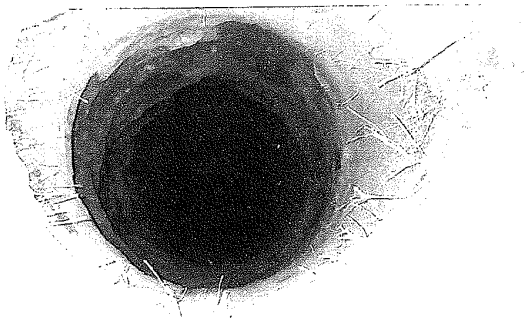
FIGURE 3
DISCHARGE POINT SCHEMATIC
LOS OSOS VALLEY INFILTRATION STUDY
LOS OSOS, CALIFORNIA

METCALF & EDDY









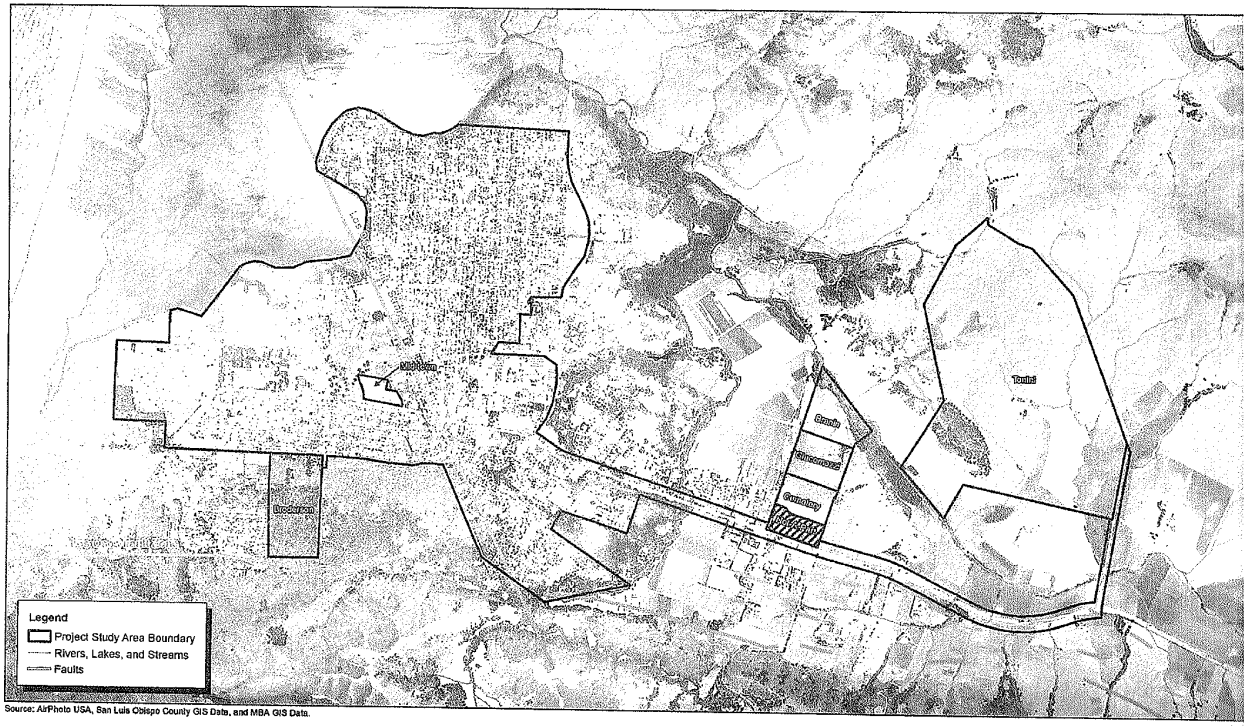
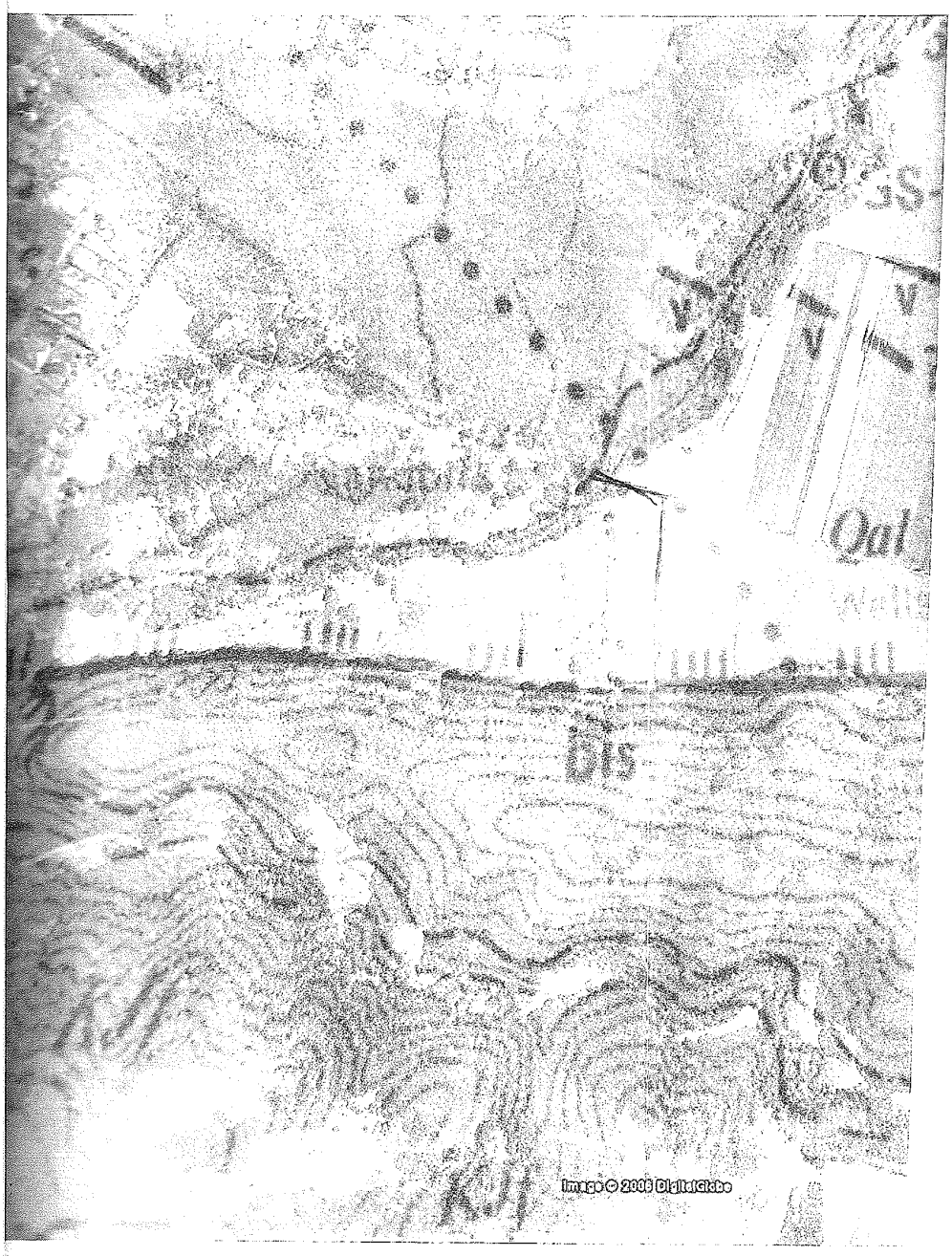


Exhibit 5.4-1
Faults and Surface Features


Qal
Tm
Tbs
Kuj
Image © 2006 DigitalGlobe

Legend

- **Property Boundary**
- **Service Area Boundary**
- USEABLE AREA AT GORBY
- RAW EFFLUENT CONVEYANCE LINE
- TREATED EFFLUENT CONVEYANCE LINE

Figure 1-2

Project Location

Los Osos Wastewater Project EIR

"Internet Webmaster "
<webmaster@co.slo.ca.us>
04/29/2009 01:13 PM

To "planningcommission@co.slo.ca.us" <planningcommission@co.slo.ca.us>
cc
bcc
Subject Planning Commission Contact Form (response #27)

Planning Commission Contact Form (response #27)

Survey Information

Site:	County of SLO
Page Title:	Planning Commission Contact Form
URL:	http://www.slocounty.ca.gov/CM/WebUI/PageTypes/Survey/Survey.aspx?PageID=10469
Submission Time/Date:	4/29/2009 1:12:45 PM

Survey Response

Name	Jerri Walsh
Contact Information (Phone Number, Email, etc.)	805-528-5800 baywoodrealty@charter.
Question or Comment	To:Sarah Christie. I think you need to allow public comment on issues raised after Mr. Ogren gives a new presentatin on affordability or anthing else not discussed last week. Thank you so much. Jerri Walsh

"David Broadwater "
<csi@thegrid.net>
04/29/2009 04:01 PM

To <planningcommission@co.slo.ca.us>
cc <fmecham@co.slo.ca.us>, <bgibson@co.slo.ca.us>, <ahill@co.slo.ca.us>, <kachadjian@co.slo.ca.us>, <jpatterson@co.slo.ca.us>, <mhutchinson@co.slo.ca.us>
bcc
Subject P.C. 4-30 LOWWP EIR Certification

SLO County Planning Commission

re: LOWWP FEIR - Los Osos Wastewater Project Final EIR

cc: SLO County Board of Supervisors
cc: Mark Hutchinson, Environmental Programs Manager, Public Works

Attached, please find my comments on the LOWWP FEIR prepared for the Commission's 4-30-09 meeting. The comments fill 4.5 pages and the list of documents examined in their preparation fills one page. It includes seven topics addressing the failure of the EIR to inform citizens and decision-makers of information essential to reaching an informed conclusion about this project:

1. Overview – Contamination Exportation
2. Classification & Definition of Sewage Sludge and Related Regulatory Restrictions Effecting Disposal/Use Options
3. Local Regulatory Setting - Effective & Proposed Sewage Sludge Land Application Ordinances
4. Public Heath, Agricultural & Environmental Consequences of Sewage Sludge and Effluent Disposal/Use
5. Alternative Methods of Sewage Sludge Management
6. Land Use and Agricultural Production & Marketing Consequences
7. Pollution Prevention & Reduction through Pretreatment

As a result of these deficiencies, the FEIR does not qualify for certification.
David Broadwater

Center for Sludge Information PC BofS LOWWP comments 4-30-09.doc

CSI: Center for Sludge Information
Advocacy through Acquisition, Analysis and Articulation of Information re:
Land Application of Sewage Sludge
6604 Portola Rd., Atascadero, Calif. 93422. ph: (805) 466-0352, fx: (805) 462-0408, email: csi@thegrid.net

to: SLO County Planning Commission
cc: SLO County Board of Supervisors
cc: Mark Hutchinson, Environmental Programs Manager, Public Works

re: LOWWP FEIR - Los Osos Wastewater Project Final EIR

from: David Broadwater, Center for Sludge Information
date: 4-30-09

As a citizen involved in researching sewage sludge land application and advocating related policy in SLO County for over ten years, a member of both Sewage Sludge Land Application Task Forces convened by the County, having examined numerous sections of the DEIR and the related technical memos and appendices pertaining to sewage sludge generation and disposal/use *, and having witnessed the 4-23-09 Planning Commission meeting about the DEIR; I feel obligated to transmit some observations.

The DEIR and its associated documents fail to provide citizens and decision-makers with adequate and accurate information regarding the:

- classification and definition of sewage sludge and related regulatory restrictions effecting disposal/use options,
- local regulatory setting including the effective and proposed sewage sludge land application ordinances,
- public heath, agricultural and environmental consequences of sewage sludge and effluent disposal/use, and
- alternative methods of sewage sludge management.

This failure renders decision-makers and interested parties incapable of reaching a rational conclusion regarding the primary non-localized impact of this project, i.e., generating sewage sludge which must be disposed of or utilized in some manner. This systemic and persistent societal failure is manifest in the 4-30-09 Planning Commission agenda in which the "construction and operation of a sewer system" is defined to entail "collection", "treatment", "effluent disposal" & "infrastructure", neglecting to identify sewage sludge generation/disposal/use as a significant component of the project. This negligence is evident throughout numerous sections of the DEIR, its appendices and technical memos.

The failures to define sewage sludge as a concentration of heavy metals, synthetic chemicals including endocrine-disrupting compounds and pharmaceuticals, and infectious organisms with toxic, carcinogenic, mutagenic and pathogenic properties; to show how the concentrations of a few of those contaminants affect disposal/use options; to accurately describe SLO County effective and proposed ordinances; to address the consequences of sewage sludge disposal/use; and to examine alternative management methods, renders this FEIR unworthy of, and unqualified for, certification.

Overview – Contamination Exportation

All of the four LOWW Projects within the scope of the DEIR (1-4), including the so-called "environmentally superior alternative", entail hauling poorly-treated sewage sludge out of Los Osos for disposal or land application after further processing. The DEIR reports that the latter activity, if pursued in Los Osos, "could potentially increase the level of salts and heavy metals in the groundwater" (1). It also reports that "Significant public outreach would be necessary to find a market for" compost containing sewage sludge (2), and that successful local marketing of sewage sludge for land application "is not likely to occur within the agricultural sector" (3).

It appears that, in a search for the most economical and expedient means of ridding itself of the contaminants concentrated in the sewage sludge generated by this project, SLO County is prepared to displace onto others the risk, responsibility and liability associated with the consequences of sewage sludge land application. While it recognizes that groundwater pollution can result from this activity, that an aggressive public-relations campaign would be necessary to dupe locals to engage in it, and that local farmers are resistive, SLO County persists in pursuing a policy that requires others to submit to lower standards of public health, environmental integrity and agricultural vitality than it will tolerate within its own jurisdiction.

Lack of Adequate/Accurate Information

This headings below address the four bulleted failures identified above.

- **Classification & Definition of Sewage Sludge and Related Regulatory Restrictions Effecting Disposal/Use Options**

In addition to the failure to accurately define sewage sludge (see above), the EIR and its associated documents fail to accurately identify and depict the various concentrations of heavy metals and pathogens which are subject to differing land application restrictions. This facilitates ignorance.

The documents repeatedly and incorrectly refer to "Class A" sewage sludge as definitive of the material and determinative of regulations, but that classification only refers to fecal coliform concentrations, not heavy metal concentrations which are also regulated. This facilitates confusion.

The lack of adequate and accurate information regarding the range of contaminants concentrated in sewage sludge and the various regulatory restrictions on them renders citizens and decision-makers incapable of effectively anticipating and planning options for managing this product of the project.

- **Local Regulatory Setting - Effective & Proposed Sewage Sludge Land Application Ordinances**

The descriptions of the current SLO County Interim Moratorium ordinance on sewage sludge land application are variously absent, inaccurate and incomplete in terms of its provisions and historical consequences. The "Regulatory Setting" presentations relative to "Biological Resources", "Public Health and Safety" and "Agricultural Resources" fail to mention this ordinance under "Local Regulations". The descriptions of this ordinance in sections such as "Disposal Opportunities" are inaccurate, as are, therefore, the available disposal options.

The documents fail to mention the two draft permanent sewage sludge land application ordinances proposed by the County since 2003. The facts that these ordinances regulate composts containing sewage sludge as well as sewage sludge; and prohibit land application to open space lands, home gardens, lawns, parks, school grounds, sports fields, and other areas by restricting the activity exclusively to agriculturally-zoned land used for crop production and grazing are, therefore, missing.

The oversights evident regarding current and proposed ordinances may be attributed to the fact that, among the SLO County agencies consulted, the Environmental Health Division (EHD) of the Public Health Department is not listed. The EHD is responsible for administering the current ordinance and drafting the proposed permanent ordinance. The failure to consult with the EHD is inexplicable and inexcusable, and has apparently resulted in unnecessarily inadequate and inaccurate information about the local regulatory setting.

These failures render citizens and decision-makers incapable of competently assessing and anticipating the present and probable regulatory contexts in which this project will operate.

- **Public Heath, Agricultural & Environmental Consequences of Sewage Sludge and Effluent Disposal/Use**

Other than the potential groundwater pollution consequences of land applying composted sewage sludge in the Los Osos area cited above, the documents suffer from a virtually complete absence of information regarding the public health, agricultural and environmental impacts of sewage sludge land application.

The documents also fail to include adequate and accurate information regarding the concentrations of contaminants in sewage plant effluents and the consequences of introducing them into the environment. This oversight is evident in Table 2 of Appendix P about sewage sludge disposal options in which the comment about "emerging contaminants: pharmaceutical and other constituents" is "No known impact".

There is a vast volume of information readily available regarding the impacts of exposing soil organisms, plants, food, water, air, people and animals to these sewage sludge and effluent contaminants by spreading them on land and watersheds. These comments do not contain any of that material due to the fact that it is simply too vast to compensate for the enormous omissions evident in the project documents. It is, perhaps, understandable that these documents omit this information relative to sewage sludge land application because the County apparently intends to export the material for spreading or disposal elsewhere. The omission of this information relative to effluent disposal in the Los Osos area is less understandable in light of the voluminous information available about the bioaccumulation of effluent constituents including, e.g., pharmaceuticals, endocrine disrupting compounds and other regulated and unregulated contaminants.

The lack of adequate and accurate information regarding the impacts of introducing sewage sludge and effluent contaminants into the environment renders citizens and decision-makers incapable of conducting a life-cycle analysis of this project's impacts including its effects on remote and local receptors.

- **Alternative Methods of Sewage Sludge Management**

Although it has been SLO County policy since 2002 to conduct a comparative analysis of alternative means of managing sewage sludge, no such analysis has occurred. The failure of these documents to contain any such analysis appears to be an extension of that failure. The Board of Supervisors, County Staff and the EHD have been in possession of information about economically and technically feasible methods of sewage sludge disposal/use alternative to land application for years.

This continuing negligence, now evident in these documents, is indicative of an uninformed presumption that sewage sludge land application is the only feasible alternative available, reinforced by a refusal to consider other methods. This failure renders citizens and decision-makers incapable of examining the economic, technical and environmental aspects of the full range of management alternatives which could assist the community in evaluating responsible means of dealing with this product of the project.

There is a large volume of information available about these methods which include landfilling with methane capture/ energy production, producing gaseous, liquid & solid fuels, and improving construction materials. These comments do not contain that information due to the volume of material available.

ADDITIONAL COMMENTS:

- **Land Use and Agricultural Production & Marketing Consequences**

Significant and long-term negative consequences to land use flexibility and agricultural production and marketing could result from a policy or practice of spreading sewage sludge on local lands. The utility of lands which have received sewage sludge or sewage effluent could be severely reduced due to the deposition of contaminants on them. This could significantly restrict land-use flexibility by excluding those lands from certain uses due to the persistent presence of those contaminants.

Currently, agriculturalists using conventional practices in raising crops cannot market their produce to a number of food processors if they use sewage sludge as a fertilizer or if their land has ever been subjected to sewage sludge land application. Heinz, Del Monte and Dole are among the companies which prohibit that activity on crops they purchase. Applying sewage sludge to local farms will reduce the amount of land which can be used to produce crops for that market.

Currently, agriculturalists using organic practices cannot use sewage sludge as a fertilizer because they will lose their certification as a result. As this is a growing sector of the agricultural industry in SLO County, the preservation of lands suitable for organic farming is of paramount importance. Applying sewage sludge to local lands will reduce the availability of land for that purpose.

As the understanding of the dangers associated with sewage sludge and effluent contaminants evolves, additional restrictions may be placed on lands subjected to their land application, including residential and recreational uses.

The absence of any information about these current and potential land use and agribusiness consequences renders citizens and decision-makers incapable of evaluating the long-term environmental and economic impacts of the project.

- **Pollution Prevention & Reduction through Pretreatment**

Although the only way to reduce the negative consequences of spreading sewage sludge and effluent contaminants on land is to prevent the introduction of treatment-resistant and environmentally persistent pollutants into the sewer system, the documents contain no plan for enforcing an effective pretreatment program designed to exclude them from the Los Osos sewer system. While pathogenic organism concentrations can be reduced during the sewage treatment process by processes and chemicals that kill them, those of non-living contaminants such as heavy metals and synthetic chemicals cannot be reduced.

If Los Osos intends to produce a sewage sludge eligible for the largest number and least expensive of disposal/use methods, it will need to institute an aggressive and enforceable pretreatment program designed to prevent users from dumping contaminants down the drain. The absence of any such plan will render the residential and commercial users incapable of exercising any responsibility for, or control over, the method selected for disposing of their waste.

* Documents Examined:

Environmental Impact Report

Section 2: Executive Summary
- 2.3 - Project Alternatives
- 2.4 - Project Components
- 2.8 - Summary of Environmental Impacts and Mitigation Measures

Section 3: Project Description
- 3.3 - Project Characteristics

Section 5: Project and Cumulative Impacts
- 5.5 - Biological Resources
- 5.7 - Public Health and Safety
- 5.11 - Agricultural Resources

Section 7: Alternatives to the Proposed Project
- 7.2 - Steps in the Alternatives Screening Process
- 7.4 - Environmentally Superior Alternative

Section 9: Organizations and Persons Consulted
- 9.1 - Public Agencies

Section 11: References

Appendix C: Land Use and Planning Information
- 5.1.3 - Regulatory Setting

Appendix P: Alternatives Information

P-1: Alternative Components
- Section 1: Introduction
- Section 2: Review of Existing Documentation
- Section 3: Summary Descriptions
  - 3.1 Wastewater Treatment Process Alternatives
  - 3.4 Biosolids Disposal Alternatives
  - 3.5 Collection System Alternatives
- Section 4: Criteria Development
- References

P-2: Evaluation of Component Alternatives
- Section 1: Introduction
- Section 2: Methodology
- Section 3: Component Evaluation
  - 3.3 Initial Screening – Wastewater Treatment Process
  - 3.4 Initial Screening – Collection System
  - 3.6 Initial Screening – Biosolids Disposal
- Section 4: Evaluation of Viable Components
  - 4.2 Evaluation - Wastewater Treatment Process
  - 4.3 Evaluation – Collection System
  - 4.5 Evaluation – Biosolids Disposal
- Section 5: Project Definition
  - 5.1 Priority A – Proposed Projects
  - 5.2 Priority B – Alternatives
  - 5.3 Priority C – Other Alternatives
- References

P-4: Regional Biosolids Management
- Section 1: Introduction
- Section 2: Biosolids Treatment and Disposal Alternatives
  - 2.1 Options
  - 2.2 Disposal Opportunities for LOWWP
  - 2.3 Regional Biosolids Treatment Alternative
  - 2.4 Results of Evaluation
- Section 3: Life-Cycle Costs
- References

P-5: Regional Wastewater Treatment
- 2.2 Description of an Integrated System

Technical Memorandum - Solids Handling Options 8-08

1.0 INTRODUCTION
2.0 REGULATORY ISSUES
- 2.1 Federal Regulations
- 2.2 State Regulations
- 2.3 Local Regulations
- 2.4 Air Quality

3.0 DISPOSAL/END USE OPTIONS
- 3.1 Disposal
- 3.2 Bulk/Bagged Distribution

4.0 DIGESTION
- 4.1 Technology
- 4.2 Feasibility of Using Digester Gas
- 4.5 Odor Impacts

5.0 SLUDGE DRYING
- 5.1 Technology
- 5.4 Odor Impacts

6.0 COMPOSTING
- 6.1 Technology
- 6.2 Facility Footprint
- 6.4 Odor Impacts

7.0 SUMMARY
- 7.3 Odor Impacts

Viable Project Alternatives Fine Screening Analysis 8-07

Chapter 5 – Solids Treatment and Disposal Alternatives
- 5.1 Treatment and Disposal Alternatives
- 5.2 Treatment Facility Solids Production
- 5.5 Thickening
- 5.6 Dewatering
- 5.7 Digestion Options
- 5.8 Heat Drying Options
- 5.9 Composting Options
- 5.10 Biosolids Hauling Costs
- 5.13 Summary of Alternatives
- 5.14 Potential Considerations for Alternative Selection
- 5.15 Environmental/Permitting Considerations
- 5.16 Apparent Low Cost Alternatives

Pro/Con Analysis on Project Component Alternatives 8-6-07
Technical Advisory Committee

Executive Summary of Solids Treatment and Disposal
- Solid Disposal Systems

References:

1. P-4: Regional Biosolids Management, 2.4 Results of Evaluation, Table 2: Results of Criteria Evaluation for Biosolids Alternatives, page 8.
2. P-4: Regional Biosolids Management, 2.3.1 Summary Description of Regional Biosolids Facility, page 4.
3. P-4: Regional Biosolids Management, 2.3.1 Summary Description of Regional Biosolids Facility, page 5.

David Broadwater
Center for Sludge Information

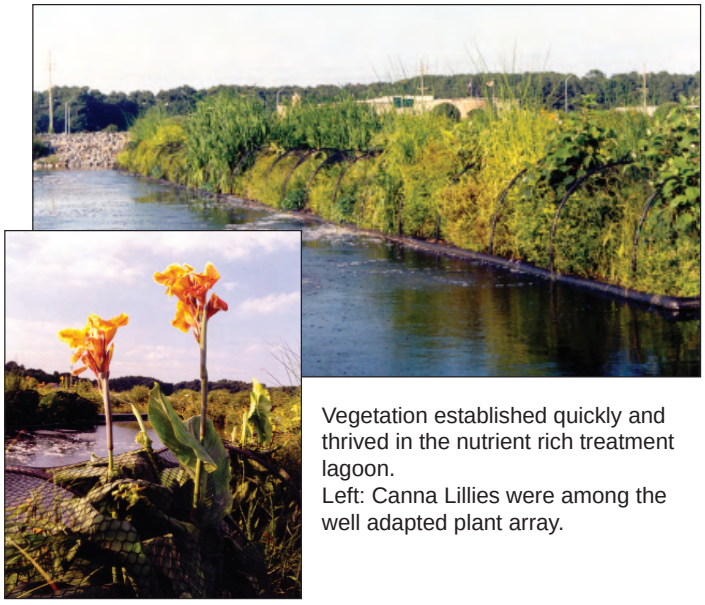
Industrial Waste Treatment Aqua-Restorer™

Berlin, Maryland

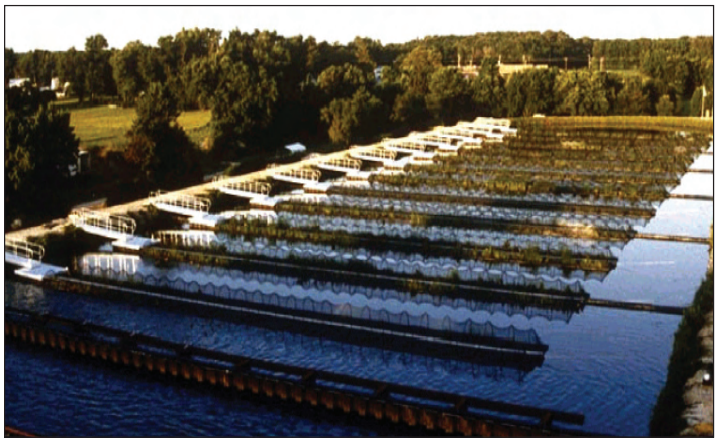
Before consulting with Ocean Arks International and the John Todd Ecological Design team in 2001, the Maryland Environmental Protection Agency levied several fines against Tyson's poultry processing facility in Berlin, Maryland.

Effluent from the Tyson lagoon was frequently out of compliance with MD-EPA standards and was unfit to discharge into Chincoteague Bay, a local fishing and shellfishing site.

With the help of John Todd's Aqua-Restorers™, Tyson Foods Inc. turned their sludge filled lagoon into a thriving ecosystem and compliant wastewater treatment site. Aqua-Restorers™ were installed to work in collaboration with existing traditional treatment elements. The result was a 95% reduction of contaminants, 70% reduction in energy use, 20% reduction in sludge production, and a discharge that complied with Maryland's open water effluent parameters.



Vegetation established quickly and thrived in the nutrient rich treatment lagoon.
Left: Canna Lillies were among the well adapted plant array.



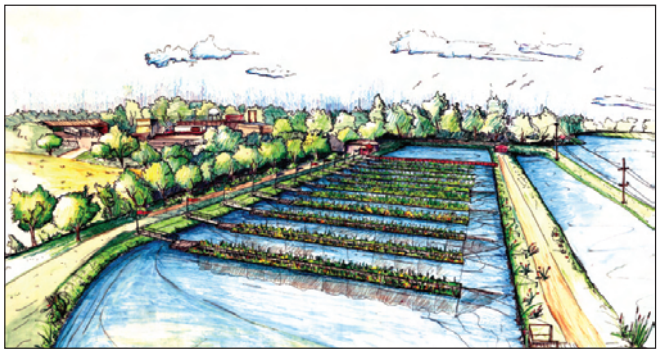
In this case, 25,000 native plants were chosen to create a balanced and complex aquatic ecosystem to provide habitat for a variety of microbial communities, all of which perform a unique function in the waste treatment process. Flotation, aeration and water circulation are used to accelerate the ecosystem's natural ability to clean water.

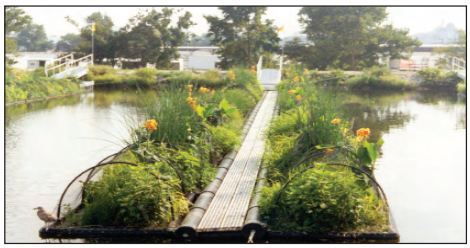
Operation and maintenance of the Restorers is simple and low in cost. Their ecological diversity results in a highly resilient system— one that is able to handle sudden overloads better than traditional systems. More recently, several local plants and turtles have migrated to the lagoon, creating a unique self-organizing ecosystem.

Tyson's existing SBR system had two DAF units connected in a series that discharged into a 13.5 million gallon lagoon. This was divided into a 4.5 million gallon basin (run as a sequencing batch reactor) followed by a 9 million gallon lagoon - used as a decant pond. The original SBR utilized approximately 280 hp of aeration equipment. The 9

million gallon lagoon needed to be retrofitted with the Restorer system which would treat water to a higher standard, use less energy, and produce less sludge than the former SBR system.

Twelve Restorers run 140 feet across the lagoon and are planted with twenty-five species of native plants. Fine bubble linear aerators installed at the bottom of the lagoon provide energy efficient aeration and gentle mixing. The center zones of the Restorers (with fixed-film media) are submerged, aerobic reactors.
The Restorers and fabric baffle are arranged to create a serpentine flow pattern which, combined with the gentle rolling action of the linear fine bubble aeration, forces the water to continually roll past four distinct aquatic ecologies: plant root zones, fabric media, sludge mounds and open water. This spiraling flow pattern mimics the natural movement of water in streams and maximizes the exposure of waste particles to diverse biological communities. The entire wastewater treatment system developed by Dr. John Todd also incorporates the following components: dissolved oxygen air floatation, anoxic denitrification, an aerated lagoon, a clarifier, and disinfection.





Above: An artistic rendering of the Tyson Restorers
Left: Canna lillies blooming

Design Treatment Standards and Results for Tyson Restorer
Estimated Flow: gpd

	Influent	Effluent	Target Effluent	Reduction
COD mg/l	490	22	-	95%
BOD mg/l (summer)*	418	16	7.5	96%
BOD mg/l (winter)*	275	21	23	92%
BOD mg/l (actual)**	267	12	-	95%
Nitrate mg/l	1.3	9.8	10	35%***
TSS mg/l	80	4.3	26.5	95%

* Based on estimated BOD-COD ratio at influent and effluent
** BOD actual represents mean data, N=13 over 4 months
*** Percent nitrification of total nitrogen load (including ammonia)

The reduction in sludge (20%) after installation of the Restorers translated into a savings of over $55,000 per year in reduced sludge disposal costs. The estimated total savings in energy compared to previous operations were approximately 3,500 kWh/day (a reduction of 60%) which equates to an annual savings of approximately $71,000. The lagoon system, treating ~1- MGD, has been successful at nitrification and removal of organic matter. The effluent from the Restorer Lagoon has an average ammonia level of 0.8 mg/l and TSS of 4.3 mg/l (see table on front side).

The Berlin system emphasizes the compatibility of Restorer technology with conventional technologies. In similar cases we would recommend a constructed wetland instead of a clarifier for improved BOD and suspended solids reduction with enhanced denitrification.

Stuart and Stephani Denker
<ssdenker@sbcglobal.net>
04/30/2009 04:08 PM

To planningcommission@co.slo.ca.us
cc "SLO COUNTY BOARD OF SUPERVISORS, Los Osos Wastewater Project OF SUPERVISORS" <LOWWP@co.slo.ca.us>
bcc
Subject Review of the County's Request for Approval of Los Osos Wastewater Treatment Project

Honorable Chairperson, Ms. Sarah Christie and Commission Members,

I have attended none of the public hearings that you've conducted reviewing the county proposed Los Osos Wastewater Treatment Project. The televised coverage and other media accounts have kept me quite well informed. I apologize for not attending and contributing a little counter weight to the large group of zealous STEP/STEG anti-gravity adherents who seem to have the time and energy to attend every meeting and try to persuade your Commission and the Board of Supervisors to undo all the good efforts of the Department of Public Works
staff.

Watching the past testimony and today's meeting's discussions, I am impressed by how little emphasis that the extreme on-lot excavation impact that would result from the removal of existing septic tanks and their replacement by new STEP TANKS. In most instances, the destruction of driveways and mature landscape features, including the root systems of the area's Oak and Cypress trees will result in a very substantial loss of both aesthetic beauty and habitat. The requirement of a 10' wide x 25' long x 10' deep excavation on each lot means that, assuming the
installation of 4,500 STEP TANKS are to be installed @ 92.4 cu. yds. per site, the result community wide impact would result in 415,665 cu. yds. of excavation, all occurring on private properties.

We've been listening to sales pitches for STEP/STEG for the past 8 years and are not persuaded by the arguments of the passionate promoters of STEP/STEG.

There are very solid reasons why the "Community Preference Poll" came out so strongly in favor of a GRAVITY Collection System.
Please give these thoughts some consideration.

Sincerely,

Stuart and Stephani Denker
1347 Pasadena Drive
Los Osos, CA 93402

805 528-8520

Ellie Porter /Planning /COSLO
04/30/2009 11:55 AM

To Mike Wulkan/Planning/COSLO@Wings, Chuck Stevenson/Planning/COSLO@Wings, Ramona Hedges/Planning/COSLO@Wings
cc
bcc
Subject Fw: Smart Growth

Ellie Porter
Planning Commission Secretary
(805) 781-5611

----- Forwarded by Ellie Porter/Planning/COSLO on 04/30/2009 11:54 AM -----

"Harold Biaggini " <bgneee@hughes.net>
04/27/2009 09:32 PM

To <kachadjian@co.slo.ca.us>, <jpatterson@co.slo.ca.us>, <fmecham@co.slo.ca.us>, <eporter@co.slo.ca.us>, <bgibson@co.slo.ca.us>, <ahill@co.slo.ca.us>
cc
Subject Smart Growth

I am afraid that the "Smart Growth" policy being proposed will not benefit our county.

I am sincere in saying that it will make housing, both rental and home owner fees, accelerate.

I feel that our county is growing fast enough and that all services will be strained to keep up.

Please do not allow this policy to pass.

Sincerely,
Harold J Biaggini

Ellie Porter /Planning /COSLO
04/30/2009 11:54 AM

To Mike Wulkan/Planning/COSLO@Wings, Chuck Stevenson/Planning/COSLO@Wings, Ramona Hedges/Planning/COSLO@Wings
cc
bcc
Subject Fw: Strategic Growth Amendment to the Co. General Plan

Ellie Porter
Planning Commission Secretary
(805) 781-5611

----- Forwarded by Ellie Porter/Planning/COSLO on 04/30/2009 11:53 AM -----

"Nancy Dodd" <rdoddranch @earthlink .net>
04/28/2009 08:34 AM
Please respond to rdoddranch@earthlink.net

To bgibson@co.slo.ca.us
cc
Subject FW: Strategic Growth Amendment to the Co. General Plan

Subject: Strategic Growth Amendment to the Co. General Plan

Please listen to the people on this one.

I would like to express a **NO** vote against the Board of Supervisors adoption of the Strategic Growth Principals, goals policies and strategies in the proposed amendment of the County General Plan.

Nancy Dodd
Paso Robles, CA

rdoddranch@earthlink.net

Ellie Porter /Planning /COSLO
04/30/2009 11:55 AM

To Mike Wulkan/Planning/COSLO@Wings, Chuck Stevenson/Planning/COSLO@Wings, Ramona Hedges/Planning/COSLO@Wings
cc
bcc
Subject Fw: Smart Growth

Ellie Porter
Planning Commission Secretary
(805) 781-5611

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"Harold Biaggini " <bgneee@hughes.net>
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To <kachadjian@co.slo.ca.us>, <jpatterson@co.slo.ca.us>, <fmecham@co.slo.ca.us>, <eporter@co.slo.ca.us>, <bgibson@co.slo.ca.us>, <ahill@co.slo.ca.us>
cc
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Please do not allow this policy to pass.

Sincerely,
Harold J Biaggini

"Bill Cagle"
<bcagle@orenco.com>
04/30/2009 04:32 PM

To <planningcommission@co.slo.ca.us>
cc
bcc
Subject FW: GHG Inventory Emissions

Dear Ms. Christie and honorable planning commission,

I understand a presentation was made by County staff today regarding the Green House Gas emissions for the Los Osos WWTP. Orenco has found this GHG Tech memo and staff comments to be in error because of the omission of critical information found in the 2006 IPCC Guidelines as reference by Carollo Engineering in their Technical Memorandum. Following are two critical pieces of information:

1. Frequent solids removal from septic tanks reduces the amount of CH_4 production. (The County wants to pump the STEP tanks every 5 years)
2. Temperatures below 59degrees F significant CH_4 production is unlikely. (Groundwater temperatures in Los Osos are less than 60degrees F)

Attached is the document we submitted. I thought this might help as I'm not sure it's easy to find within the EIR. Please don't hesitate to call me should you have any questions.

Respectfully,

Bill Cagle
National Accounts
Orenco Systems Inc.
www.orenco.com
bcagle@orenco.com
(P) 800.718.4046 direct
(F) 541.459.2884

From: Mike Saunders [mailto:msaunders@orenco.com]
Sent: Tuesday, October 14, 2008 12:04 PM
To: jwaddell@co.slo.ca.us
Cc: 'Bill Cagle'
Subject: GHG Inventory Emissions

Mr. Waddell,

Orenco has reviewed the Greenhouse Gas Inventory Emissions Technical Memorandum.

Since there was very little discussion regarding GHG emissions throughout the Rough Screening and Fine Screening Analysis, we were caught a little off guard by the current focus on this issue. While we do not disregard the importance of GHG emissions, we believe that other potentially serious environmental issues such as long term I&I impacts, potential spill

impacts, excavation impacts, dewatering impacts, earthquake resistance, etc. should be given equal or more consideration prior to the Environmental Review Process being finalized.

While we understand that the document summary states that the GHG emissions for each alternative are considered nearly the same, we do not believe that the general perception created by this document is consistent with the stated summary. Most readers will wonder why the summary states that GHG emissions are nearly the same when the tone of the document and virtually all of the supporting text appears favorable towards gravity sewer. In response we felt that it was important to disregard the summary statement and focus on the general content of the Memorandum.

We believe that the Memorandum requires major revisions if it is to be utilized as a factual and unbiased reference document. Without revision, we would suggest that the memorandum be removed from future reference.

Our letter has been attached for your reference.

Respectfully,

Michael L. Saunders
Compliance Program Manager
Orenco Systems, Inc.


OrencoGHGcomments.pdf


2006 IPCC Guidelines Waste.pdf

"Internet Webmaster "
<webmaster@co.slo.ca.us>
05/01/2009 07:59 PM

To "planningcommission@co.slo.ca.us" <planningcommission@co.slo.ca.us>
cc
bcc
Subject Planning Commission Contact Form (response #28)

Planning Commission Contact Form (response #28)

Survey Information

Site:	County of SLO
Page Title:	Planning Commission Contact Form
URL:	http://www.slocounty.ca.gov/CM/WebUI/PageTypes/Survey/Survey.aspx?PageID=10469
Submission Time/Date:	5/1/2009 7:58:23 PM

Survey Response

Name	Beverley De witt-Moylan
Contact Information (Phone Number, Email, etc.)	bnbmoylan@sbcglobal.net
Question or Comment	Dear Chairperson Christie, Thank you for your and your commission's kind and thoughtful attention to all the comments from the citizens of Los Osos during the past two Planning Commission meetings on the LOWWTP. I am writing specifically to address Commissioner White's question regarding the evidence upon which the CCRWQCB bases its claim that individual septic tanks are polluting the Los Osos aquifer and hence polluting "the waters of the state." A reading of the transcripts or a viewing of the video recordings of the various hearings of randomly selected Cease and Desist Order recipients like my husband and me would provide an answer to that question. During cross examination each defendant asked the CCRWQCB

	prosecution team leader, Harvey Packard, what site specific evidence he had proving that each defendant was guilty of polluting the waters of the state of California. His consistent reply was, “None.” Nonetheless, every defendant received a Cease and Desist Order. These orders take effect on January 1, 2011, less than two years from now. A copy of the order we received was submitted to your staff for your information. I hope you find this information helpful. Sincerely, Beverley De Witt-Moylan CCRWQCB CDO #R3-2006-1041

"al barrow"
<a.barrow@charter.net>
05/03/2009 06:53 PM

To "planning commission" <planningcommission@co.slo.ca.us>
cc "galen ricard" <grpr@charter.net>, "russ and Martha" <ladyart1@sbcglobal.net>, "Martha Goldin" <honmgret@charter.net>, "'Leon Goldin'"
bcc
Subject Your Planning Commission presentation as it relates tp Los sSos

Dear Planning Commissioners:

I am a 12 year Los Osos Residents and lived in Eugene OR where I graduated in Fine art Architecture Department. I bought a home there. I am an organic gardener and I make compost tea out sink/washing water for my vegetables. I use less than 20 gallons a day of water and reuse what I do not flush. I use natural barriers to insects so no chemicals.
I worked with Dr. Dan Wickham Ph.D UC Berkeley Marine Research on sustainable WW treatment. We installed his SludgeHammer at he LOCSD Fire Department reducing the BOD and converting ammonia for leechfield application.

I have worked with Dr. Oswald and his colleague John Hinde both WW pond experts on their pond treatment plans for Los Osos (2000 on to 2008). I *a* m familiar with the wetland treatment in Arcadia and prefer these passive, chemical free longer time treatment trains over the riskier 24hour in and out highly engineered mechanical systems that use a lot of hazardous chemicals. I am an affordable housing advocate and agree with the National Siera Club that a sustainable community must have housing for all income groups.The massive sewer bill will make that impossible. Considerations need to be made to reduce road trips for the work force.
A low pressure STEG collection will an affordable approach to centralized collection with a pond treatment followed by subsurface wetlands that will sequester heavy metals, POP and EDCs. The STEG eliminates the need for added electrical panels, the pumps bio baskets associated with STEP and the removal of existing tanks. Saving $25 million in capital costs. The energy needed to maintain the pressure curve are provided in the rights of way by small booster pumps that add energy in line and with much less environmental impact and overflow risk than gravity lift stations. The maintenance required cleaning a $100.00 filter every five years when the solids levels are checked. Tank replacement is by need only...if it is good after smoke test. The 1.5 inch lateral from the tank to the collection pipe is the lowest impact. Shallow small diameter pipes are installed by vibrator equipment.
This small diameter shallow collection move the effluent to treatment at ponds. Then the nuetrient rich effluent is delivered to farms nearby for soils beneficial soil amendment after disinfection and BOD/TSS removal. That reduces potable water pumping from the aquifer and reduces energy demand. The Los Osos Creek compartment allows 800acre feet for farmning. Contracts can be let to reduce pumping costs and fertilizer demands.

The water that is designated for indirect aquifer recharge...they are incorrectly calling it DISPOSAL... instead could be wetland polished so as not to pollute our limited water supply. Anything less is a violation of the CWA adverse affects rule.

The No Project alternative is a required consideration for CEQA, The present treatment systems have a much lower environmental impact as well as cost. Since the ground column is removing the target pollutants the project goals are missed and the Nitrogen remains in the GW after the project is completed it's life cycle. A basic understanding of the perched water clay lenses and the lamellae is needed for you to grasp what is jappening to the water from the septic tank. First the solids and fats are separated and the effluent is dosed on the leech feilds as the tank receives new waste water. The first 6 feet of the soil column is aerobic hosting nitrifying bacteria. Then the anerobes take over as the effluent moves by gravity downwards There is some crossover. The denitrification then is completed as indicated in a variety of studies.. The Los Osos sandy loam is the premier environment to remove nitrogen. Isotope studies show

that the septic systems are not the Nitrogen source.

Have you read the 40 page drainage plan for Los Osos by Michael Ogden of Southwest Wetlands (attached)? It is at the LOCSD office I am sure they will provide a copy for you. Two unpaved street that are not used for auto traffic Paso Robles and Pismo were planned to have burms to prevent rainwater moving further downslope thereby eliminated flooding in Baywood Park and more silt fill in the Bay.The swales would have periodic leech lines and wetland plants.This plan will add rain water perc to the GW and reduce the run off and first flush impacts to the Morro Bay Estuary.

A second method of drainage is the onsite ordinance that requires all properties to contain their rain fall. A lot of impermeable hardscape has been unfortunately approved by the Planning department. We use the right of way for parking out here. Instead of a Seattle sized catchments for 70 inch rainfall local average is around 16".
I was on the LOCSD WW Committee and the Septic Tank Maintenance committee. I was on the recent LOCAC DEIR committee commenting on the 3200 pages. The comments were adopted by the LOCAC board and submitted.
I have had conversation with the Seattle PW department regarding the Carnation WA collection project using a vacuum system. And the wetlands polishing before the river outfall which to date the wetlands has not been implemented. We need to do a better job of protecting our biology. EDCs and POPs should be removed before WW is allowed into aquatic habitat.

I have been to most of the lectures locally by Jonathan Todd and Brock Dolman. My background is the Organic Foods industry starting in 1968 when brown and white Wonder bread was the super market offering...The Organic food industry fought for pesticides free soils and foods process free foods and locally grown crops. I am proud of my environmental efforts. I am a well informed activist. I can distinguish between political BS and scientific fact. The Counties WW proposal will have a net greater impact than the present system of septic/leechfield. There is ample evidence that the Nitrate pollution is not from human sources. 1/3 is from the horse farms upslope and in the valley compartment where other animal operations pollute the GW. On a site visit we stood and the North banks of Warden Creek upslope of the creek where the rancher Branin was feeding pairs. The grass was largely covered with fresh cattle manure. The next day we had a downpour that washed it into the creek upslope of the Morro Bay Estuary. he stood at the same meeting you attended beating the drum of protection. These kinds of specious argument are a constant barrage of inuendos and myth to push the outcome in a direction for special interests.

Two isotope testing regimes of leechate, one by SLO County indicate that the source of Nitrogen in the GW is NOT from human sources, Black&Veatch did on for the County. The other was done by a private person from well head sources using delta O18 and N15 in concert. both showed the source to be other than human origin. To spend scarce resources and miss the target pollutant is unacceptable. Further U.C.Davis Water researchers http://repositories.cdlib.org/cgi/viewcontent.cgi? Jeannie L. Darby Harold Leverenz found removal of N and P to 2m/l non detect ecoli and virus in 30 inches of loam soil.
The RWQCB3 seems to have eliminated science as a criteria.Their rep stated when asked by commissioner White...is there evidence that septic systems are causing the nitrogen problemm he did not know"...cn't tell if they are. When asked again he stood by his statement . The vast majority of the N samples come from illegal test wells lacking sanitary seals they make up the bulk of the RWQCB3 data that the PZ is based upon. Surface N is allowed in these conduits to GW: have they been properly sealed?.Affidavits from expert witnesses available. Both the levels and the source are not clear. 24A is above the septic in Redfield Woods above Highland .shows 10-12m/lN is 2002-2006 testing available in electronic form upon request). Letting AG and horse farms continue to put N in the GW is uneven handed.
I have the tests from the CA Depart of Health for ecoli in the Morro Bay Estuary 2007-2008. The Oyster farms are given a clean bill of health since the Men's Colony and the MB Gravity collection was repaired. The Los Osos septics have not been identified as a source. We have hundreds of boats parked in the bay and at the marina both moored and docked. MBNEP program conducted a testing of DNA/RNA but neglected controls, and the chain of custody was in question.Still it was inconclusive as to Los Osos

leechfields as a source of ecoli. The recharge of the aquifer, reversal of saltwater intrusion and drainage cannot be a separate process. The only way we can stop saltwater is to stop pumping the lower aquifer. The onlt way to remove the Nitrogen is well head treatment.

In sum the County plan removes water from the basin, does not remove the target Nitrogen but changes to a less efficient treatment at a huge environmental and dollar cost as is evidenced by the 3200 page DEIR and the 1200 page response needed to vet it. Even more disturbing the California Coastal Commission staff in an 11 page response said none of the four project proposed in the DEIR were permutable including the preferred project. The County has been reluctant to give up the site and disposal method, two serious sticking points.The local environmental groups find these approaches unacceptable. The concerns of the CA PTA regarding EDCs have not been addressed, Nor have the USF&WS.

There are much better ways to address the real problem of nitrogen. We have now available efficient and affordable well head treatment at 60 cents a thousand gallons called ion exchange. No need to reintroduce WW effluent into the potable water supply. Use it for landscape water and AG reuse.

Please continue to vet these issues. I know you are volunteers and your heart and minds are dedicated to the best outcome. I have left many issues untouched such as bio solids. I will save that for now.

Thank You.
Al Barrow Coalition for Low Income Housing & Citizens for Affordable and Safe Environment


DEIR 2 COMMENTS AL BARROW CASE 2.doc


Drainage Feasibility Report.pdf

DEIR COMMENTS CASE AL BARROW

1. A-2: Supplemental Notice of Preparation and Comments/Responses Need another SOP to evaluate new information not provided by SLO County for OPR.

2. Appendix B PD Data
Project data is flawed. The rough and fine screening assumptions upon which it is based are constructive fraud Attach, # 125

. Attach, # 132, Attach, # 139. Attach, # 140, Attach, # 144, Attach, # 150 Professionals in the fields of Vacuum and LPS systems have consistently Attach, # 143, Attach, # 144 disagreed the SLO County Staff and the consultants have ignored this new information. The Airvac has repeatedly asked for a meeting with County staff and been denied. At a townhall meeting in November 2008 (available on DVD). Supervisor Patterson and Hill saw this new information as presented by the representatives who have many existing projects evidencing the viability of these less expensive and more protective technologies. The following are environmental impacts that are avoided by these technologies;

1. Vacuum: no INI (300K gpd for gravity) Reduced impacts more protective Vacuum no leakage of sewage into the drinking water aquifer. CMOM show 5% to 8% leakage from gravity sewers Reduced impacts more protective. Attached studies show 16.5 to 49.1 percent , or leakage of raw sewage. Attch # 6 Bulletin 118, #17, # 40, Attach # 78. # 79, # 99 page 1, # 102, Attach, # 153, Attach # 195, Attach # 196

2. Vacuum no septic tank footprint on site, no electrical panel hookup onsite, no deep trenching avoiding those gravity impacts. Reduced impacts more protective
3. Vacuum can take advantage of gravity slope opportunity similar to gravity assist (a principle of vacuum engineering). Reduced impacts more protective
4. Low Pressure System: Vacuum no septic tank footprint on site.
5. HDD: Directional drilled to avoid bio, Cultural resources, existing infrastructure. Reduced impact more protective Attach # 223
6. No septage hauling/pumping can be installed in wet weather.
7. Without industry input these USEPA approved systems have not been vetted adequately. Airvac and Eone and the like must submit reports on these technologies and their benefits along with existing projects. Why has this been ignored? The best project with least impacts should be part of this DEIR and the RFQ, which is not the case.

8. The environmental, economic, and community preferences information has been omitted by Carollo and SLO County staff as to alternatives. Vacuum and LPS need to be vetted here. As the more protective technologies. This new information must be evaluated according to CEQA. May 2007 Carollo said cost savings from alternatives vacuum and LPS will be insignificant. They say otherwise in fact a savings of 50% is expected and huge environmental protection from INI and exfiltration # 40, # 41, #42, # 43. Attach # 61, Attach # 78, #122, Attach, # 133, Attach, # 151,page 12 conclusion, Attach # 240
9. Attachment, Forward collection comparisons: Here is a 14 point discussion of Step vs Gravity pointing out the many foibles of Gravity. Please address these concerns. How can gravity be preferred in 3 of 4 projects? It is a bold lie. And you have no basis for this judgement simply because the other side of the discussion was not vetted. This is an engineer that has both Gravity and Step experience. Attach #17. Attach, # 137, Attach # 198, Attach # 199, Attach # 226

;

10. $21,900,000 attachment: If Reverse Osmosis is required due to grab violations at Broderson the trucking cost, mileage and pollution need to be identified. Have you got those details? Document 1 PO Plant
11. 2-40 bulletin 118 details show half of recharge was sewer leakage. And attachment 09-15-04-8ssr speaks to Petaluma WW system upgrade, which was done by Carollo a pond wetland in an area of high rainfall. They did not vet this or award winning 2008 Carnation WA in their screening. Sustainable and low energy solutions.
12. 600r01034 attachment: pg 4 show where leakage in gravity collection systems are found…almost all joints to manholes lateral, trunks and mains. They leak a lot, what is your plan to fix them at what cost? It's time to be honest and transparent. Attach # 211, Attach # 212 page 3
13. ABAG attachment; this shows the loss of life and property in Attach # 25. which is magnified by our liquefaction conditions. Attach # 67, Attach, # 142 Please open it. The Northridge and the Loma Prieta quakes killed people and huge lost property recorded. If the bridges into town are damaged where will help come from? The South Bay Fire Department is our emergency services if that building collapses on the fore equipment, the com goes out or telephone service which is common in strong quakes what is your plan to recover? Broderson with its lamella underlay will cause liquefaction under the SBFD and the Redfield woods housing development. Many people would need assistance, fires may start from ruptured gas mains and sewer service would not be restored without repairs, When must the county have a recovery plan? When would it be studied for adequacy? Attach # 67
14. Biosolids Final Report, attachment: Not a popular proposal it is again in public review due by 2010. Project like ponds STEP that have no trucking

for up to 40+ years are the Number one choice environmentally. The Cal Poly marine biology toxicology team has seen Nonylphenol disrupting the lifecycles of Goby and other MBNEP biology. It is a special status not allowed. Leakage of sewer effluent either from Broderson or collection system needs to be eliminated. Czmacd attachment: notes that federal funded project must comply with Coastal Zone Management law enforced by the CA Coastal Commission in permit applications. Leaking sewer in our potable water supply is not protective of coastal resource (water), and CZLUO attachment: Says protect archeo cultural resources, which gravity sewers do not. These trenches are all on grid with exact slopes; unlike HDD small pipe installation they do not allow avoidance of graves and artifacts. How will you mitigate these impacts? Attach #18, #38. # 44. # 45, Attach # 54. Attach # 67, #123, Attach, # 152 DHS DWSAP attachment: The rules for new source water require an application of 120 pages detailing the new water source. When will this be available and who will fill out this application? Sewer effluent will have a high bar for treatment. Potable water supply mixed with EDC and emerging contaminants that no wastewater treatment removes, may require RO. How many truckload of brine for a one million gallon plant? Where will brine be treated Ventura? At what cost $21 million a year? How much more water will be removed from our aquifer for this? Attach # 20, Attach, # 157, Attach, # 158, Attach # 230. Attach # 233

15. Soil Slippage attachment: Homes slide off of lots in liquefaction conditions as Berkeley reports. Damage to foundations, plumbing and wall how will the SLO County restore taxpayers/property owners for the losses caused by this foolish decision if such a quake should occur and the County has caused the liquefaction conditions? Lamella will cause the effluent to run under these homes and SBFD. Attach # 52, Attach # 67
16. Before development of empty lots proof of water supply and an HCP with a mitigation bank is required by Ca Coastal commission. Why would a second assessment pass (part of the capital sewer cost $27 million) if we are in RMS Level 3? Why if there is no habitat mitigation bank taking is not allowed? Is the cart pulling the horse? Attach #4, #10 Attach # 15, 16, 27, Attach # 68, 70,71,72. Attach # 80, # 103, # 105. Attach, # 154, Attach, # 155, Attach, # 156
17. Assessment passed by threat of Notice of Violation from CCRWQCB up to $5,000.00 fines and loss of use of your property. Coercion or encouragement? Attach #10, #11, #26. # 30, #31, #33, #34. #119
18. Initiative petition, attachment: SECTION 1. PURPOSE "The purpose of this initiative measure is to establish standards and procedures for the location of sewer and wastewater treatment facilities to be constructed by the Los Osos Community Services District (the "District") both within and outside the District boundaries that would serve and be paid for by the people of the District. Such standards would serve to protect the people and the environment, including the groundwater, from health and environmental damage that may result from improper siting of such

facilities. Attach, # 164 " TRI W is slated for a lift station…that has to be put to a vote according to Measure B. Have you considered the gravity collection in that light? What impact might that have on the project. Attach # 57. # 120, Attach # 232

Monowitz CCC permit, Attachment; the attorneys show that false or misleading information is grounds for denial of Coastal Development Permit. Attach # 56, Attach # 68, Attach, # 152

Grounds for revocation of a permit shall be:

- Intentional inclusion of inaccurate, erroneous or incomplete information in connection with a coastal development permit application, where the commission finds that accurate and complete information would have caused the commission to require additional or different conditions on a permit or deny an application.[1]

Stated differently, all that the Commission must find to revoke the Permit is (1) the Commission was presented with incomplete, inaccurate or erroneous information; (2) the inclusion of this information was intentional; and (3) complete or accurate information would have caused the Commission to have issued at least one condition in a different manner, or have denied the application.

- 2. <u>The Incomplete Or Incorrect Information Need Only Have Related To The Permit Application.</u>

B. <u>The Information Must Have Been Intentionally Included</u>.

The second prong is that the information was intentionally included.

1. 1. <u>There Is No Required Showing Of Bad Faith.</u>
2. 2. <u>The Best Means To Determine Whether Information Was Intentionally Included Is To Determine How Often the Statements Were Made.</u>

The County consultant Carollo has repeatedly stated unsupportable fact regarding costs and claims of the best most protective technology and that they all cost the same. How will you refute that? Attach #4, Attach # 81

21. Pipe Slopes 2 Attachment: Many pipe slopes in the MWH collection design are inadequate for 2' per second scouring speeds using the Manning formula. What will you do to make them functional? Vacuum truck daily pumping? The same slopes caused the Nipomo manholes to degrade by hydrogen sulfide and were replaced or repaired please give us the cost of R&R of decayed manholes due to inadequate slopes. To force fit gravity collection in this hilly environment the grade from South Bay to the Bay was designed at .05 or less many miles under the SLO County standards for gravity slopes. (Standard Improvement Specifications and drawings) section 11-351.1611. 100 gallons per person is the flow with double peak flow, minimum velocity of 2 foot per second minimum flow. Please explain how this will be achieved, as the stated flows in the Carollo reports are less than 70 gpp. Please account for the diurnal flows (morning and

[1] Section 13105(b) provides the alternate ground for revocation of a permit: "Failure to comply with the notice provisions of Section 13054, where the views of the person(s) not notified were not otherwise made known to the commission and could have caused the commission to require additional or different conditions on a permit or deny an application."

evening). The design flow and the gradient seem a challenge to meet in hilly Los Osos/Baywood Park. A 1/8 of an inch slope is a conservative and standard for gravity collection. Why not err on the side of caution rather than end up like Nipomo with replacement and vacuum sewer costs? These problems do not exist in STEP and LPS collections and to far lesser degree in Vacuum collection. So why chose the antiquated technology best suited for flatter conditions? Design flows are minimal for a community that has to conserve water reducing flows, why? Isn't this a design to fail? Attach, # 133
(D) The minimum gradient for 8-inch sewers
should be no less than 0.4 percent
Regardless of pipe material.
(E) The minimum gradient for 6 inch sewers
should be no less than 0.6 percent, preferably 0.75 percent.

19. Re: Comments on fine screening, Attachment:# 107, Attach # 239

· Sewer plant O & M costs should be pegged through the life cycle of the loan period to the rate of energy related inflation. Will that be done?
· The sewer best option should be chosen by energy analysis. No detailed energy analysis has been done. I am really surprised at the lack of information and it's omissions. When will that be done?
· The simple mention of existing power rates in a graph has nothing to do with sustainability analysis and puts the whole project in jeopardy. Will you correct that?

· Energy availability will be a problem because of the10 to 30 percent hydroelectric related snow pack reduction and increases in peak energy demand due to Global Warming caused by higher summer temperatures. Will you take that into consideration? How?
· Loss of annual snow pack means reservoirs will have to shed winter overflow that was previously used to create spring and summer power.
· Blackout and brownouts may be the norm when this sewer plant comes on line in 2011.
· Lifting water to Broderson to achieve a 20% groundwater recharge is a fatal flaw. One it won't reach 20% and two it will pollute potable water. For every gallon recharged, five gallons have to be lifted to the sight at unknown energy costs. Attach # 57, # 121
· Aggressive on site greywater retrofit program would use zero energy and help clean the upper aquifer immediately. Will you consider that in calculating future water flows lower? As with Ag. Watering, there would be 'no discharge' if delivered to the root zones of home landscaping. Why not consider that?
· Conservation is the most energy efficient method for offsetting overdraft. It is not addressed adequately, When will you address that?
Comment:
The most accurate assessments of energy availability make the whole sewer project unsustainable and

contrary to good planning practices. Graphs courtesy of the Dynamic Cities Project, show a depletion
model for the United States.
Urban planning for peak oil and natural gas depletion is essential. The present sewer projects in the fine
screening would be severely impacted by any energy emergency above a class 2 emergency described
above. How ill you address this?
Final Comment:
The Fine screening is incomplete related to GHG issues, energy scenarios, sea level issues, and salt
water intrusion issues driven by sea level rise. Improving the environment is a holistic action. GHG Append # 28, Append # 86, # 107
pollution is important for generations to come. Nitrogen mitigation that drove the original need for a
centralized project seems to have been forgotten as a goal. Consideration of the total water cycle has
been driven off course by an uncooperative Water board that has lost is way with environmental water
stewardship. Attach # 24, Attach # 187, Attach # 210 *The sewer project refuses to face sustainability issues that are mandated by the very same state water agency in Sacramento that the RWQCB3 answers to.*
· State GHG goals are being totally ignored in this study.
· Energy costs per ML nitrogen removed totally ignored in this study.
· Sea Level rise is being totally ignored by this study.
· Global warming impacts on energy are totally ignored.
· Nitrogen sequestering and recycling is totally ignored.
· On site and scaled cluster systems are not compared for energy efficency and omitted as viable while
considered elsewhere. Attach #22
· Alternative energy is not proposed for operations.
· Sustainability's relationship to affordability and environmental justice is misunderstood and ignored. Attach #49
· Co-generation is not proposed or studied although being used elsewhere in the State.
In defense of my position I would say that building a 1960's energy and resource consumptive community
sewer driven by market forces related to known engineering relationships and 'mega-project' construction
standards drives this study. Energy efficiency, global warming and GHG issues are left off the table. Attach # 22
Citizens should accept no excuse for their omission. – Steve Paige June 5, 2007
How will you address these concerns?

22. 6 Table 1.1 needs to name the facultative ponds still in after fine screening. Is ADS, AIPS or Nelson

in? Attach # 44, # 45, Attach # 73
7 1.2.1 Seawater intrusion reversal can be accomplished outside of the project by reducing the lower
aquifer draft in lieu of upper aquifer water with # 29 for residential landscape application. Attach, # 178. These
expenses can be paid by new development starting with the schools and park. Purple pipe is
encouraged and funded by DWR. See the 2003 white paper on reuse. (Our upper aquifer is
replenished by septic effluent and classed as partial wastewater or we would not need a sewer. Attach # 62
8 1.2.2 Golden State has applied to CAPUC for rate increase to pay for infrastructure and treatment
that will utilize the upper aquifer. How many ACY will that reduce the lower draft? This is an omission
that needs attention. Attach, # 125
9 1.3 Flow projections will not change constituent treatment requirements, with ponds it is not a big
factor as with 24 hour in 24 out treatment train but that will effect disposal numbers. Attach, # 125
10 FATAL FLAW "Properly installed bell-and-spigot…" will leak raw sewage into our drinking water
aquifer which will soon be the upper aquifer as the lower aquifer is not recharging. Attach # 112, #122
11 2.1 KEEP THE WATERS IN THE BASIN unless the water is not needed then it can be sprayed and
disposed.
12 2.1.2 Lower aquifer is intruded and that portion is lost That is not necessarily so.
13 Upper aquifer water must be harvested to the point it does not leak into the bay. Attach # 213
14 Recharge must not have Phosphorus, which will clog soil pores. All treatments so far do not address
this.] impact on reuse. Calcium treatment that is affordable can be used in combination with wetlands
to remove phosphorus this so the treated effluent waters are safe. Attach # 51, Attach # 64, Attach, # 125, Attach, # 159, Attach # 279
15 2.3.2 Bullet 4 describes the cost per acre of grade II-III farmland as $40, 000.00 I think $10,000.00 is
a more responsible number. Giacomozzi was $323,000.00 for 35 acres at one point. More inflated
costs!
16 The case is correctly made that pumping the upper aquifer as landscape water is cheaper than
piping effluent back to town and much safer.
17 Table 2.1 page 33

18 PERCOLATION PONDS AT BRODERSON: This was a project FATAL FLAW in 1997 SLO County
plan Attach # 23, # 35. #122
19 Urban wastewater reuse is a poor concept compared to upper zone nitrogen water for irrigation Attach # 187, Attach # 242
instead of drinking water. Less piping and much lower health risk on school and community center.
20 They represent over 40ACF reduction in saltwater intrusion on the school/park sites.
21 2.1.2 Sea water intrusion is not irreversible. Early-indicator signals of groundwater contamination: the
case of seawater encroachment Attach # 57
22 FCGMA documents reversal of saltwater intrusion in Ventura County. http://publicworks.countyofventura.org/fcgma/GMA%20Management%20Plan-Final%20051506x%20electronic%20v2.pdf see page 25 for reversal of saltwater intrusion. Grants
from 319 USA were used, see page 75 reduction in seawater intrusion. Attach, # 178
23 I recommend a cost benefit analysis for purple pipe in the reuse portion. And a note on septic INI if a
tank can be retrofitted in ground with sprayed epoxy, like manhole restoration it would only cost
$700.00 per tank. saving replacement and removal and retirement costs Replacements could take
place at the point of resale so as not to have the community dug up at once. Charlotte County did not Attach #7
replace any tanks. For Gordon's benefit they used a Tarriff document to gain access to private
property i have a copy if you would like me to send it along. Tank need certification as per RWQCB3
requirements. If a tank is abandone it could be used to capture rain water and recharge through
existing leech fields. (No waste)
24 The STEP collection works well with pond , Attach, # 125, with low biosolids production and lowest energy
demand making the combination the most sustainable as the project goals state Many constraints
and costs have been added to STEP by this document that are not supported by the STEP Industry
data. Attach # 38, # 73, #116, Attach, # 137 . I have screened out gravity due to the eventual leakage into the drinking water as they
have admitted. One other FATAL FLAW is the seawater intrusion around the Bay where the deepest
pipes will be trenched in. Attach # 36, # 112, Attach # 243 Attach # 283, #122, When saltwater enters the collection system then the treatment plant will

require reverse osmosis and brine trucking to Ventura County will ensue as many as 60 trucks a day. # The expense of these impacts was not added to the gravity cost as I recall $60,000.00 a day or

23. Re;Revocation of Coastal, Attachment: Revocastion of Coastal Development Permit Application No. A-3-SLO-03-113…. Attach # 246

Dear Commissioners, Peter Douglas, and Staff;

C.A.S.E. is represented by Burke, Williams & Sorensen, LLP. I say that so you will understand the gravity of our concern.

1. The misleading and completely false information in the LOCSD/MWH sewer Project

   Report led you to believe, incorrectly, that the proposed sewer was somehow located in the only place appropriate for Los Osos i.e. the Tri-W property on ESHA, upslope of the Morro Bay estuary. Raw sewage plant of this genre is responsible yearly for over 6,000 coastal spills a year. The risk of a plant upslope of the Bay is not acceptable when an environmentally preferred site is still presently available. Attachment #5 RWCB, # . Attach # 56, Attach # 67, Attach # 284, Attach # 286

2. Wetland impacts have been taken lightly by the LOCSD. For example 4th and Pismo, a rout for sewer mains, has 20 foot tall willows and oaks growing halfway to 5th St upslope where a spring originates feeding the wetlands below all the way to the Bay a distance of several blocks. USF&WS have relied on LOCSD environmental consultant Crawford Multari & Clark to provide true and accurate information on wetland impacts. Attach # 8 USACE The District has 9 employees with truck that service and check the 3rd street pump station two blocks away. The willows described at the edge of the bay from the El Moro drainpipe to Sweet Springs preserve grow along the eastern side of the Bay. Such an omission could not be construed an oversight, but seem an unwillingness to redesign the collection system in that area. Attach # 39. # 50. Attach # 301, Attach # 304
3. There has been no study on the impact to that spring and it feeding of the wetland bio. The Coastal Act protects such wetlands. Attach, # 128 Routing a collection system that will require maintenance and repair through sensitive areas is improper and a FULL hearing is required, We have seen staff to staff advice between Mr. Monowitz and LOCSD General Manager Bruce Buel over the appeal process fail to address these issues by micro managing the project. That is why this method of oversight is inappropriate under Coastal Act Rules. Attach # 68

4. The preferred environmentally protective method in the Final EIR, STEP collection will avoid these issue. It was "too expensive" to use according to table 4-4 of the LOCSD Project Report. That was a lie. I am attaching a present cost of the environmentally preferred STEP collection and treatment plant on the preferred location in grade 3 AG land. Attach # 39. # 108 page 310 Table B-4
5. The "On Balance" argument used for this sewer location is a flat out lie. This LOCSD sewer in not more protective of the Coastal Resources. It wastes our Attach # 270 It destroys wetlands. It is 10 times the National average in cost. It unnecessarily destroy ESHA in the sacred "Green Belt" where ESHA is contiguous. It may require 40 acres be negatively impacted by leech field failure as not effluent perc test have been applied to the drain filed areas.
6. The recovery plan in the Draft HCP has omitted the replanting with viable plants rather than seeds. And the likelihood of the HCP to address the perpetuity of the endangered species is very questionable. The Coastal Act/LCP require your commission CERTIFY these documents BEFORE a coastal development permit is issued. Attach # 13, #27, Attach, # 154, Attach, # 155, Attach, # 156, Attach # 217,

I respectfully request you withdraw the Coastal Development Permit for this project until the Habitat Conservation Plan is certified. At present it is going to SLO County for beginning public circulation and comment. The affected public here has yet had comment on this HCP or the final EIR/EIS from USFWS. Your cart should be behind your horse. Attach #12, 23, 27. Attach, # 154, Attach, # 156

I respectfully request you Revoke the LOCSD CDP due to the project designs are incomplete. You may be aware that the Design Engineering firm has left out concrete and other amenities essential to build the proposed plant. The cost estimate was close to 50% in error. Only 3 of many qualified contractors bid the project showing there is a lot of risk tied to this project. Attach # 4, 21, Attach # 189

The gravity collection design listed on the the DEIR SLO County web site is the one referred to above. That permit was cancelled by LOCSD. How will the concerns listed and answer how they will be mitigated, changed or addressed? Attach # 23, # 39, Attach, # 129

24. Sewer Paper attachment:
The NRDC published some concerns in the paper “SWIMMING IN SEWAGE” How will you address these environmental concern created by Gravity sewers? • Endocrine toxicity;
• Gastrointestinal/liver toxicity;
• Immunotoxicity;

• Respiratory toxicity; and
• Skin or sense organ toxicity.
Bioaccumulative toxin that will store in fat tissues and all the risk associated with sewer effluent in potable aquifers well documented need to be avoided. How will you do that?

Draft EIR available will enable Los Osos community residents, the project team and County elected
officials to consider the LOWWP's potential environmental impacts as the County identifies the
County of San Luis Obispo
Alternatives to the Proposed Project Los Osos Wastewater Project Draft EIR
7-6 Michael Brandman Associates
H:\Client (PN-JN)\0224\02240002\DEIR\1 Sections\02240002_DEIR Sec07-00 Alternatives.doc
Preferred alternative using environmental, economic, and community preferences information;
incorporates appropriate mitigations; and moves forward with the final design and permitting process.

1. The environmental, economic, and community preferences information has been omitted by Carollo and SLO County staff as to alternatives. Vacuum and LPS need to be vetted here. As the more protective technologies. This new information must be evaluated according to CEQA. Attach #87, #122, Attach # 304
2.

;

3. Appendix C Land Use
The Williamson act as related to prime ag land at Tonini is not addressed. Giacommazi has grade 3 grazing lands primarily. The impacts are quite different. Less piping for Giacommazzi.

Appendix D Groundwater

Recharge at Broderson is not evaluated for the impacts of the Lamellae fine lenses as they will move effluent laterally more than stated. Seawater mitigation will not happen. Water will surface down slope to destabilize housing development Redfield Woods as liquefaction conditions are caused by effluent lateral movement underneath the foundations. These home cannot get earthquake insurance. Please re evaluate. 300K gpd lost to INI in gravity collection. Please evaluate and mitigate these significant impacts. There are cumulative impacts here. Attach 25. . Attach # 53, Attach # 57, Attach # 69, Attach # 67, Attach, # 125, Attach, # 153, Attach # 179, Attach # 180

Recharge at Broderson will likely call for RO and Advanced Oxidation. Reverse osmosis membrane will reject over 30% brine that will be hauled to Venture brine receiving facility or elsewhere. Please address this missing information as complying with CA DHS Recharge regulations apply for Broderson if sewer effluent is used.

Over 60 truck loads a day at 5K gallons (42,500 pounds per truck). The air pollution is not quantified for pounds of diesel emissions.

The footprint of such treatment is not described. Please include.

4. Appendix E Drainage Attach # 75

NC

5. Appendix F Geology

Morro Bay gravity collection pipes were so damaged in the Dec 22, 2003 earthquake FEMA grants were awarded…In Los Osos where the water pipes were not damaged as in MB the septic tank remained intact as well. But the SLO County engineering put a penalty on STEP but not on gravity collection more bias based on not science. Attach #25, Attach # 67

The 1994 Northridge earthquake is well documented for damage to gravity collection (14years and $2 billion to repair) pipes but water pipes were much easier and quicker to repair over 60 of water was restored in 24 hours. Similar to STEP, LPS and Vacuum collections. Attach # 25, Attach # 69, # 88, Attach # 181, 182

4.6 GROUND LURCHING The October 17, 1989 Loma Prieta earthquake was responsible for 62 deaths and 3,757 injuries. In addition, over $6 billion in damage was reported including damage to 18,306 houses and 2,575 businesses. Approximately 12,053 persons were displaced. Attach #25, Attach #

69 .The most intense damage was confined to areas where buildings and other structures where situated on top of loosely consolidated, water saturated soils. Loosely consolidated soils tend to amplify shaking and increase structural damage. Water saturated soils compound the problem due to their susceptibility to liquefaction and corresponding loss of bearing strength. Attach # 67
Ground lurching occurs as the ground is accelerated during a seismic event. As evidenced by the Loma Prieta, Landers, Northridge, and San Simeon earthquakes, the effects; Attach # 25, Attach # 69
The October 17, 1989 Loma Prieta earthquake was responsible for 62 deaths and 3,757 injuries. In addition, over $6 billion in damage was reported including damage to 18,306 houses and 2,575 businesses. Approximately 12,053 persons were displaced. The most intense damage was confined to areas where buildings and other structures where situated on top of loosely consolidated, water saturated soils. Loosely consolidated soils tend to amplify shaking and increase structural damage. Water saturated soils compound the problem due to their susceptibility to liquefaction and corresponding loss of bearing strength. See http://www.es.ucsc.edu/~es10/fieldtripEarthQ/Damage1.html Attach # 69
Ground lurching can damage facilities and buried pipelines. Ground lurching occurs due to
detachment of underlying stratigraphic units, allowing near-surface soil to move differentially
from underlying soil. Attach # 69 The site is within a seismically active region of Central California that is
prone to moderate to large earthquakes. It is therefore our opinion that there is a potential for
ground lurching to impact the site. Ground lurching is generally not a geologic hazard that can
be prevented, and therefore is mitigated by implementing preparedness measures.Attach # 25, Attach # 69 That is why lamellae is a new liquefaction condition not addressed. That changes the impact levels and the mitigation therefore is an unaddressed significant impact. Attach # 272

The fault search routine in FRISKSP was used to identify active and potentially active mapped faults and fault segments within a 62-mile radius of the project vicinity They include: Los Osos, Hosgri, San Luis Range (S. Margin), Rinconada, Casmalia (Orcut Frontal Fault), Lions Head, San Juan, San
Adreas (Cholame), and Los Alamos Attach #25,
Attach # 69

5.4.5 - Level of Significance Prior to Mitigation
Less Than Significant or No Impacts were found related to the project being susceptible to fault

rupture and landslides. These issues will not be discussed further.

- Hokie and unscientific assumption in light of exisiting evidence that Los Osos has a 7.5 Hosgri fault 10 miles offshore 7 magnitudes higher than the San Simeon 2003 quake. The complete analysis and with the lamellae lenses this is inadequate. People will die, buildings will be destroyed if Broderson is implemented.
- The gravity trenching will cut through he clay lenses causing the waters to run down the trenches to the bay. A matrix of 8' deep trenches will make a creek that will drain these perched water bowls (clay lenses) out to the bay where we will lose a large mount of waters. When a quake occurs the wet soils in the trenches will consolidate and the engineered slope of the beds will be lost. The gravity sewer will cease to function as designed and Los Osos will be without sanitary services and at risk of cholera and other contagious diseases. How will services be provided? At what cost? Please detail the recovery plan as case law has adjudicated. Attach, # 133, Attach # 296

rationale for determining a Less Than Significant or No Impact for each of the thresholds of
significance can be found in Appendix F-1. Table 5.4-1 is a summary of Geology Significance
Determination and provides a quick reference for items of No Impact, Less Than Significant Impact,
and Potentially Significant Impact (for which mitigation measures are proposed).

Project-Specific Analysis Attach, # 167
Proposed Project 1
Strong seismic ground shaking can occur in response to local or regional earthquakes. The sites
under Proposed Project 1 are located within a seismically active area, and the potential exists for
strong ground motion to affect the proposed facilities at the sites under Proposed Project 1 during the

design lifetime. In general, the primary effects will be those phenomena associated with shaking
and/or ground acceleration. Given that it is likely for the proposed facilities to be impacted Attach #25,
Attach # 69, Attach # 275
Cumulative Impact Analysis
Proposed Project 1
Implementation of Proposed Project 1 may contribute to cumulative ground shaking impacts on
people and/or structures. Therefore, Proposed Project 1 may contribute to cumulative fault rupture
impacts; and this contribution is considered cumulatively considerable, therefore, significant.
Not correct as mitigation is called for but not detailed. It could be inadequate without seeing it. Kabuki. I am reading this with a tinfoil hat on.

5.4.7 - Level of Significance After Mitigation
Project-Specific
Proposed Projects 1 Through 4
Less than significant.
Cumulative Again Not correct as a mitigation is called for but not detailed. It could be inadequate without seeing it. Kabuki. I am reading this with a tinfoil hat on.

Proposed Projects 1 Through 4
Less than significant. Not correct as a mitigation is called for but not detailed. It could be inadequate without seeing it. Kabuki. I am reading this with a tinfoil hat on.

6. Appendix G Biological

See California Native Plant Society responses which are significant and note that Native that are damaged by diesel will be invaded by nonnative like South African Veldt grass, thereby losing the mitigation for TRI-W and the excavation of the Broderson leach field will also be invaded by non natives or exposed to it. How will you mitigate those impacts?

7. Appendix H Cultural

Deep trenching of gravity collection will disturb cultural resources. Where there is an alternative of lesser impact that should be selected. See CZLOU and Coastal Act and Estero Plan which all require least impactive project to goals and guidelines. Attach # 54.

8. Appendix I Public Hearing

10. Appendix J Traffic

21,900 brine trucks
Union Asphalt quantified the truck hours to move 2,500 trucks of river rock for leach fields at Broderson. From their Santa Maria Site; 228,690 mile, $1,262,869.05 materials, $734,349.00 trucking cost, 90 miles round trip. 170 minutes a trip at 20 yards of rock per load and each truck will weigh 80,000 pounds. A yard weighs 1.2 tons or 2400 lbs. Times 20=48,000 lbs. How much diesel fuels for all of this hauling please state the facts, the impacts and the mitigation. Attach # 185

Please evaluate road impacts/damage and traffic flows. Why this obvious concern is not addressed is curious.

Similarly evaluate 3,750 truck loads of sandy soils to be removed from Broderson leach field and where it will be taken. If fill for what site? (leach field is 8 acres assuming 7 acres of leach area 6 feet deep with 4 feet of rock and 2 feet of other cover.)
Untitled 3 attachment: Shows utility pipes crossing gravity trench have to be cut, capped and replaced loss of service time needs to be identified for those properties. Have you evaluated this impact?

11. Appendix K Air Quality
All trucking mentioned above has AQ impacts. Will truck retrofits, as described by recent air quality legislation since this document was written, be implemented? That will increase the economics of this aspect of the project. Please re evaluates. Attach # 202

12. Appendix L Noise created by Brodeson truck and RO trucking need quantifying, What will those potential impacts be to humans, plants and animals? Attach #13

13. Appendix M Agriculture
AG lost from Tonini is a greater impact than Giacomazzi grade three grazing land that is hard pan clay in the summer and expansive in the wet season. What will you do to reduce those impacts or mitigate them?

14. Appendix N Visual Resources

15. Appendix O Environmental Justice

8.3 - EFFECTS FOUND NOT TO BE SIGNIFICANT

The environmental issues that were determined not to be significantly affected by the proposed
Project and therefore, do not require evaluation in the document, per section 15063(c) of the State
CEQA Guidelines, are as follows:

. Mineral Resources
. Population and Housing (Displacement of Substantial Numbers of Existing Housing and
People)
. Public Services and Utilities (Fire and Police Protection, Schools, Parks, Solid Waste, and
Other Public Facilities
. Recreation

The above environmental issues were determined not to be significantly affected by the proposed
project in the Notice of Preparation (NOP) for this Draft EIR (Appendix A), and in the Draft EIR for
the Los Osos CSD Wastewater Facilities Project (November 2000). The NOP, 2000 EIR, and the
following discussion are intended to provide adequate environmental documentation for the issues
that will not be further addressed in the EIR.

So the impact of losing your housing does not count?
When renters lose their housing due to proposed $250.00 a month cost of this sewer as defined by SLO County. Many can barely make the rent payments. That is not an impact of this sewer. When senior lose their homes, that is not an impact? When marginal population become refugees that is not considered a project impact? Attach # 189, Attach # 209
Please read Sierra Club sustainability policy for affordable housing stock:
“Affordable Housing Crisis Plagues America
More Americans than ever before live in inadequate housing or spend more than half of their monthly income on housing. As the growing population's demand for housing increases, we are failing to provide affordable, convenient options. Strip malls and cookie cutter housing developments do not represent the needs or wishes of most Americans. Suburban sprawl and limited transportation choices

often fail to provide affordable housing. Even middle income Americans are feeling the affordable housing crunch as new home prices escalate. Sprawl pulls investment and the tax base away from existing communities, and forces the expensive construction of new roads, sewer lines and other infrastructure. Smart Growth provides a solution to sprawl and the affordable housing challenge. Fighting sprawl can and should include Smart Growth and affordable housing." See http://motherlode.sierraclub.org/challenge_sprawl.html Attach # 19, Attach # 52

Gentrification: An Unnecessary Evil
Many residents of inner cities fear revitalization projects. If their community becomes a more desirable place to live because of improved services, accessible jobs, and business opportunities, won't housing prices rise? To prevent gentrification-the displacement of current residents by more affluent newcomers--community members can create a development plan that incorporates exclusionary zoning, fair-share housing, and rent controls to keep housing affordable. Replacement ordinances make sure affordable housing is not lost in the construction of better communities. Giving all citizens a voice in planning is the key to Smart Growth. Revitalization does not need to drive out low-income residents. Attach #19 And:

http://www.lhc.ca.gov/lhcdir/house/FrankJun01.pdf

The impacts of this project will be to reduce the affordable housing stock. Under General Plan, CZLOU and Estero Plan policies and principles that is an impact. Again case law supports protecting coastal resources for affordable housing. See CA Coastal Commission laws and Policies. And Ca Housing Policies and statutes. A project in conflict, where there is a project alternative of a lesser impact should be selected. No where in the body of water law or state law does it state a community must implement the most costly alternative. In fact the opposite is true. Attach # 47, Attach # 54, Attach # 191, Attach # 210

Fair Share housing to promote neighborhoods, create a vibrant,

Diverse community, and meet the needs of a variety of income levels… This project does not allow our diverse community, but forced gentrification. Our work force will need to commute causing more traffic impacts with these added costs

http://www.sierraclub.org/sprawl/affordable.pdf Attach #19

16. Appendix P Alternative information

Constructed Wetlands: Effluent disposal using constructed wetlands would create habitat as
Well as recreational and aesthetic benefits for the community. Wetlands are considered primarily
As a storage device. However, disposal through evapotranspiration could also occur.
Constructed wetlands typically operate at depths of 1 to 5 feet, and areas of both vegetation and open water allow for different types of habitat. Attach # 64, Attach, # 159 Attach, # 175,
http://www.npr.org/templates/story/story.php?storyId=90043021
Yes and it remove the human carbon that causes disinfectant by products. Metals and emerging contaminant
sustainably. Polishing the water for AG reuse and exchange. At a low energy cost. Attach #9 See Clayton County Ga Attach # 51, # 101, # 109 Page 7, Attach # 302"I like to say it's raining everyday in Clayton County because we're putting right now about 10 million gallons back in our water supply," says Mike Thomas, general manager of the Clayton County Water Authority.

Thomas says the reservoirs here are full and have never been in danger of being too low. That's because back in the 1980s, folks realized there wasn't enough water to support the growth, so they decided to build a system of wetlands and reservoirs that would help them save water. And… The price tag is also an advantage — it can be as little as half the cost of building a regular wastewater treatment plant.

This idea probably won't work for bigger cities like Atlanta because it requires a lot of land. Still, it's attractive for smaller communities.

And there's an added benefit: Officials can create a nature preserve for those who live nearby.

Table 1: Summary of Evaluation Criteria
Baseline Criteria Sub-criteria Comments
1. Water Balance A. Salinity Management Project must contribute to mitigation of saltwater intrusion into lower aquifer

Due to lamellae lenses the effluent will not reach the lower aquifer and no seawater mitigation will occur. Attach, # 156 Project goal not met.
B. Groundwater Recharge Project must contribute to recharging groundwater resources in lower aquifer
Again: Due to lamellae lenses the effluent will not reac.h the lower aquifer and no seawater mitigation will occur. Project goal not met. Attach # 57 Attach # 186,

2. Water Quality A. Meeting RWQCB Requirements for WDR
(Discharge limits)
Project must be effective in meeting effluent discharge levels for: BOD, total suspended solids (TSS), nitrogen, Attach # 183 viruses, and bacteria.
B. Meeting RWQCB requirements for elimination of pollution to groundwater
Project must involve mitigation of potential effects of effluent discharge on domestic water wells. Attach, # 183, #184
C. Addressing emerging contaminants:
pharmaceutical and other constituents
Project is required to be consistent with EPA standards for emerging Contaminants
Project fails to meet this goal. RO and Advanced Oxidation required, not included in project description.
3. Energy The project is a higher energy user...not sustainable. See ponds and wetlands and AG exchange data in Ripley Project Report 2006. Attach, # 125
A. Contributing to Improvements in air quality
Project must demonstrate:
• Minimizing particulate emissions
As stated above in Traffic and AQ the trucks trips necessary for Broderson and RO brine hauling will have significantly greater impacts than Ag exchange in Lieu of pumping where RO and trucking 3,700 truck of dirt are not required.
• Effectiveness in minimizing release

Baseline Criteria Sub-criteria Comments
of airborne pathogens, and exposure to vectors

Any septage hauling will cause spores to be air borne See SWRCB fines of the Pacifica Plant.
B. Promoting
sustainability
Project must increase energy efficiency
over conventional designs, reducing
overall use of natural resources
C. Reducing greenhouse
gas emissions
Project must result in reduction of
carbon footprint from conventional
designs Carbon footprint big with gravity construction. Fused pipe under estimated
4. Costs A. Life Cycle Costs Project must involve:
• Efficient use of funds for capital
improvements
• Lowest feasible and practical
Operations and maintenance costs
Necessary to meet WDR discharge
Limits.
Gravity sewers have a long history of violations; Here is a plant designed by MWH the designer of the 3 gravity projects you have listed as project 2,3 and 4.

Lila Tang of the San Francisco Bay Regional Water Quality Control Board said her agency would investigate the January spills in Pacifica.

"We have taken quite a few enforcement actions against the city (over time), possibly more action than against other cities," Tang said. "We haven't imposed any corrective actions on them for the January incidents or for these types of wet-weather events in general," she added, noting that the city of Burlingame ended up discharging more than 2 million gallons of fully treated wastewater into the Bay during the same weekend. Attach, # 145

Tang said the Pacifica plant could escape a fine if it had no alternative than to dump the wastewater, and demonstrates the ability to cope next time.

January's spill wasn't the only such incident in the plant's history, however. Documents provided to the Times show that another big storm -- lasting from Nov. 29 to Dec. 1, 2001 -- forced 110,000 gallons of partially treated wastewater out into Calera Creek without the benefit of the sand filters or the ultraviolet cleaning system.

Gromm attributes those incidents to growing pains at the plant, which had just come online in September of 2000.

"We had to figure out how to change the plant to respond to these high flows," he said. "Since then, I don't think we've had any problems" -- the most recent incident excepted.

But other violations of a different nature have plagued the wastewater plant since its inception.

The Regional Water Quality Control Board fined the Pacifica facility $396,000 for violating its discharge-permit limits 137 times between January 2001 and Nov. 30, 2007.

The list of violations included at least 74 discharges of fecal coliform, 23 discharges of ammonia and two mercury-limit violations, according to documents obtained from the board.

Some of these problems are attributed to the plant's anaerobic digester, which becomes clogged with foam. Plant engineers employed a temporary workaround, and next week, construction crews will begin the process of modifying the machine at a cost of $1 million, according to Gromm.

Other machine malfunctions have also led to fines. In December 2001, a pump station in the neighborhood of Linda Mar discharged over one million gallons of untreated sewage into the ocean, leading to fines of $125,000.

In December 2005, 253,000 gallons of sewage escaped from the Rockaway pump station during a pipe system replacement. Pacifica was fined $190,000 and sued the construction company for negligence.

Reach Julia Scott at 650-348-4340

B. Staffing Requirements Project must minimize number of
required management and staff
positions.
Ponds, vacuum or LPS would have the lowest staff hours as well as ADS pond treatment. Attach # 48, Attach, # 125
C. Community
Acceptance
Includes consideration of:
• Private property value
A large assessment of $25 to $40 million would be less acceptable than a project of $15 K. Nowhere in California even in areas of high income is there a sewer fee of $250.00 a month…it is outrageous taking of our rights to live under the constitution of the USA. Attach #19, Attach # 67. # 118, Attach, # 134
• Aesthetics
5. Permit ability A. Coastal Permit • Required for any work

• Must be in compliance with the Local
Coastal Plan (LCP) Not in this project, Attach # 54.
B. Endangered Species. Attach # 219, Attach # 220
Habitat Areas (ESHA)
Includes considerations of what is
permitted in the ESHA
C. Environmental Includes consideration of the following:
• Endangered Species Protection Act
Many species including homo sapiens will be adversely affected in the endocrine systems as they develop. EDSAP
http://www.cardam.eu/NR/rdonlyres/733613DB-623F-4A8A-B193-B38D28E24103/0/HildaWittersfinal.pdf and
Since 1998 teat are ongoing for all domestic chemicals sold or released into the USA environment http://www.epa.gov/endo/
National Resources Defense Council and other plaintiffs joined and won a decision to force USEPA to go forward with that evaluation.
" In recent years, some scientists have proposed that certain chemicals might be disrupting the endocrine system of humans and wildlife. A variety of chemicals have been found to disrupt the endocrine systems of animals in laboratory studies, and compelling evidence shows that endocrine systems of certain fish and wildlife have been affected by chemical contaminants, resulting in developmental and reproductive problems. Based on this and other evidence, Congress passed the Food Quality Protection Act in 1996, requiring that EPA initiate EDSP to screen pesticide chemicals and environmental contaminants for their potential to affect the endocrine systems of humans and wildlife."
http://www.epa.gov/endo/pubs/edspoverview/index.htm
World wildlife federation
http://wwf.worldwildlife.org/site/PageServer?pagename=can_results_endocrine

Dioxin Exposure, from Infancy through Puberty, Produces E
http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2199303 endocrine Disruption and Affects Human Semen Quality. Attach # 20
There is ample and overwhelming evidence both from studies and common sense that the products we use daily. Prescription drugs, off of the shelf healthcare and cosmetics have levels of toxins and pollutants and other classes of chemicals that effect human health and development…mutagens and carcinogens that remain in sewer effluent after treatment process that is scheduled to be added to our potable and limited water supply for 15,000 people. Add to this the chemicals on the cleaning aisles of supermarkets, hardware and auto parts stores, local dry cleaners, auto Body and other stores that will be added pollutants…over 200,000 and we have a new source of potable water at Broderson that must meet recharge standards. You have failed to meet CEQA requirements to define impacts, classify impacts and meet mitigation standards. Our hope is a SEIR may do so. Attach # 192, Attach # 195

Stably transfected human breast cancer cell line,

developed by INSERM (Balaguer et al, 1999)
Section 7 consultations with US Fish
and Wildlife Service
• Archaeology
• Sensitive species/habitat
• State Marine Reserve
D. Land Uses Includes:
• No other feasible alternative for
ESHA
• Prime agricultural land
• Siting of public utility facilities
E. Engineering Includes the following elements:
• Health and Safety
• Drainage Attach # 75
• Noise
• Odor
• Traffic Trips
• Operational Dependability

5.1AG Exchange is different than reuse as we get potable water for treated effluent. Attach # 51. Using the AG X should be an A priority. ReCip TVA subsurface wetlands vector proof, in Small Flows article and followed by

page 432 DEIR 7-24 Table 7-5 screening level A,B,C
Disagree with the values in penalizing and minimizing bias, Attach, # 148

Table 7.7 page 456: Wrong $11.4 Capital cost $355,000 O&M
. Construction low:
$18 to $21 million
. O&M medium:
About $800,000/year.

Page 464 top Wrong… ponds need dredging 15-20 year

Page 474 Other Effluent Disposal Alternatives
Constructed Wetlands Can't harvest water see Clayton County Georgia

Conclusion:

There is evidences of constructive , Attach, # 144 *through the process.* Attach, # 132.. Attach, # 140, Attach, # 143 . *The values reported in the due diligence, Rough/Fine screening tech memos and the resulting conclusions are based on questionable values. The alternatives were not vetted in some cases leaving out*

known data from Carollo project that won awards recently…Petaluma Pond/wetland and Carnation WA Vacuum sewer with wetlands.
This plan has a lot of deferred costs and impacts. How ill these be identified in the disposal plans?
Please obtain a copy of Los Osos TAC Report Comments by Tom Ruethr March 30 through April 8, 2007 Dr, Ruehr has 35 years studying this project from the earlier TAC in the 80-90s, was a member of the citizens group that formed the LOCSD "The Solutions Group" and a retired (last year) Soil Scientist at Cal Poly San Luis Obispo. He has information that needs considering in this DEIR…lamellae layered at 2" to 4" depth hold the effluent in the soils and crerate a lateral flow. Attach, # 149 *As I have pointed out earlier. If you do not recognize these problems the CA Coastal Commission or the Courts may. It is after all scientific evidence.* Attach # 54, #88, #122
More study needs to be completed and Tom supports my view that Vacuum, Low Pressure and STEP have a superior outcome for collection in these conditions than does gravity. Please invite and evaluate the submissions of LPS, Vacuum and STEP/STEG as well has wetlands and AG exchange. Attach, # 137, Attach # 279
Thank You AL Barrow Coalition for Low Income Housing and Citizens for Affordable and Safe Environment.

**Eone puts a valve at the septic tank junction to the grinder pump for power outages,*

Natural Systems International, LLC.

LOS OSOS DRAINAGE FEASIBILITY REPORT

LOS OSOS, CALIFORNIA

NOVEMBER, 2001

Design, Build, Operate / Planning / Engineering / Landscape Architecture / Project Management / Specialists in Water & Wastewater Treatment / Reuse / Reclamation

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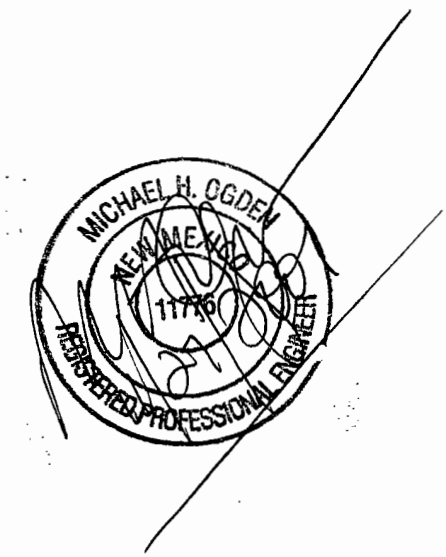
LOS OSOS DRAINAGE FEASIBILITY REPORT

LOS OSOS, CALIFORNIA

NOVEMBER, 2001



INDEX

EXECUTIVE SUMMARY AND RECOMMENDATIONS

NSI was asked to "*evaluate and make possible corrections/additions to the EDA Report, identify possible conversion properties for retention/percolation or constructed wetlands with the intent of acquisition consideration and identify to the Client any additional information or surveys needed to complete this Study*" and. "*to review the EDA report for background information on the above mentioned project; i.e. historic problems with storm water conditions and proposed solutions and finally to make recommendations* to the Board.

We have made eight specific project recommendations attaching some very preliminary cost estimates for the Board with the understanding that the cost estimates were done without the aid of adequate survey information, hearsay evidence concerning land costs and without the aid of actual engineering plans. However given these caveats, we are recommending that the Board proceed with engineering studies for the following 8 projects:

1. El Moro Avenue between 6th and 8th (El Moro depression), and the areas immediately to the north within one block. $672,000
2. 2nd Street at foot of El Moro (part of El Moro depression in EDA report) $100,000
3. Pismo Avenue and Ramona Lake: $125,000
4. Paso Robles Avenue & Walker ditch (14th to 18th) $75,000
5. Skyline and Broderson / Ash and Pine $150,000
6. Foot of Pine $300,000
7. Top of Broderson $125,000
8. Detention Basins / Riparian Corridor $1,000,000 to $2,000,000

To accomplish these eight projects, the Board will have to commission the following:

A. Topographic surveys (1 ft contours of each site)
B. Geotechnical investigations of each site, including soil types and percolation rates, depth to groundwater, underlying geology
C. Engineering design studies
D. Property surveys and valuations

These additional studies should provide the necessary detail to establish more accurate cost estimates of the projects. The project estimates listed above should not be considered as any more than a means to rank projects.

We also recommend solving some of the problems with smaller scale techniques and methods that emphasize infiltration and that develop parks and wetlands. We have addressed some of those alternative stormwater management techniques in Part III and Part IV of this report.

Solving the drainage problems will require major financial resources. To assist the community and the Board with financial planning we provided a substantial resource book entitled " Stormwater Resource Manual" which lists many sources of training and funding. We urge the Board to immediately pursue the sources of funding and training identified in this manual.

The EDA report is a very comprehensive engineering drainage study that focuses on conventional methods of conveying storm water either to the Bay or to large detention basins. The value of the study is that it provides a very clearly defined set of solutions that could solve drainage problems in the community of Los Osos. Missing from this report is the recognition that the drainage area cannot be separated from Morro Bay, and that any solution must provide treatment as well as conveyance.

If we accomplish no other task but to direct the Board's attention to the regulatory issues faced by the District, to the many agencies involved, and to the concept of "watershed based planning" as well as an awareness of potential solutions, we believe that we will have saved the District a great deal of time, money, and grief. As we have suggested in our commentary, dealing with the ecological relationships of the drainage basins, the relationship to Morro Bay, and groundwater is extremely important in terms of long range environmental and regulatory issues.

The stormwater runoff and flooding situation in Los Osos cannot be separated from the septic tank and groundwater issues. Unless the septic tank effluent is collected and treated, and the existing groundwater table lowered in some areas, the alternatives for stormwater management with infiltration methods are extremely limited. In addition, state and federal regulatory agencies are increasingly concerned about pollution from "non point" stormwater discharges, and the location of Los Osos and other coastal communities is of special concern.

To assist the Board in identifying and planning for the more stringent stormwater treatment requirements likely to take effect in 2002, we have identified:

A. Some of the California regulatory agencies and funding sources
B. Type of projects likely to be funded
C. Sources of information on stormwater and watershed management
D. The next steps that should be undertaken by the LOCSD including the need to address stormwater issue at the watershed level

Solutions to the drainage problems will be constrained primarily by financial and political issues, not technical. The solutions that are developed, however, should be based on principals of ecological sustainability. Keep in mind that the drainage problems are the result of development over the past 100 years. The time frame for resolution could be twenty years.

The Los Osos Challenge

As residents of Los Osos recognize, the community has a set of unique characteristics that include the topography, subsurface groundwater and geological conditions, and other factors that combine to present a much more complicated challenge in terms of both stormwater and wastewater management. As a coastal community Los Osos creates additional challenges posed by regulations associated with the state and federal agencies having jurisdiction over water quality in coastal California. Morro Bay supports the most significant wetland system on California's south-central coast and is included in the National Estuary Program, which is concerned with the effects of pollutant loads, and is in the process of developing a comprehensive conservation and management plan addressing point and non-point sources of pollution.

The need to address simultaneously both a community wide wastewater treatment system and a stormwater management plan requires thoughtful consideration of the timing for any proposed improvements. In Los Osos, there are conditions related to the septic tanks, groundwater levels, and the aquifers that cannot be treated in isolation due to the need to consider the effects of lowering the existing groundwater levels while at the same time attempting to provide infiltration of stormwater to reduce the ultimate discharge volume and to recharge the aquifer. A later section of this report addresses concept of stormwater infiltration in more detail along with other measures and products designed to reduce stormwater pollution.

EPA "Phase II" Storm Water Rules

Many communities are concerned over the adoption and enforcement of one more "unfunded mandate" from the federal government. The new rules require much more stringent treatment of all stormwater by smaller municipalities. Los Osos will undoubtedly be required to comply with the Phase II regulations as a "municipal separate storm sewer system" or MS4 that will require a program with six minimum control measures (unless the NPDES permitting authority grants a waiver). These measures include public education and outreach; public involvement; a mapping and detection system; and treatment to reduce pollution runoff. EPA intends that the majority of discharges from urbanized areas be authorized under general permits issued by the NPDES permitting authority. In all cases, best management practices (BMP's) will be required to be implemented.

California Agencies with Regulatory Authority

In addition to federal agencies such as the USEPA, the Corps of Engineers, and the U. S. Fish and Wildlife Service, Los Osos as a coastal community must coordinate stormwater management programs with local and state agencies. The following program is jointly administered by several agencies:

NPS/CZARA Program
(Nonpoint Source/Coastal Zone Act Reauthorization Amendments)

Administered by:
State Water Resources Control Board
California Coastal Commission

Intensive efforts are underway in California to address the best potential stormwater management methods. One example is the publication of the "Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities" (MURP). This is a document prepared by the cities of Monterey and Santa Cruz along with the CCC and others, as a handbook for responding to the challenge of coastal communities in managing stormwater runoff.

Watershed based planning

The concept of watershed based planning has received increasing emphasis within state and federal agencies responsible for funding infrastructure and environmental projects. The logic for this more comprehensive evaluation of drainage basins is clear. The impact of adjacent areas upstream will affect your planning area, and if ignored, may render your solutions ineffective. For that reason, many – if not most – grants for stormwater management planning and implementation require a watershed-based context. This does not imply that all local attempts to address stormwater and flooding problems are required to undertake massive, total watershed evaluations; only that information should be sought from sources or agencies dealing with the broader watershed to reflect an understanding of the context within which a local entity exists, and respond to problems or requirements for coordination as appropriate.

Among the specific objectives of the Morro Bay National Estuary Program are to reduce erosion and sediment transport in Chorro and Los Osos Creeks and the subsequent impact in Morro Bay. There is a major emphasis on the overall watershed, and the LOCSD ultimately should develop a defined relationship with this program to try to enhance both the effectiveness of stormwater management and also to help identify funding opportunities.

There is a massive amount of available information on watershed planning, ranging from conference and seminar papers to extensive reports by both private organizations and public agencies. We have identified a considerable amount of resource material separately from this report in a "Stormwater Management Resource Manual" provided to the LOCSD.

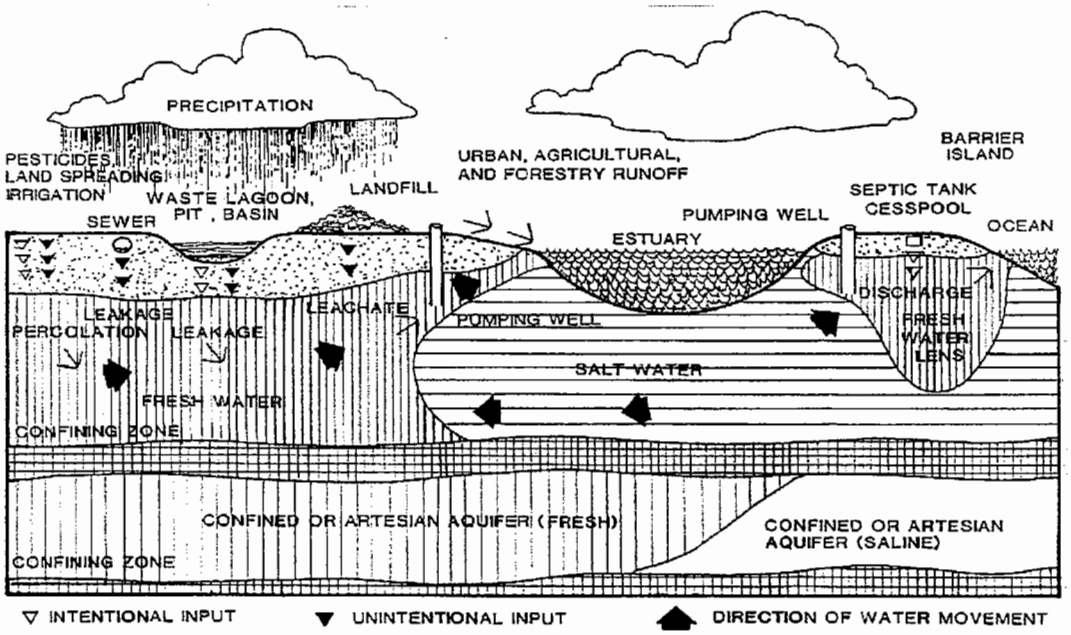
There are a multitude of biological, physical, economic, and social factors that are all interrelated in watershed planning; and this often requires an integrated collaboration of governmental agencies, environmental groups, and others to successfully address these issues. As a result there are guides on setting up collaborative conservation partnerships that are appropriate vehicles for dealing with watersheds. One very useful source of information of relevance to the LOCSD is the following report:

The Watershed Protection Approach: A Project Focus.
USEPA Office of Water Document #EPA841-B-94-002

This EPA report covers the basic watershed planning process, including: building a project team and public support; defining the problem; setting goals and identifying

solutions; implementation; monitoring and making adjustments. Available from: USEPA, Office of Water (4501F), 401 M Street, Washington, DC 20460. The USEPA also has a manual (EPA 841-D-98-001) that is an "Inventory of Watershed Training Courses".

In addition to the wealth of materials on watershed planning available from the EPA, another excellent source is the Conservation Technology Information Center, 1220 Potter Drive, Rm. 170, West Lafayette, IN 47906. This organization has available a number of booklets, reports, and guides on setting up watershed partnerships and putting together watershed management plans.



The diagram above is from an excellent publication entitled "Stormwater Management – a Guide for Floridians" published by the Stormwater/Nonpoint Source Management Division of the Florida Department of Environmental Regulation. The diagram provides a simplified overview of the numerous watershed interrelationships with groundwater and groundwater contamination; estuaries; aquifers; runoff; and other aspects of watersheds that all interact. Los Osos and the Morro Bay watershed have unique characteristics that impact issues of stormwater management and treatment.

PART II. REVIEW OF EDA REPORT

"Stormwater infiltration requires new ways of perceiving the urban environment and the aspirations of stormwater management. Stormwater management is constructive only when practiced in a context of environmental interactions and the quality of urban life" [Ferguson, 1994]

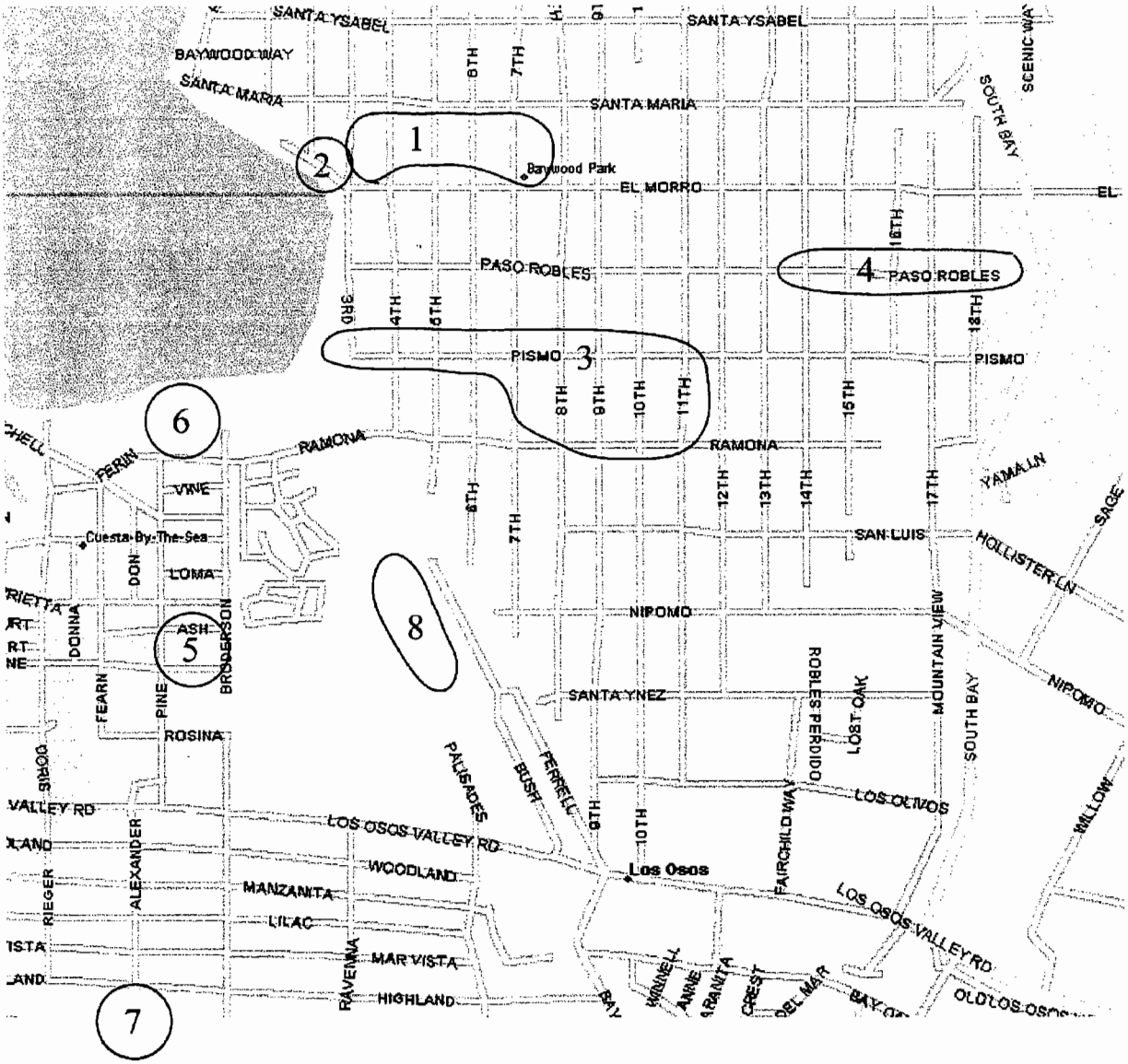
The EDA report is a very comprehensive review of the drainage problems in the Los Osos Community Service District. The mapping, discussion of ground water issues and description of solutions is complete. From our review of the report and our meeting with members of the community it appears that every single known flooding event has been reported and discussed at length and in detail. Table III-1, which summarizes the construction budget for the 27 areas, along with Map 5, provide a complete drainage program for Los Osos. Given enough money, every solution, if implemented, would solve the drainage problems. Yet the consequences of the implementation of a comprehensive drainage plan were only guessed at. Many state and federal agencies will be closely examining any storm water plan that discharges into Morro Bay. It is inconceivable that some additional treatment will not be required.

Given the difficulties of developing any form of treatment along the edges of the bay, it appears to us that any solution must seriously discuss minimizing storm water discharges. How this might be accomplished was never discussed.

Almost all of the solutions rely on conventional engineering approaches to drainage. The potential value of storm water as a resource to be used to create open spaces for parks and wildlife as well as recharging shallow aquifers has been minimally addressed. The EDA report did mention the new regulations requiring on-site detention for new subdivisions; however, very little effort was devoted to the value of upgrading individual homes with simple devices such as rain barrels, small detention ponds, gravel less trenches and subsurface infiltration basins.

Although it is not within the scope of this report to comment in detail on the suggested solutions for all 27 areas there are seven significant areas that we have identified with the assistance of the CSD staff and board members as well as residents of the neighborhoods affected by the flooding. The eight areas that we have identified as significant are:

1. El Moro Avenue between 6th and 8th (El Moro depression), and the areas immediately to the north within one block.
2. 2nd Street at foot of El Moro (part of El Moro depression in EDA report)
3. Pismo Avenue and Ramona Lake
4. Paso Robles Avenue & Walker ditch (14th to 18th)
5. Skyline and Broderson / Ash and Pine
6. Foot of Pine
7. Top of Broderson
8. Detention Basins / Riparian Corridor



Key to sites

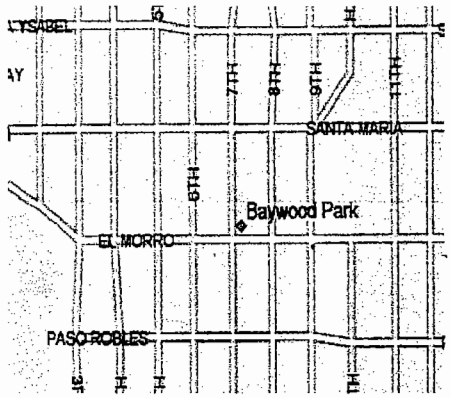
1. El Morro Avenue between 6th and 8th (El Moro depression), and the areas immediately to the north within one block.
2. 2nd Street at foot of El Moro (part of El Moro depression in EDA report)
3. Pismo Avenue and Ramona Lake
4. Paso Robles Avenue & Walker ditch (14th to 18th)
5. Skyline and Broderson / Ash and Pine
6. Foot of Pine
7. Top of Broderson
8. Detention Basins / Riparian Corridor

We have read the Board comments regarding the EDA report and concur with those comments regarding the overall expense of the proposed drainage solutions. Without grants, the $15.6 million construction cost translates into a debt of approximately $2,836 per district customer ($20/month for 20 years at 6%) or fifteen times the current annual district assessment. Unfortunately, the total cost for flood control has not yet been calculated because the proposed EDA solutions do not take into account the additional funding required to provide for treatment prior to discharge to the estuary. Equally important in the total overall financial picture is the problem posed by the rising ground water table in certain areas and the essential need for an eventual wastewater collection and treatment system. Solutions to the flooding problems in many areas are dependent on lowering the existing ground water. The stormwater runoff, flooding, and wastewater/septic tank situations are all ultimately connected to each other, and require a comprehensive environmental program that will protect water quality in the estuary as well as reducing flooding and providing stormwater and wastewater treatment.

Clearly some form of prioritization is necessary in dealing with the problems associated with flooding, and both the EDA and the Board have recognized the value of logging complaints and instances of flooding. We have relied on this information as part of our report, as did the EDA report. Indeed, one of the most significant facts presented in the EDA report and summarized in Table ES-1, and independently supported by a map presented to us by a board member is that only 33 homes have reported flooding. Of that total 24, or 73% of the total number of homes occur in the El Moro depression. The second most significant source of complaints and flooding is the Paso Robles depression. Ranking third in total of complaints and flooding was the area of Broderson and Skyline. This area had the second largest number of complaints (but only one reported flooding of a home). Finally, the Ramona/Pismo depression had 22 complaints and two instances of flooding.

Relying on the conventional solutions proposed in the EDA report, the total cost of these four projects is $6,679,800. This expenditure would solve 94% of the flooding problems. The next question is whether or not there are simpler less expensive solutions. Finally, there is the significant problem created by creating efficient storm drainage systems that convey almost all of the water to the Bay. Wherever possible, the EDA report proposed to minimize this problem by building detention/retention basins and using constructed wetlands to provide treatment. Ultimately, the quality of the water in El Moro Estuary may be a bigger issue than flooding, and the community may find it is easier to collectively address the water quality in the bay rather than any particular issues associated with flooding.

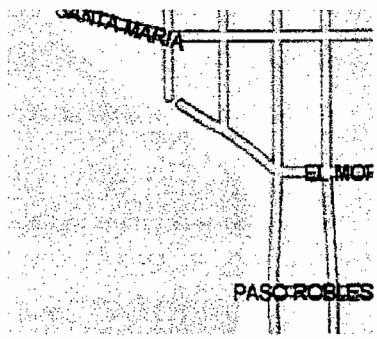
The following are our comments regarding proposed solutions for the each of the first three priority areas identified in the EDA report as Category I areas.



THE EL MORO DEPRESSION

The recommended alternative relies on storm drains and catch basins for an estimated construction cost of $1.2 million. This solution is designed to quickly convey water to the bay. No costs associated with treatment of the discharge are identified. Some level of treatment of storm water prior to discharge to the bay is probably going to be a requirement.

Since EDA options do not provide treatment, an alternative plan, which develops a wetlands riparian, corridor park system (see plan) should also be considered as an option. This option relies on a combination of box culverts and approximately 8 acres of riparian corridor. On a much smaller scale, some improvements to the existing cross lot drainage developed by the residents should be reconsidered. Additional recommendations and expansion on preceding solutions are included in Section III.

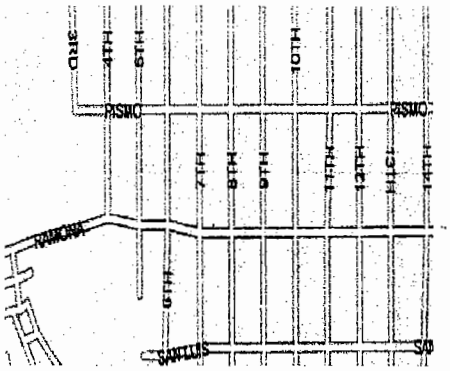


2ND STREET AT EL MORO AND THE BAY

This area was not specifically identified as a problem area but was included in the El Moro Depression. The significance of this area is that it brings home the ultimate problem associated with discharging into the Bay. A limited area of paving and parking areas in this location directly discharge into catch basins and then to the tidal flats. As mentioned in the EDA report, fecal coliform bacteria, nitrogen, and sediment, and petroleum hydrocarbons are serious and increasing contaminates in the Bay. The impact on receiving water quality from surface run-off is a known problem nation-wide. Because of the importance of the Morro Bay Estuary to wildlife and fisheries, both state and federal regulations will require that the community provide some form of treatment. Questions that must ultimately be addressed are; What kind of treatment? Where will it be built? How much will it cost?

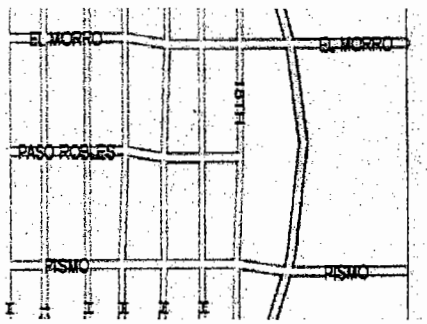
At this location there is not much than can be done other than replacing a standard catch basin with one of the specially designed structures that capture much of the sediment and oil.

PISMO AVE AND RAMONA LAKE



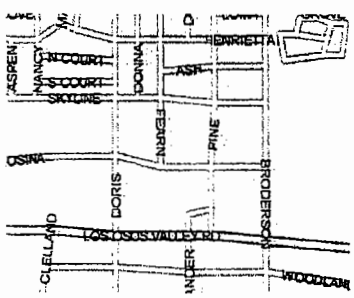
The EDA report proposed a $2.3 million dollar solution for an area receiving 22 complaints and reporting 2 instances of flooding. Some alternative solution must be found for this area. Purchasing the two affected homes, moving to another location or salvaging, and constructing detention basins in the lots would be less expensive than the proposed EDA solution. We have suggested some alternatives that have additional benefits to the community (besides cost savings) in Section III. As section III describes in more detail, linear parks might prove to be more cost effective, and eligible for grants. Linear parks, detention basins doing double duty as parks and ball fields, or surface basins that provide habitat create additional value not found in 54" culverts buried in the ground. Solutions that provide multiple uses are politically and economically easier to implement.

PASO ROBLES AND THE WALKER DITCH



The recommended alternate is a $1 million dollar solution that would affect flooding in 6 homes. The solution proposed has the essential elements of a big city approach to drainage. As an alternative, drainage swales with culverts should have been considered. Grassed drainage swales on both sides of Paso Robles eliminate the need for catch basins, and if grassed, instead of being paved, provide for treatment and recharge. On the north side, a buried arched culvert can carry stormwater to the Walker Ditch. A detention basin that served double duty as a wetlands might be nice, but the amount of flooding occurring here does not justify the additional cost. The EDA report suggested as one alternative a 16.3-acre foot retention basin on the east side of 18th. There may be ways to develop this site as a multifunction recreation field / infiltration area, rather than a retention area; but only if groundwater elevations and permeability conditions permit such development.

SKYLINE AND BRODERSON/ASH & PINE



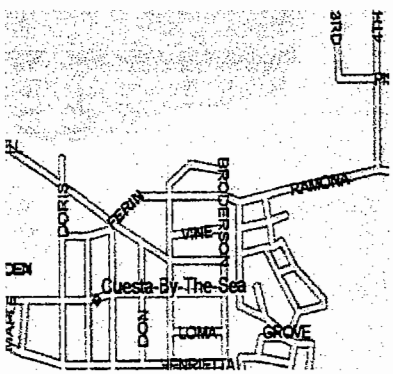
The EDA report gave this area the number one priority even though the fewest number of homes are impacted. It is our understanding that flooding, when it occurs, is the result of surface run-off coming from the

subdivision south of LOVR primarily from between Alexander and Palisades. Most of the water crossing LOVR naturally flows to this small one block area is where drainage area 16 narrows. As a general rule whenever a drainage area narrows, flooding is likely. The upstream flow for the 10-year flood at the crossing on LOVR and Ravenna and LOVR and Palisades is 54 and 24 cfs respectively.

The suggestions made in the EDA report for retention basins are in our opinion the correct choice. Constructing upstream retention basins that also serve as parks and ground water recharge basins would effectively reduce flow into the low lying area at Broderson and Skyline. Further enlargement of the small basin at Broderson and Skyline should effectively stop flooding except during the larger storms. Grading the area at Broderson and Skyline will allow larger events to overflow to Broderson and then down to the bay. This will minimize the need for storm drains.

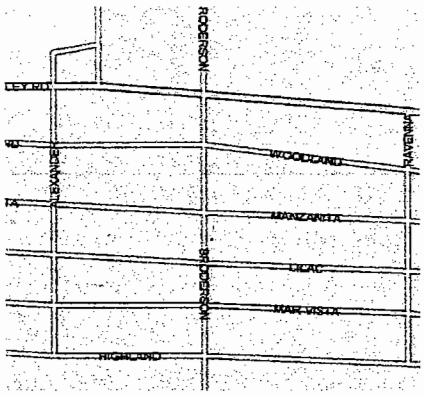
Because watershed areas 16 and 17 are very likely the source of the water for the Sweet Spring, every effort should be made to create detention and recharge basins. The farther away these basins are from the spring, the better the water quality will be by the time it surfaces in the Sweet Spring. Although it is not clear, it is very unlikely that any surface water made it to the bay prior to human development. The porosity of the soils, the gentle slopes as the watershed nears the bay, and the natural vegetation all combined to direct rainfall down into the aquifer that fed the Sweet Spring. Every effort should be made to re-establish this vertical movement of water.

FOOT OF PINE



Basically this is where Area 16 meets the Bay. This is a similar condition as that at 2nd and El Moro, and as such should have some means of catching the run-off and providing treatment. According to the calculations for storm flows, a 10-year storm shows a flow of 145 cfs and a 100-year event, 393 cfs. On a forty-foot wide street, the 100-year flood is a 1 ft wall of water moving at about the same speed as a marathon runner. Prior to human development, the existing wetlands served to remove sediment and organic matter and were the nursery for the invertebrate populations and small fish that fed the migrating wildfowl and larger fish and shellfish in the Bay. Every effort should be made to preserve this buffer between the bay and the land. It is even more important given the need to provide some treatment for storm run-off.

TOP OF BRODERSON

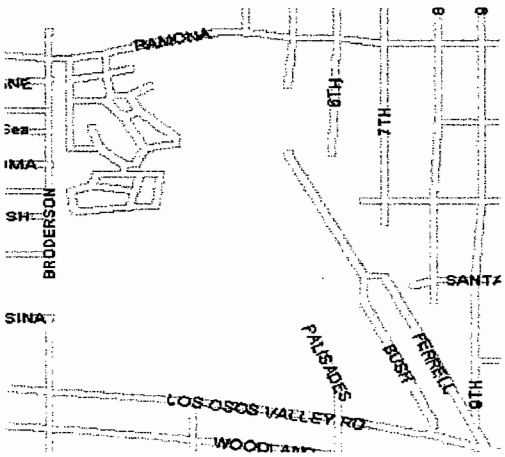


There is a growing problem at the upper end of the drainage affecting Skyline and Broderson, but was not specifically addressed in the EDA report. However, this problem, which results in mudflows, is illustrative of the importance of dealing with problems at the top of the drainage, rather than at the bottom. The general strategy is to build lots of small retention basins and check dams rather than a few small large basins and dams.

This is a classic erosion problem created by trail runners and day hikers who have packed the soil to such an extent that the run-off coefficient is very similar to concrete. If nothing is done to stabilize this area, the eroded area will enlarge with each rain, and the volume of mud flowing down Broderson will increase with each storm. The gully will continue to enlarge, eventually becoming a steep v-sided channel many yards across.

Every hillside area must be protected from this type of erosion. This does not mean that there should not be any access to these areas, but that access should be controlled and confined to pathways as at the State dune park. Paths should be designed and constructed to divert direct runoff away from the path corridor and into basins with small periodic check dams off to the side.

DETENTION BASINS-RIPARIAN CORRIDOR



In the area adjacent to Ferrell Avenue initial planning studies suggested constructing detention / infiltration basins with a riparian corridor that would serve multiple functions including recharge of the underground aquifer, creation of open space and parks, and habitat. The detention / infiltration basins could be supplied with either storm water or treated effluent from the new wastewater treatment facility. Determining an appropriate size for the detention / recharge basins will require a comprehensive study of the underlying soil and geology. However, as a preliminary design setting aside approximately 20 acres of this site is a reasonable starting point in absence of survey or geotechnical information. This utilizes treated effluent and/or stormwater to create wetlands and riparian habitat, open space for parks and recreational facilties, and to provide for the percolation and recharge of ground water.

These detention / recharge basins present a complex problem because of the connection between groundwater and septic tank discharges to the aquifer. As the sewer system is developed, water quality will improve. The rate of recharge will be affected by water quality – the cleaner the water, the better the percolation -, and by the infiltration methodology. Underground basins will be more effective than surface basins but are more expensive to build. This area is also probably crucial to the long-term health of the spring. Ground water recharge will almost certainly benefit the spring.

In our original instructions from the District management, we were told that purchase of the resource park was problematical and discussions regarding detention / recharge basins should not be included in this report. Because of the crucial importance of storm water management and ground water recharge, purchase of this land should be an important long-term goal for the Board.

The Character of Storm Water Pollutants

Storm water run-off from the urban landscape contains many different pollutants, including metals, oil, grease, diesel fuel, gasoline, paint, herbicides, pesticides, fertilizer, dust and dirt, paper, cardboard, glass, plastics, leaves, sticks, grass clippings, and a host of other items in varying quantity. Of this list, the first nine items are the most important to be removed from run-off. They are harmful to us and to wildlife, and if they are allowed to continue to be discharged into the estuary, the long-term effects will be disastrous to the Bay. These compounds ideally should also be prevented from entering the ground water.

Constructed Wetlands

The ecology of the wetlands is ideally suited for the treatment of storm water. Indeed, wetlands have evolved as low places in the landscape that receive run-off water and associated sediment and organic matter. The particular characteristics of constructed wetlands that we are interested in for stormwater treatment are the following:

- Bio-degradation of petroleum hydrocarbons
- Sequestration of metals in the form of chelated compounds
- Bio-degradation of organic compounds
- Nitrogen removal
- Sediment removal

Wetlands are naturally adapted to the seasonal rainfall and the ebb and flow of flood events. The particular structure of the wetlands plants allows them to be inundated and to bend, rather than break, during exposure to strong currents during floods.

By incorporating wetlands into detention basins, we can clean up and remove the pollutants of concern, and at the same time create an attractive habitat for waterfowl, frogs and other amphibians, and mammals. Wetlands are particularly suitable where drainage is poor, and the soils are saturated. In areas with sandy soils we can create wetlands by placing plastic liners that are impermeable and non-degradable over the sandy soils. The liners protect the underlying aquifer from contamination. Because of the requirements for impermeable soils, wetlands are therefore not very good as a means of infiltrating water into the ground. There is some vertical movement of water, albeit very small amounts. If the wetlands are built using liners on sandy soils, a subsequent downstream area can be developed as an infiltration area. This is an ideal combination as this allows for treatment prior to percolation and recharge.

Wetlands are ideal in many respects for the removal of pollutants because unlike mechanical systems, little or no maintenance is required beyond periodically removing trash. The ability to biodegrade pollutants, or sequester metals in a passive manner eliminates the need for electricity or equipment of any kind.

As part of the landscape, they create the open space so essential to the urban environment. Once planted with the many species of natives, including flowering plants, the wetlands can provide a pleasing green corridor within the community and at the same time, the plants and associated microbial community clean the water.

When designing wetlands for stormwater run-off, they are usually combined with sedimentation basins and trash removal racks. Sediment can ultimately fill in a wetlands changing its character entirely. Because of the likely amounts of trash such as paper, cans, bottles, and plastic, a screening device installed immediately in front of the sedimentation basin simplifies the removal and management of this trash, and ultimately keep it out of the Bay.

Wetlands can be any size - from a few tens of square feet to many square miles. The primary vegetation should be native central California coastal plants; however, there are numerous non-invasive, non-native flowering species of plants that make these stormwater wetlands very attractive. This landscape quality makes them very attractive for stormwater treatment, albeit at the expense of land. Siting wetlands into the available land can be a challenge but, as the examples in the appendix demonstrate, not impossible. Because of the shallow slopes, less water can be detained than in an equal area of a detention basin; however, fencing is not required. Wetlands are often combined with pools or ponds, which can increase the storage capacity.

Wetlands are encouraged in state and federal regulations, and as part of a mitigation or restoration program they are eligible for additional funding. No urban stormwater plan should be considered complete without the use of constructed wetlands for stormwater treatment. The runoff wetlands installed at Sea Pines Resort represent a good example of the positive attributes that even small scale wetlands can provide in the community.

Vegetated Swales

Grass swales have many virtues for conveying and mitigating impacts of storm water. They offer capabilities of providing both treatment and ground water infiltration. The micro-organisms in the root zone of the soil are very effective in bio-degrading the pollutants in the run-off from the streets, and the grass retains the soil, sand, and gravel. They are inexpensive to build requiring only a grader and some grass seed, and they fit in with the rural quality of Los Osos. The green belt between the home and the asphalt paving provides visual relief from the harsh quality of asphalt.

On steeper gradients swales require small check dams (see drawing) that slow the water and prevent erosion. The low check dams are constructed in such a way that vehicles can drive over them without damage. Swales eliminate the need for catch basins, and can be incorporated into the crossing streets either as concrete channels where the grade allows, or channeled into culverts at cross streets and driveways. In areas where space is available, treatment and infiltration can be achieved bv incorporating one or a series of infiltration

basins that can also be constructed using liners on sandy soils where some water retention is desired to maintain wetland plants This is an ideal combination as this allow for treatment prior to recharge.

Infiltration / Exfiltration

The State of Florida has developed an outstanding guidebook for the general public on best management practices (BMP's) for stormwater that illustrates a wide range of the most environmentally sound techniques utilized in that state. Among those techniques are "wet" ponds, retention basins, vegetated swales with check dams, spreader swales to allow recreational areas to serve as infiltration basins, and exfiltration pipes. The following illustrations are from that guidebook.[1]

More attention is being given within the general orientation toward environmental protection to systems of stormwater management that minimize the typical paved surface and piped subsurface collection systems. An essential technique for managing storm events is the use of infiltration basins, percolation ponds, subsurface basins, cisterns, recharge wells, and french drains. All of these devices rely on the ability of the soil to treat and absorb water. Construction of these devices serves three essential storm water management functions:

- Recharge of ground water.
- Minimizes or totally eliminates the discharge of storm water from the drainage area.
- Changes the time of concentration and reduces the peak flow during a storm event.

The net effect of these three functions on the storm event is to lessen the size of storm drains and culverts, and to minimize the size of the storm water treatment system. Equally important is the recharge of ground water.

Infiltration basins and percolation ponds are essentially the same and differ only in scale. Both basins (which may exceed 100 acres) and ponds rely on soil and plants to provide treatment. The plants may be wetlands plants or grasses such a Bermuda. They can also include trees and herbaceous plants. The roots of the plants are important as they provide treatment of pollutants such petroleum hydrocarbons and metals, and because they also keep the soil pores open thus allowing for continued percolation of storm water.

Infiltration basins need not be fenced holes in the ground. They can be attractive landscape features serving multiple purposes as parks, ball fields, and wildlife habitat. As an example, the Sepulveda Flood Control Basin in Los Angeles located at the intersection of I5 and US 101 is an 18-hole golf course with tennis courts and baseball diamonds.

Small, shallow percolation ponds can be incorporated into the individual homeowner's landscape. Plants including shrubs, grasses and trees, as well as rocks and round river gravel can be added to a small percolation pond placed to receive and percolate all of the roof run-off from most homes in Los Osos.

[1] Stormwater Management – A Guide for Floridians. Florida Dept. of Environmental Regulation Stormwater/Nonpoint Source Management

Subsurface infiltration basins can employ a variety of patented devices that range from "Infiltrators"™ that are essentially half pipes (see drawing at right) or a cluster of modular, stackable plastic structures such as "Rainstore" that can be installed underground in driveways and parking lots. Variations include large diameter interconnected perforated pipe buried in trenches and surrounded with gravel. French drains are essentially the same concept on a smaller scale with or without a perforated smaller pipe. Other products are available to capture water below grade within a swale or French drain.

Infiltration wells are simply perforated pipe installed vertically into the ground. Often standard manhole sections are used with perforated concrete pipe. The perimeter of the well is surrounded with gravel to facilitate the movement of water into the surrounding soil (see drawing next page)

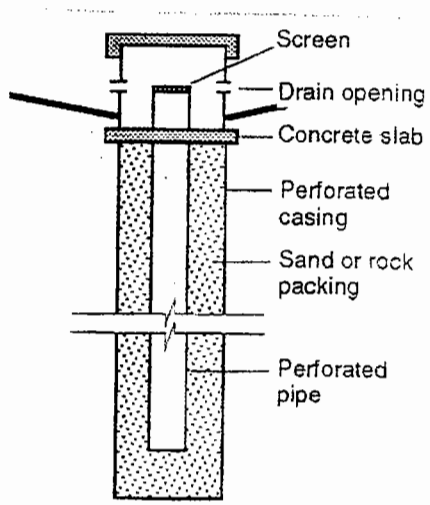
Cisterns can vary in size from a rain barrel to several tens of acres. Often they are used for storage and reuse, but they can also be used for recharge by leaving the bottom open. As an example, placing a 3 ft diameter, 3 ft long concrete pipe vertically under a down spout and partially burying the pipe so that water can percolate into the soil provides both storage and a percolation surface that can be easily cleaned. Increasing the soil surface by constructing french drains that receive water from down spouts is a very effective technique for individual homes.

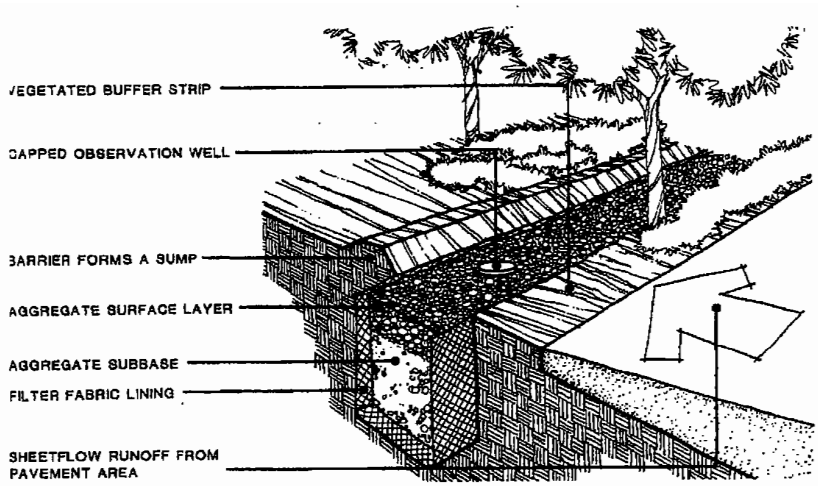
Finally, small lawns can be used as percolation and detention ponds by attaching roll-up vinyl lawn sprinklers, which attach to the down spouts. When it rains, the lawn sprinkler unrolls distributing the water over the lawn.

The City of Seattle has had regulations requiring infiltration trenches to accommodate residential roof runoff water for at least twenty years. The City provides a formula for the infiltration trench based on a percolation rate for the soil on the property and the area of impervious surfaces that are planned.

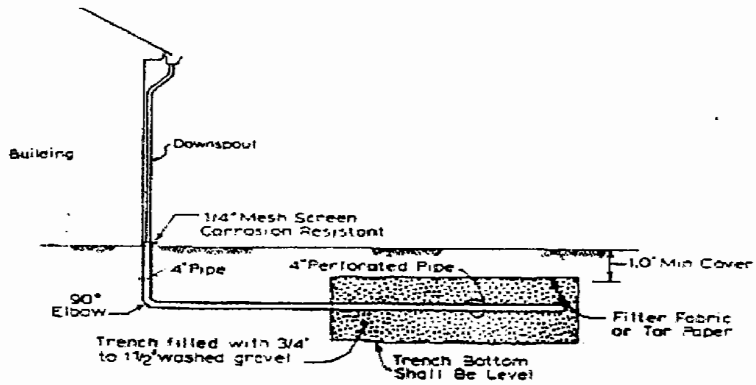
The diagram below is from the City of Seattle.

There are a great many variations on the detail shown at right for capturing runoff water and allowing it to infiltrate into the surrounding ground through different installations utilizing perforated pipes, gravel, and other media. This type of installation will obviously not be effective in areas of high ground water. Trenches to accommodate the same infiltration process are also often employed, especially where they can intercept parking lot runoff. The diagram below illustrates a trench type infiltration bed.





This graphic illustrates the concept of utilizing vegetated buffer strips, usually grass or groundcover, to trap some of the solids transported in surface runoff, as well as providing contaminant reduction, prior to stormwater entering a gravel strip that provides both retention and infiltration at a rate determined by the saturation of the surrounding soil.



Infiltration Trench Detail
No Scale

Residential scale infiltration trenches have been required for new construction in Seattle and much of the rest of the Puget Sound area for decades. The size of the percolation trench required is based on a formula relating the total square footage of impervious surfaces and the existing soil percolation rate. A combination of rain barrel/stock tank installations for roof runoff catchments and storage along with infiltration areas is appropriate for Los Osos where there may be a deficit of summer rainfall.

Catch Basin Inserts and Fossil Filters™: Some Observations

The EDA report references the use of "Fossil Filters"™ as one method of cleansing stormwater runoff. This product is one of a number of different installations categorized as Catch Basin Inserts (CBIs). There are at least 13 manufacturers of CBIs that range from cartridges to bags and trays, all with a filter media designed to capture debris, oil and grease, and other pollutants. Few laboratory or field tests have been accomplished to allow evaluation of the comparative effectiveness of any of these products. The few tests that have been done, in Sacramento; Santa Clara; Snohomish County, Washington; and Santa Monica have made the following observations:

- Substantial overflow is likely to occur in major storm flow events
- Filters tend to clog quickly with fine sediment, pine needles, etc.
- Removal of oil and grease ranged from 49% to 86% with decreasing efficiency at high flows
- Removal efficiency will approach zero with liner saturation and age
- Hydraulic capacity may not match vendor's claims, as studies have shown that catch basin inserts may overflow at rainfall events as low as 0.15 in/hr and flows less than 6 gpm, which is less than the flow from a garden hose.
- CBIs require frequent regular maintenance that must be factored into the overall annual costs in addition to initial installation costs.

A study by Larry Walker Associates, "NDMP Inlet/In-line Control Measure Study Report 1997-98", was conducted in the field for the Sacramento area storm water dischargers and evaluated the performance of the Fossil Filters™ installed in a commercial shopping center. Based on significant hydraulic, maintenance and performance problems, this product was not recommended for further testing.

Another study of stormwater inlet inserts in other jurisdictions that compares performance of ten different products by Woodward-Clyde consultants tend to support the same conclusions.[2] To quote from the report

"They have become a Best Management Practice in Australia with over 260 installations including the Olympic games site and Sydney Harbor. In addition to their performance in removal of gross pollutants such as coarse sediments and litter, the CDS units have also demonstrated capabilities at removing up to 80% of free oil and grease, especially with the addition of a sorbant."

"One study in Australia by the Cooperative Research Centre for Catchment Hydrology suggested the combination of CDS units with constructed wetlands for a very effective 'treatment train'."

"The CDS unit can remove nearly all gross pollutants and a significant proportion of finer pollutants, particularly during storms. An annual removal efficiency of 65% and 21% for TSS and TP respectively."

[2] URS Greiner Woodward Clyde. "Stormwater Inlet Insert Devices Literature Review. January 31, 2000

Additional Options for 'First Flush' Stormwater Treatment

All systems that attempt to reduce the debris load as well as oil, grease, and other contaminants prior to discharge into detention ponds or other receiving areas will require more regular inspection and maintenance than will a traditional system of catch basins and storm drains. Many of these measures, such as trash racks, present blockage along with a reduction in hydraulic performance and trapping efficiency. A new and innovative approach to this problem was developed in Australia in 1992 that has demonstrated considerable research and field testing to support the vendor's claims regarding performance.

This product is called a "Continuous Deflective Separation" device, or CDS, and is essentially a screening device that utilizes a circular flow to create a higher velocity stream of runoff against a screen, creating continuous movement that prevents blockage. CDS units separate solids from liquids and are capable of performing at a wide range of flow conditions from 1 to 300 cubic feet *were estimated by assuming typical pollutant concentrations during different flow conditions and using removal efficiencies estimated using data collected during this study.*

This study suggests a stormwater treatment sequence involving an efficient gross pollutant trap, such as the CDS unit, followed by a constructed wetland or a bioremediation zone can be expected to treat a wide spectrum of pollutants found in stormwater. The constructed wetland or bioretention zone in the treatment sequence would be designed to promote biological uptake of soluble pollutants under dry weather flow conditions and removal of fine suspended particulates under storm flow conditions and would complement the performance of a CDS unit."[3]

(Emphasis by NSI)

The Concept of a Treatment Train

The best management practices – or "BMP's" as they are referred to – for storm water management rely on a wide variety of devices and techniques, each appropriate for particular conditions related to watershed characteristics, soil, flow volumes, and other factors. In the case of Los Osos, the wide variety of both opportunities and constraints encountered in different areas requires employment of both traditional methods of conveyance such as diversion swales, culverts and storm drains, sediment and recharge (infiltration) basins as suggested in the EDA report, along with a range of other solutions. These range from the individual homeowner level – the installation of asphalt diversion humps at drivepads or barrels to collect roof runoff, for example – to constructed wetlands and special pollutant trapping structures.

[3] Walker, T. A.; Allison, R. A.; Wong, T. H. F., and Wooton, R. M. "Removal of Suspended Solids and Associated Pollutants by a CDS Pollutant Trap". 1999.

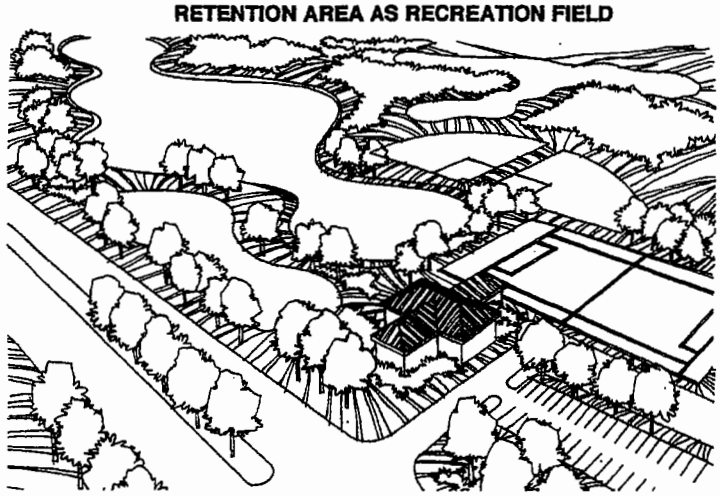
State of Washington has published guidelines for this type of installation for all new residential construction.

For commercial properties with paved parking areas, it is essential to attempt to minimize grease. At the individual property level, the District should consider requiring retrofit installations to accommodate runoff water generated from within each residential property. These installations can be simple french drains, dry wells, and the roof runoff catchment barrels and other small scale solutions based upon a formula that relates total impervious roof, driveway, walk and patio surfaces to a particular size on-site storage and infiltration area requirement. While this approach may not be feasible in areas with high ground water such as El Moro, they could serve to minimize the creation of surface runoff from properties at higher elevations to those at lower elevations. King County in the oils, and trash from flowing off the property. Toward this end, there are products such as CDS (Continuous Deflective Separation) designed to block gross pollutants at design flows up to 62 cfs (cubic feet per second)

Recreational Uses and Storm Water

The 70 acres of land in the proposed "Resource Park" previously proposed for the AIWPS wastewater pond treatment system appears to be the only potential space within Los Osos that might be appropriate for recreational field development that also provides stormwater detention and infiltration. There are other sites, mentioned elsewhere in this report, that might be acquired for neighborhood or linear park use in conjunction with enhancement of some of the surface drainage corridors, but these sites are either too small or with too much slope to be developed for recreational field uses. If a portion of the AIWPS site is available for recreational field development, there will probably be competing objectives related to disposal of the wastewater effluent and the desire to utilize stormwater infiltration within the same areas. There may be a possibility of a dual application, during different seasons, of both wastewater and stormwater with the wastewater being detained during the rainy season and discharged to the fields in the form of irrigation during the summer dry periods.

RETENTION AREA AS RECREATION FIELD



In Los Osos the Resource Park area presents one of the only appropriate areas to accommodate stormwater detention or retention within a park and recreational field setting. The drawing at left illustrates the general concept of a recreational field that also serves as a stormwater retention area.

The Monarch Grove Elementary School site in Area 14 might accommodate storm water runoff but the existing playfield would probably have to be regraded and potentially rebuilt with a different base to allow additional storage volume.

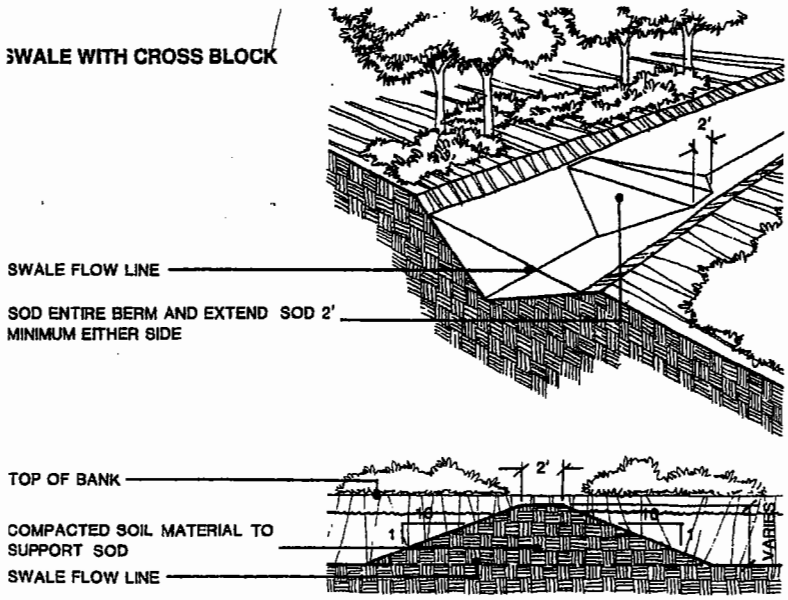
Walker Ditch area:

Another potential site to develop a combination stormwater infiltration basin and recreational development is the flat, open field that lies just south of the Walker Ditch, on the east side of 18th Street. While this property currently displays a sign indicating it's availability for development, no development is possible until the wastewater / storm water issues are addressed by the District. It might be possible to regrade this area to accommodate a soccer or multi-purpose field that could receive flood irrigation from a reconstructed Walker Ditch.

Another option for the Walker Ditch that would provide both increased storm water treatment and retention along with a visual amenity is to reconstruct and realign the ditch as a naturalistic channel with willows, cattails, and other wetland plantings to both uptake water and provide pollutant removal. This option would present a far more attractive view from South Bay Boulevard than the existing concrete ditch. This "treatment train" will provide the Best Management Practices (BMP's) for Los Osos Stormwater

The "treatment train" BMP for Los Osos might best be described as a combination of collection, conveyance, and treatment measures that basically depend on surface rather than piped, subsurface systems. Such a treatment train will be less costly to install and maintain, will allow for reduction in overall volume through infiltration, and will produce higher quality discharge water than a piped system.

In the case of Los Osos, the most cost effective application of this type of treatment train would be at paved parking areas in the commercial areas of the town, or possibly at some of the school sites. In these situations – each of which will be somewhat unique – storm water may need to be captured and conveyed by gutters or swale to a below grade CDS type installation that then transitions to a surface flow situation, either to grassed swales or constructed wetlands. The overall objective should be to minimize the ultimate discharge volume through encouraging infiltration, as well as removing as much of the debris and pollutants prior to any discharge to the bay or Los Osos Creek.



The diagram above, from Stormwater Management – A Guide for Floridians, illustrates the principle of intercepting stormwater flow in grassed swales using grass berms or "cross blocks" at intervals to allow infiltration to take place.

PART IV. SUGGESTIONS FOR SPECIFIC PROBLEM AREAS

1. El Moro Avenue

Of the seven major areas where flooding is likely to create problems, the areas between 4th and 8th adjacent to El Moro Avenue have recorded by far the most number of problems. As this drainage basin is the second largest, generating 320 cfs of run-off, of which 177 cfs would arrive at the 8th and El Moro pump station, flooding would be a natural expectation in all but the best-drained areas. As most residents living in this area are aware, the natural drainage pattern which drains to the WNW crossing El Moro between 7th and 8th streets was interrupted by the north-south/east-west pattern of street development. Complicating the drainage pattern is low-lying area at 8th and El Moro.

Area residents and the community have dealt with the flooding problem fairly efficiently by diverting water around their homes, passing the flood event downstream, and by pumping some portion of the flood event out to the bay. The virtue of this solution is that it is relatively inexpensive; homeowners have learned to deal with almost all but the largest flood events.

Possible solutions to the drainage problem in this area are the following:

A. Construct a large diameter storm drain along El Moro to the Bay with intersecting drains and drop boxes at each cross street.

B. Enlarge the pump station and discharge lines; add feeder drains at low points on 6th and 7th streets. Add surface and/or underground detention/recharge basins.

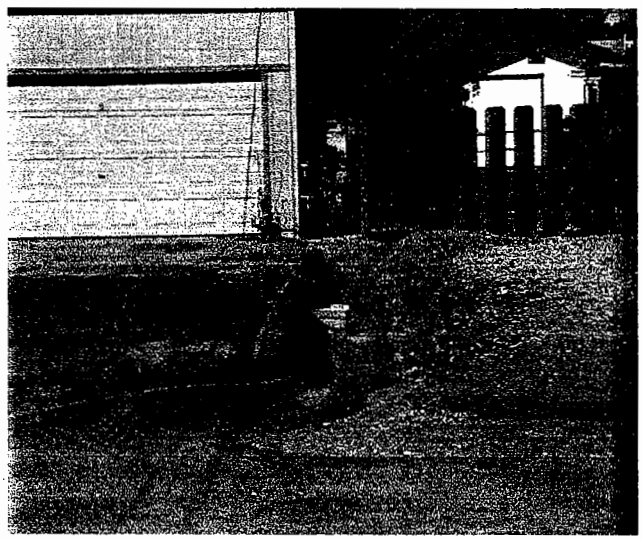
C. Work with affected neighbors to create drainage easement along the natural drainage channel and build linear riparian wetlands parks that provide stormwater treatment as well as parks and habitats. This would require enlarging the existing channel and adding the necessary catch basins and tributary drains. Add surfaced and / or underground detention / recharge basins. In this scheme 1300 ft of 3ft x 4ft box culverts, 6.65 acres of parks and riparian wetland corridor. This scheme has an estimated cost of $672,000 plus the cost of purchasing vacant lots.

The first solution is the one proposed by EDA, and is the most expensive. It is certainly technically feasible, and is the classic solution for urban storm drains. Underground gravity drains have the virtue of requiring little or no maintenance. Storm water is quickly conveyed away from the low-lying areas and discharged into the Bay. At an estimated cost of $1,219,500 this is a very expensive solution for the number of homes currently affected by flooding, estimated to be 24.

Pumping solves one of the problems associated with a storm drain, which is the excavation cost and the size of the line. Pressure lines can follow the road contour, and it is possible to move much more water in a pressure line than in a gravity line. The disadvantage

is that pumps are required and with them comes the associated maintenance problems. However, a system of wet wells and pumps can certainly work - New Orleans is an example on a large scale where all of the storm water is moved by pumps.

The third solution develops the natural drainage channel by working with the neighbor hood to develop the existing channels around the houses. As the following photograph shows, the neighborhood has developed some ingenious solutions. These solutions can be enhanced by enlarging the channels, adding additional channels, and by adding roll curbs and catch basins to divert and transfer the storm water to the channels. This solution is likely to the most cost effective, since much of the basic work is already in place. As the attached drawing indicates, there are only 24 homes that have been affected by storm events, and given the cost of the alternatives, this option should be seriously considered.



The condition illustrated at left is typical of areas where stormwater runoff is diverted from the street right of way through private lots. One possible improvement would be to install appropriately sized pipe, with a swale above to accommodate excess runoff, and culverts at driveways and cross streets to funnel the water as needed.

Dual wall drainage pipe – this type of drainage pipe is flexible and easier to install than concrete pipe and is a possible material for installing between homes in drainage easements.

Unfortunately, the problem with the last alternative is that drainage easements are very likely necessary for this option. If the residents affected are not willing to agree to easements, then this solution is delayed by the time it takes to condemn that portion of the property for an easement.

One of the issues that will affect each solution is the question of who will pay for the drainage improvement, and how is the cost distributed over the district.

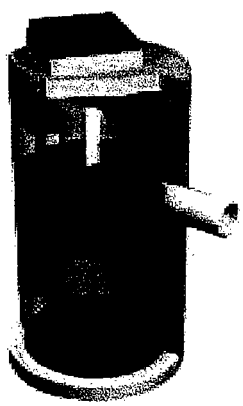
Although the district has an annual budget of approximately $90,000 a year this is not sufficient to cover the costs associated with the larger drainage projects. It is therefore very important for all members of the community to recognize that the solutions proposed for individual neighborhoods are in fact part of an overall plan to protect the groundwater and the bay.

Recognizing that there is an overall plan to protect the ground water and the bay, the CSD should undertake to implement the following goals as part of the overall plan:

- Minimize the total volume of water running to the bay by building detention ponds where ever possible. This is a current California subdivision requirement, and is in fact in place in the newer subdivisions. The volume of water to be retained should be equal to the difference between the pre and post development run-off. Upgrading neighborhoods in critical areas is a reasonable political goal.

- Drainage swales (in lieu of curb and gutter) should be build adjacent to every public right of way (see details) wherever possible. Grassed swales will slow the water and encourages percolation into the soil.

- Every home should provide for detention of roof and paved surface run-off. Rain barrels, detention ponds, and cisterns (see details) all provide a means of keeping water on the property, as well as a means of recharging the aquifer.



The stormwater manhole shown at the left is designed to capture sediment, trash, and oil and grease that is associated with typical municipal run-off

Schematic Plan for Linear Park and Riparian Wetlands – El Moro Drainage Corridor from 8th to 2nd.

As the details show, these tasks are relatively simple and inexpensive to implement. They can be accomplished over time with use of both public and private funds. As an example the purchase of large quantities of rain barrels by the CSD would allow the home owner to purchase at a discounted price, rain barrels to place at the four corners to their home. Four barrels would retain 25% of the roof run-off from a 1500 sf roof during a 1", 2 hour storm. A simple swale 10 ft x 10 ft, averaging 1 ft deep would retain the rest. If every home in the El Moro zone did these two things, the impact on the run-off would be a 40% reduction in the total run-off during a 1" storm event. All of the subsequent downstream channels, pumps, pipes, are similarly affected.

Drainage swales and retention ponds are very effective for diminishing flow and in the case of most areas of Los Osos, effective means of recharging the aquifer. For example, the likely recharge rate in the El Moro area for each acre of swale and detention pond is approximately 4 million gallons in a 24 hour period. This is equivalent to reducing the run-off during a 1" storm event on 96 acres to zero. The entire El Moro area is only 127 acres. However, the El Moro depression has ground water very near the surface, and therefore recharge has to be developed in conjunction with the installation of a sewer collection system. As recharge begins to take place, the underlying aquifer will be flushed with clean rain water.

2. Paso Robles Ave and Walker Ditch

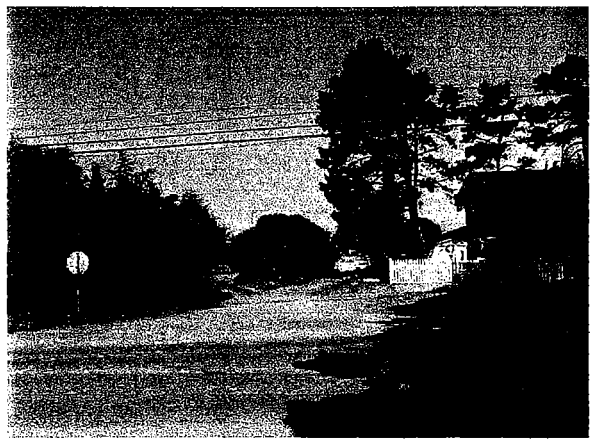
Robles Ave. from 15th to 18th streets suffers from occasional flooding when the rainfall exceeds the capacity of the small catch basin and pump. Drainage into the catch basin is not as efficient as possible because of the road grades on Fifteenth Street. Only a few homes are affected; however the solution is very likely one that the district can accomplish with little expense.

It appears that the invert of the Walker ditch is approximately 1.0 feet below the invert of the 12" CMP at 16th and Robles. By constructing drainage swales on the south side of Robles Ave. and installing culverts under each cross street it should be possible to divert storm flow into the Walker ditch. The north side of Robles will require a HDPE smooth dual wall corrugated pipe at each cross street. As an alternative, continuous infiltration chambers can be installed in lieu of piping. This would allow both infiltration and transport of stormwater to Walker Ditch. In most situations there appears to be sufficient room to build swales. The construction of swales can be done with a grader, and once seeded with grass, the swale will provide treatment in the form of sediment removal as well as treatment of petroleum hydrocarbons. In addition, there will be some recharge of the aquifer.

If the gradient is close to zero, then installation of double wall HDPE drainage pipes should be considered. Unlike swales there is no treatment or recharge, but the gradient can be less than swales. Catch basins would be installed at four locations at each intersection. In the worst case scenario, i.e. there is insufficient fall to the ditch, then a low head, high volume pump should be installed in a pump vault at the entrance to the ditch.

3. Pismo – Ramona Area:

As previously described, there is a hierarchy of potential solutions to the various stormwater drainage issues in Los Osos, the simplest of which occurs at the homeowner level. There are numerous examples of recently installed asphalt humps at drivepad intersections with streets that were constructed to divert runoff water away from private properties. Several homeowners asserted that these solutions not only were effective but that the cost was only around $500. There are many areas where this simple solution would clearly be sufficient to minimize or totally eliminate the nuisance runoff flooding of private properties. It has to be recognized, however, that wherever this solution is chosen, there will likely be increased runoff onto other properties that have not taken this step and that could exacerbate the flooding on these other sites. In other situations, there are already drainage channels that run under fences and between properties. This particular condition is somewhat unique in that private property owners are the reluctant managers of stormwater originating off of their property, much of it within the public rights of way. The typical situation where this occurs in other jurisdictions would be a drainage easement where the responsibility for maintenance does not lie with the property owner.



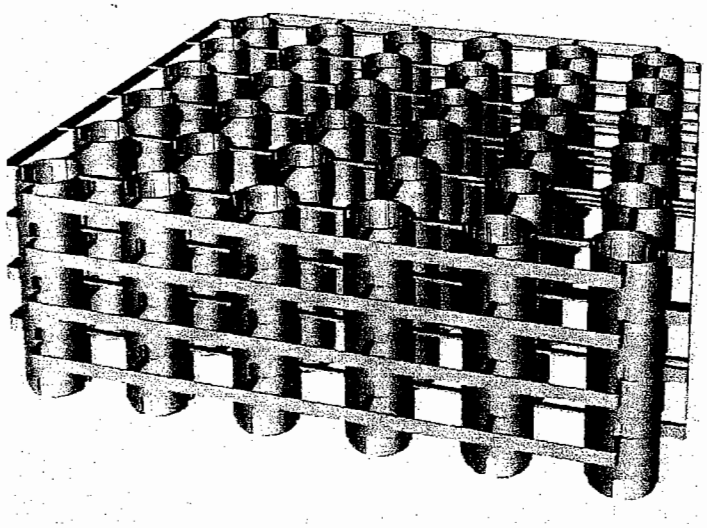
Ramona Lake

There are conditions that currently prevail along some of these drainage channels that present significant potential blockage problems due to the luxurious vegetation growing adjacent or within these channels. Without yearly maintenance, there is no doubt that in many cases some areas of these channels will restrict runoff flow and increase the flooding problems within the adjacent or upstream properties.

An effort should be made at a voluntary level to enlist the assistance of property owners to establish a 'ditch association' similar to the management of irrigation water ditches where the same concerns over siltation, vegetation, and conductivity prevail. The associations would assign a 'mayor domo' for each ditch and schedule a regular cleanup to ensure each segment is capable of efficiently carrying runoff water.

The area between 10th and 11th referred to humorously as "Ramona Lake" presents a unique challenge that may not have any one solution. There is a dilemma posed by the potential attractiveness of temporary standing water, which if important to nearby residents, would not be conducive to remedies that essentially eliminated this seasonal condition. One alternative that would allow capture, storage, and infiltration of stormwater runoff within this area is the installation below grade storage/infiltration chambers that would allow the water to slowly percolate into the surrounding soils.

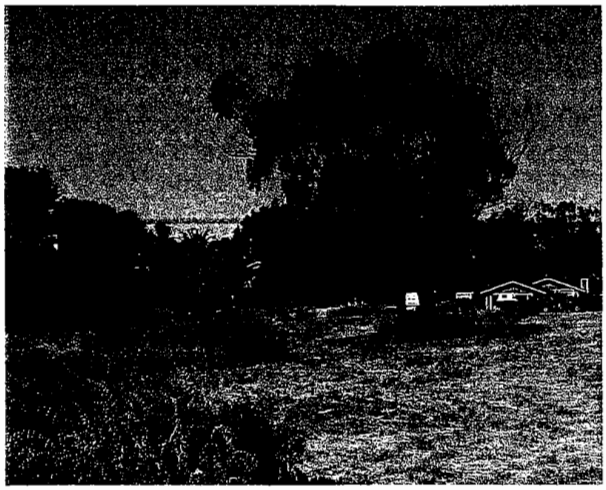
Several products now on the market specifically designed to be installed below gravel parking areas that store runoff water in vertical chambers with openings to allow percolation into the surrounding ground at a slow rate. Similar installations have been used under parking areas in situations where little or no space was available for detention ponds. This solution is superior in a visual sense to the typical detention pond and does not require the level of maintenance that all detention ponds require.



The above drawing illustrates one product on the market designed for subsurface water storage, "Rainstore" as manufactured by Invisible Structure in Aurora, Colorado. It requires only 12" of cover and is comprised of an interconnected structure of cylindrical columns; it can be installed in depths up to over eight feet.

Ramona –Pismo Linear Park

The drainage path down Ramona from the "Ramona Lake" area cuts through private properties between 6th and 9th over to the Pismo corridor. This represents a distance of over 1.000 feet within which the stormwater runoff path is essentially out of view and within private properties. Without a drainage or access easement, this situation obviously poses maintenance problems that appear to be at the discretion of each property owner.



View of open space looking west, near Pismo and 6th

Where the Ramona drainage intersects with Pismo, the flow is within the existing public open land (the Pismo ROW) between 4th and 7th, which presents an interesting opportunity to demonstrate both innovative stormwater management and to provide an attractive neighborhood mini-park. On the north side of the ROW between 5th and 6th, there is a larger open space with a large, mature eucalyptus tree, a Canary Island palm, and gentle slopes suitable for a small passive park that might encompass a children's play area, a picnic site, sand volleyball, horseshoes, and interpretive wetland features.

By regrading the existing surface stormwater flow line in a more meandering path, reinforcing the edges with boulders and smaller rocks, and creating small check dams and seasonal ponds, the conditions for slowing runoff and allowing for increased detention and percolation are enhanced within a public space that could acquire a significant presence in the community as it develops.

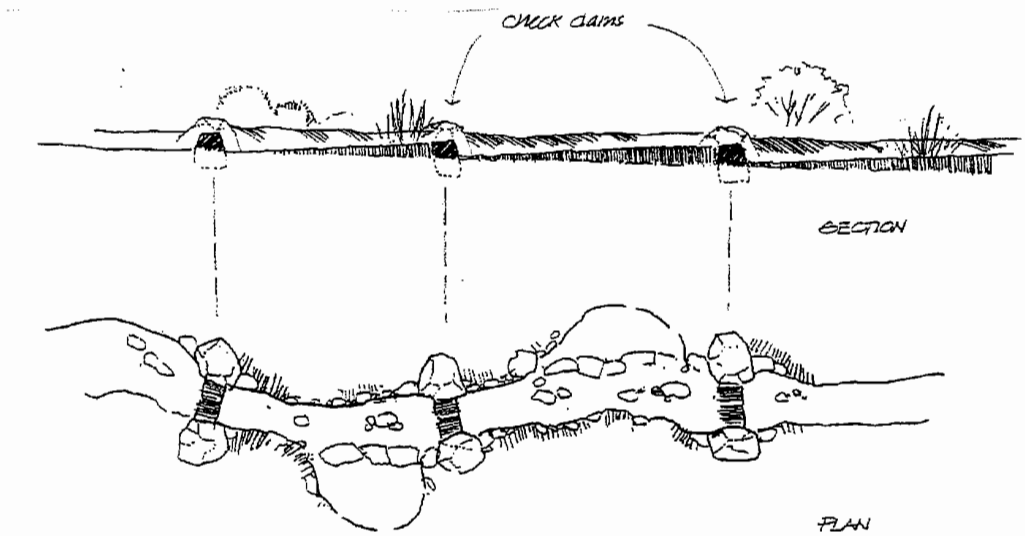
This enhanced drainage corridor could extend for the full four blocks between 4th and 7th and could accommodate a meandering trail with sitting areas.

This 'Pismo Watercourse Park' corridor would terminate at 4th Avenue at which point the surface drainage system could be piped under 4th to the existing wetland channel leading to the bay through the area to the southwest of the intersection of 3rd and Pismo.
A trail winding down through this corridor alongside the enhanced drainage channel could continue along Pismo to 3rd at which point informal trails lead to the bay.

There may be other opportunities to develop enhanced drainage corridors that incorporate similar improvements that provide public amenities, stormwater treatment and flow reduction, and other benefits. One such area may be the Paso ROW corridor that also provides an opportunity to develop a trail system and linear park in conjunction with drainage improvements. These type of multiple function projects may qualify for grants not available for single purpose drainage projects.

Sweet Springs at End of Pismo Ave.

The Ramona-Pismo drainage corridor offers the District some wonderful possibilities that are based on existing conditions shown in the photo at left and on the next page. The termination of this corridor occurs in a particularly attractive area with the Sweet Springs. *(Photo at left)*



This sketch illustrates the concept of regrading the existing drainage flow line or corridor between 4th and 7th to provide a longer, more meandering pattern that is naturalistic, with rock and boulder edging to minimize erosion. Periodic check dams of stone will provide sedimentation basins and allow infiltration as well as reducing the velocity and volume of runoff.

The drainage channel on the south side of Pismo was constructed with cobble rock that have become overgrown with wetland plants. Although these plants inhibit the flow as compared with an open ditch, they also serve to reduce velocity, capture pollutants, and provide wildlife habitat. This segment of the Pismo drainage corridor could benefit from periodic thinning of vegetation every few years, but otherwise should function satisfactorily. If a trail is constructed through the Pismo corridor from this point up to 7th, a continuation should be provided on the south side of Pismos adjacent to the channel.

This photo is of the east side of 4th, looking up the Pismo ROW that is now utilized only as a drainage corridor. The ROW width between 4th and 7th can be utilized to create a more meandering drainage channel with ponding areas, rock check dams, wetlands, and special edge treatment; this will allow the runoff to infiltrate, be treated, and be reduced in volume prior to discharge at 4th Street. At this point.the runoff over the pavement could be reduced or possibly piped to the existing wetland drainage channel on the opposite side of the street.

The above drawing represents a view uphill to the west from a location on 5th within the Pismo drainage corridor. In addition to an enhanced drainage channel or water course, trails and native planting can be installed to provide an attractive multi-function linear park.

4. Broderson Avenue

While this street and it's intersection with Los Osos Valley Road are not indicated on the plan as creating flooding, there have clearly been significant recent incidents that created major flooding of properties on both sides of Broderson as well as carrying a considerable load of silt and debris down to Los Osos Valley Road. There are restrictions on both physical access and on the range of potential acceptable solutions that would require construction uphill of the end of Broderson.

Trail and erosion at the head of Broderson

Among those solutions are a series of

5. 2nd Street and El Moro Avenue Area

The intersection of 2nd and El Moro is the site of a recently installed catch basin that discharges directly to the bay. A small deck and interpretive signage at this location presents an opportunity to develop a demonstration tidal treatment wetland. While there may be many regulatory obstacles that confront such a proposal, the clear and compelling argument for such an installation is the potential capacity to provide a natural filter that will remove contaminants from stormwater discharges before they enter the bay proper.

Tidal flats west of 3rd near El Moro

The existing configuration of the shoreline and the offshore tidal shallow area lends itself to the design of a tidal marsh with carefully controlled inlet and outlet structures. Plants such as California bulrush (*Scirpus californicus),* Alkali bulrush *(Scirpus maritimus)* and other wetland plants associated with brackish marsh conditions might be utilized. It should be recognized, however, that "a brackish marsh is one of the most restrictive habitat types because of the fluctuations of fresh and salt water"[4]. Due to the wide seasonal variations in levels of salinity, attempts to establish wetland plants should employ a wide selection in order to ensure the establishment and survival of the most appropriate species for the conditions that prevail at this site.

Dock area at Second Street and El Moro

The El Moro Pump Discharge

In addition to the stormwater runoff generated by the streets, sidewalks, and properties near the 2nd street and El Moro intersection, the El Moro pump discharge could either be directed into a newly created tidal marsh or a constructed wetland within the upland area just west of 3rd Street near the El Moro intersection.

While this site presents significant slope problems and the actual area for a wetland may be quite limited once regrading establishes a controlled perimeter, it is worth evaluating in detail the feasibility of utilizing this site in conjunction with the tidal wetland to provide additional natural treatment of the stormwater prior to the existing direct discharges to the bay.

[4] Faber, Phyllis M. Common Wetland Plants of Coastal California (Pickleweed Press, 1996)

The strict regulations currently in existence or being considered by both State of California and federal agencies may require this level of treatment and there may be opportunities for state or federal grants that are designed to support innovative demonstration projects that may have application elsewhere. The various agencies and potential sources of funding for this type of installation are detailed in Part V of this report.

Potential constructed wetland area, El Moro and 3rd Avenue

The critical next steps that would have to be undertaken to determine technical as well as regulatory feasibility are a detailed site survey as well as a wetland delineation to determine whether any of this upland area is already classified as a wetland. Generally speaking, wetlands that are less than one-third of an acre in size do not require mitigation or Corps of Engineers 404 permits; but given the sensitive location of this site, it would be prudent to document the plant community and conduct a wetlands delineation. In addition, a detailed soil investigation and survey of grades would be needed to determine the characteristics of the site and the feasibility of constructing a treatment wetland within this area.

Bulrush and sedge at edge of bay

The maximum flow volume from the El Morro pump discharge of 5,700 gpm is a significant volume that would probably require a much larger area of wetland to achieve any detention time and treatment at the higher flow levels. At lower flows, the wetland could provide treatment but might require special weirs and overflow discharge structures to accommodate high flow levels without damaging the wetland plants. It is important to document the typical flows to allow a determination of the maximum timeline for the higher flows and the need to accommodate them in any constructed wetland design.

An emergency overflow diversion might be installed to handle these high flow conditions, and provide protection from scouring of the wetland by high volume, high velocity flows. The conditions within this constructed wetland would not present the same brackish mixture of fresh and salt water that the tidal wetland needs to accommodate; and there are numerous wetland plants that would be suitable for this 'freshwater' constructed wetland.

Bulrush species often called Tule – and in particular the California bulrush *(Scirpus californicus)* – have proven to be the most effective wetland plants in removing contaminants from wastewater and stormwater. This is at least partly due to their impressive root structure that extends deeper than cattail and many other wetland species. They have been utilized in large wastewater treatment wetlands such as a 12 mgd (million gallons per day) facility in Beaumont, Texas where they removed 90% or more nitrogen within one year of planting.
It would be worthwhile to conduct a visual quality inventory, along with documentation of existing major trees in this sensitive area prior to commencing with any detailed planning and design for stormwater management installations that would require major regrading. This could possibly be undertaken by landscape architecture students at Cal Poly and would provide essential tools in determining feasibility, location, and landscape integration of any constructed wetlands or other stormwater management improvements in the area.

APPENDIX

POTENTIAL FUNDING SOURCES

Program: CWA Section 205(j) Water Quality Planning Grants
Lead Agency: State Water Resources Control Board (SRWCB) and U.S.EPA Region 9
Program Type: Water quality planning projects to reduce, eliminate, or prevent water pollution and to enhance water quality.

Program: 319(h) Nonpoint Source (NPS) Implementation Grant
Lead Agency: State Water Resources Control Board (SWRCB)
Program Type: Watershed management and implementation projects to reduce, eliminate, or prevent water pollution and to enhance water quality.

Program: Clean Water Act (CWA) Section 104 (b)(3) – Wetlands Program Development
Lead Agency: Environmental Protection Agency (EPA), Office of Water
Program Type: To assist local government in implementing new programs related to wetlands preservation and enhancement

Copies of announcements for these grants with additional details follow this section. See these documents for application deadlines and contact persons.

California's Nonpoint Source (NPS) Pollution Control Program
This program has an internet site (http://www.swrcb.ca.gov/nps/index that documents in detail some of the water quality grants briefly outlined above

U. S. Environmental Protection Agency
EPA's new office of Sustainable Ecosystems and Communities supports community-based environmental protection projects that integrate environmental management with human needs, consider long-term ecosystem health, and highlight the positive correlations between economic prosperity and environmental well-being.

Programs that can be utilized by partnership groups working with water quality issues, particularly nonpoint source pollution control and watershed management.

See: EPA report Watershed Protection: A Catalog of Federal Programs
Contact: Water Quality/Water Management branch, EPA

Sample Program: EPA 319: Nonpoint source assessment; management; and grant award programs that supplement states' ongoing nonpoint source management programs, favoring those that encourage strong interagency coordination and public involvement. (See description of state (SWRCB) administered 319 programs in section above)

See: A Guidebook of Financial Tools: Paying for Sustainable Environmental Systems
This is available only the EPA Web site:
http://www.epa.gov/efinpage/guidbkpdf.htm

California Department of Housing and Community Development
The State Community Development Block Grant Program (CDBG) provides federal community development grants to non-entitlement cities and counties. Whether the LOCSD would qualify is uncertain and should be explored.

Contact: Lisa Vergolini, 916.327.3615, lvergoli@hcd.ca.gov

SOURCES OF INFORMATION AND ASSISTANCE:

National Center for Small Communities (NCSC) has publications related to funding:
www.natat.org/ncsc/Pubs/Funding.html

Keys to Successful Funding identifies major federal and foundation funding sources and strategies for developing competitive applications.

Innovative Grassroots Financing: a small town guide to raising funds and cutting costs.

Sample Program: Small Watersheds

The Watershed Protection and Flood Prevention Act (Public Law 83-566) authorizes the Secretary of Agriculture to provide technical and financial assistance to local organizations for planning and carrying out watershed projects. Through this program NRCS provides technical and financial assistance to state agencies, any county or group of counties, flood control district, Indian tribe or tribal organization, or any other nonprofit organization with authority under state law to plan, carry out, maintain, and operate watershed improvement works to reduce soil erosion and coastal flooding and to address other conservation needs on watersheds under 250,000 acres. Eligible purposes include: (I) preventing damage from erosion, floodwater, and sediment; (2) furthering the conservation, development, utilization, and disposal of water; or (3) conserving and properly using land.

CBEP News Online. Office of Sustainable Ecosystems and Communities, EPA.
(Free). A bimonthly electronic newsletter published by EP A's new Office of Sustainable Ecosystems and Communities that "shares information about community-based environmental protection (CBEP) resources, tools, and information. To subscribe, send an e-mail message to Editor.CNO@epamail.epa.gov -include your name, organization, telephone number, and where you heard about CBEP News Online. The newsletter can also be obtained through EP A's Fax-On-Demand System at 202-260-5339 and at http://www.epa.gov/ecocommunity.

Organizations

The Center for Watershed Protection A non-membership, non-profit organization "dedicated to finding new, cooperative ways of protecting and restoring our watersheds. " The Center focuses on urban watersheds. Its principal functions are independent research and technical support to professionals. The Center publishes a journal, "Watershed Protection Techniques" and technical guides on topics like site planning, urban best management practices, constructed wetlands, design of stormwater ponds and filtering systems. For more information contact: Center for Watershed Protection, 8737 Colesville Road, Suite 300, Silver Spring, MD 20910. phone: 301-589-1890.

Environmental Partnership Field Guides. Environment and Business Management guidebooks cover more formal partnerships, such as industry-government partnerships with no community involvement as well as community-based partnerships. There are three guidebooks: **Environmental Partnerships: A Field Guide for Nonprofit Organizations and Community Interests. Management, Environment, and Business, 1995. ($10)** Booklet covering the basic steps to forming a partnership--reviews formal agreements and documents. Good section on deciding whether or not to form or join a partnership group. Covers technical details, such as how to prepare an MOU, a work plan, and a budget. Extensive section on financing and fund-raising.

The Watershed Protection Approach: A Project Focus. USEPA Office of Water Document # EPA841-B-94-002. June 1994. This EPA report covers the basic watershed planning process, including: building a project team and public support; defining the problem; setting goals and identifying solutions; implementation; monitoring and making adjustments. Available from: USEPA, Office of Water (4501F), 401 M St., Washington, DC 20460. tel: 202-260-6582.

Watershed Protection: catalog of Federal Programs. USEPA Office of Water. Document # E7A-841-B-93-002. Detailed tables describe agency programs that support watershed planning, protection, research, and related projects. Lists eligible entities, amount appropriated to each program in recent years, and types of projects funded.

ATTACHMENTS:

1. **Program Announcement: Water Quality Planning Grants**
2. **319(h) Nonpoint Source (NPS) Implementation Grant**
3. **Clean Water Act (CWA) Section 104(b)(3)**