

**JOINT MEETING  
CITY OF MORRO BAY AND CAYUCOS SANITARY DISTRICT  
WASTEWATER TREATMENT PLANT  
(UNDER JOINT POWERS AGREEMENT)**

**Cayucos Sanitary District Board of Directors:**

Robert Enns, President  
Bud McHale, Vice-President  
Harold Fones, Director  
Shirley Lyon, Director  
Michael Foster, Director

**City of Morro Bay City Council:**

Janice Peters, Mayor  
Carla Borchard, Vice-Mayor  
Noah Smukler, Councilmember  
Betty Winholtz, Councilmember  
Rick Grantham, Councilmember

**AGENDA**

**MEETING DATE:**

6:00 p.m., Thursday, July 8, 2010

**HOSTED BY:**

Cayucos Sanitary District

**MEETING PLACE:**

Cayucos Veterans Hall  
10 Cayucos Drive  
Cayucos CA 93430

**CALL TO ORDER AND ROLL CALL**

**PUBLIC COMMENT PERIOD**

Members of the audience wishing to address the governing bodies on Morro Bay-Cayucos Wastewater Treatment Plant (WWTP) business matters may do so at this time. By the conditions of the Brown Act, the governing bodies may not discuss issues not on the agenda, but may set items for future agendas. When recognized by the Chair, please come forward to the podium and state your name and address for the record. Comments should be limited to three minutes.

**A. CONSENT CALENDAR**

1. Minutes of June 10, 2010 JPA Meeting – Recommend approve.
2. Minutes of June 16, 2010 JPA Meeting – Recommend approve.
3. Wastewater Treatment Plant (WWTP) Operations Report through May, 2010 – Recommend receive and File

**B. OLD BUSINESS**

1. Discussion and Consideration to Adopt the Draft Amendment #2 to the Facility Master Plan – Recommend Approval and provide direction to staff
2. Status Report on Request for Proposal (RFP) for Project Management for the WWTP Upgrade Project – Recommend receive and provide direction to staff

**C. NEW BUSINESS**

1. Discussion and Consideration to Send a Letter to Regional Water Quality Control Board and USEPA Requesting a Reduction in Monitoring Frequency for Selected Parameters Contained in the Monitoring and Reporting Program of the NPDES Discharge Permit for the WWTP – Recommend approval and provide direction to staff
2. Schedule Next Joint Meeting and Agenda Items

**ADJOURNMENT** - (Next meeting will be hosted by the City of Morro Bay)

Copies of staff reports and other public documentation relating to each item of business for this meeting are available for inspection at Morro Bay City Hall at 595 Harbor Street and the Cayucos Sanitary District at 200 Ash Ave. A copy of this packet is available from the City of Morro Bay for copying at Mills Copy Center and from the Cayucos Sanitary District for a copy and duplication charge. Any person having questions regarding any agenda items may contact Bruce Keogh, Wastewater Division Manager (City of Morro Bay) at 772-6261 or Bill Callahan, District Manager (Cayucos Sanitary District) at 995-3290.

Materials related to an item on this Agenda submitted to the Morro Bay/Cayucos Wastewater Treatment Plant Joint Powers Authority after distribution of the agenda packet are available for public inspection at: Public Services Office at 955 Shasta Avenue, Morro Bay, CA 93442; Morro Bay Library at 625 Harbor Street, Morro Bay, Ca 93442; Mills/ASAP Reprographics at 495 Morro Bay Boulevard, Morro Bay, CA 93442 during normal business hours.

**JOINT MEETING  
CITY OF MORRO BAY AND CAYUCOS SANITARY DISTRICT  
WASTEWATER TREATMENT PLANT  
(UNDER JOINT POWERS AGREEMENT)**

**MINUTES**

**CAYUCOS SANITARY DISTRICT  
BOARD OF DIRECTORS:**

Robert Enns, President  
R.H. Bud McHale, Vice-President  
Harold Fones, Director  
Michael Foster, Director  
Shirley Lyon, Director

**CITY OF MORRO BAY CITY COUNCIL  
MEMBERS:**

Janice Peters, Mayor  
Carla Borchard, Vice-Mayor  
Rick Grantham, Councilmember  
Noah Smukler, Councilmember  
Betty Winholtz, Councilmember

**MEETING DATE:**

6:00 p.m., Thursday, June 10, 2010

**HOSTED BY:**

City of Morro Bay

**MEETING PLACE:**

Multi-Purpose Room  
Community Center  
1001 Kennedy Way  
Morro Bay, CA 93442

**CALL TO ORDER AND ROLL CALL**

Mayor Peters called the meeting to order at 6:02 p.m. and asked that the record show four Council members are present with Councilmember Winholtz absent. President Enns stated all members of the Cayucos Board are present.

Morro Bay Staff members present were Bruce Keogh, Rob Livick, Andrea Lueker, Rob Schultz, Susan Slayton and Cindy Jacinth.

Cayucos Staff members present were Bill Callahan and District Counsel Tim Carmel.

**PUBLIC COMMENT PERIOD**

Members of the audience wishing to address the governing bodies on Morro Bay-Cayucos Wastewater Treatment Plant (WWTP) business matters may do so at this time. By the conditions of the Brown Act, the governing bodies may not discuss issues not on the agenda, but may set items for future agendas. When recognized by the Chair, please come forward to the podium and state your name and address for the record. Comments should be limited to three minutes.

Mayor Peters opened the Public Comment period.

- Bill Martony asked why the vote is equal between Morro Bay and Cayucos members. Since Morro Bay is two-thirds of the project, he questioned if Morro Bay should have a bigger vote.
- Richard Margetson of Cayucos, wanted to know if opinions of MWH were sought from the Los Osos CSD. He is concerned about MWH after the Los Osos sewer project estimates increased.

The following persons spoke to encourage the Board to consider a different sewer plant design:

- Natalia Moresen, of Los Osos; Grant Crawl, of Morro Bay; Melody Demeritt of Morro Bay; Chanel Channing of Morro Bay; and Julie Linxwiler of Morro Bay.

Hearing no further comment, Mayor Peters closed the public comment period.

Peters asked to show for the record Councilmember Winholtz has arrived.

#### **A. CONSENT CALENDAR**

1. Minutes of May 13, 2010 JPA Meeting – Recommend approve.
2. Status Report on Design Process – Recommend receive and file
3. Status Report on Request for Proposal (RFP) for Project Management for the WWTP Upgrade Project – Recommend receive and file

Smukler asked to pull item A3 from the Consent Calendar.

**MORRO BAY MOTION:** Smukler made a motion to approve Consent Calendar Items 1-2. Grantham seconded and the motion passed unanimously.

**CAYUCOS MOTION:** McHale made a motion to approve Consent Calendar Items 1-2. Foster seconded and the motion passed unanimously.

- A3. Status Report on Request for Proposal (RFP) for Project Management for the WWTP Upgrade Project – Recommend receive and file.

Smukler asked staff how to further involve the JPA Board as a whole in regards to the hiring selection for the project manager position.

Keogh responded that staff will evaluate and take their recommendation to the JPA's Technical Advisory Committee. Rob Schultz clarified he contacted the firms who responded to the RFP for a copy of their proposals so they can be shared with the Board. The TAC will evaluate both the proposals and the staff recommendations.

Board members discussed ways to observe and potentially tape the job interviews.

**MORRO BAY MOTION:** Smukler made a motion to approve Consent Calendar Item A3. Borchard seconded and the motion passed unanimously.

**CAYUCOS MOTION:** McHale made a motion to approve Consent Calendar Item A3. Fones seconded and the motion passed unanimously.

Peters asked Counsel to respond to the question raised during the Public Comment period regarding what is the vote ratio. Carmel said voting is done on an equal basis.

#### **B. NEW BUSINESS**

1. Proposed Budget for WWTP FY 2010-2011 – Recommend Approve

Slayton presented the staff report. Smukler asked about the trend of increased expenses over time. Keogh said operation and maintenance expenses will be fine tuned and evaluated as we move through the process.

Board members discussed the process for the timing of cost allocations.

Enns read a statement from Louis Brookins' analysis of budget which recommends approval.

**MORRO BAY MOTION:** No motion was put forth by Morro Bay.

**CAYUCOS MOTION:** McHale moved to approve the WWTP FY 2010-2011 Budget. Lyon seconded and the motion passed unanimously.

Peters noted Agenda Items #2 and #3 were out of order and proceeded to Item #3 first.

3. Discussion of Board and Council Members Independent Review of Alternative WWTP Project Delivery Methods

Board member Foster gave a presentation summarizing his visit to the PERC- designed treatment plant in Santa Paula. Foster noted the increased risk of not having a certainty of cost and encouraged the Board to allow PERC to present a proposal as an alternate option.

Board members discussed the option of having PERC submit a Construction Design Report (CDR) and the variety of system options including Oxidation Ditch technology, Membrane Bioreactor (MBR) and Sequence Batch Reactors (SBR).

Enns asked Barry Brannon of Morro Bay to come to the podium to give a summary of the process. Brannon encouraged the Board to structure competition in order to get the best design by allowing both PERC and MWH to submit reports within a 60 day period.

MWH representative, Steve Hyland stated they are not opposed to alternate technologies. This project is currently proposed as a Design Bid Build method and he encouraged the Board to make sure that when they are considering other methods, they are making accurate comparisons.

PERC representative, Brian Cullen spoke and explained the Design Bid Operate methods they utilize. Cullen clarified the certainty of cost guarantee is achieved through the specifications already in place. If the Board is willing, they would be able to produce a CDR within 60 days.

Board members continued to discuss the CDR, training of staff, the timeline and differences between Design Bid Build (DBB), Design Build (DB), Design Build Operate (DBO), and Design Build Operate Finance (DBOF).

Peters called for a break and the meeting resumed at 8:30 p.m.

Board members continued discussion regarding whether they want to accept the \$75,000 proposal by PERC.

Keogh asked the Board if they are seeking to change treatment technologies or delivery methods by switching from Design Bid Build to Design Build. He noted the tight time schedule to complete the project.

Enns noted that the value engineering process has not been discussed and the Board has a responsibility to ratepayers to get the best value. Randy Rominger, of Kitschall, a construction management company, spoke to discuss the concept of value engineering.

Board members continued lengthy discussion regarding how to determine certainty of cost, the concept of value engineering, and the need to schedule another meeting to discuss these issues further. The items proposed for discussion at the next meeting would be whether to accept a CDR proposal and value engineering.

Cullen said PERC would be willing to submit a CDR at no cost provided that MWH does the same. Hyland clarified MWH Constructions could provide the equivalent of a CDR to put together a DBO, and possibly a DBOF, however he is concerned that without an RFP process, that it will not be an even comparison.

Winholtz recommended that the Board meet again in a week to decide if they will allow both companies to submit a proposal within the next 60 days. Borchard added the Board needs to decide which delivery method will be used. Peters stressed the process should be open to other companies and not just PERC.

Keogh asked for staff direction to proceed with the next steps.

Peters asked staff to bring back before the next meeting information on the RFP process for MBR Design Build Operate delivery method and information on value engineering.

## 2. Schedule Next Joint Meeting and Agenda Items

Board members determined the next JPA meeting will be 9:00 a.m. on June 16<sup>th</sup>, 2010 at a Morro Bay location to be determined.

## **ADJOURNMENT**

Peters adjourned the meeting at 10:03 p.m.

**SPECIAL JOINT MEETING  
CITY OF MORRO BAY AND CAYUCOS SANITARY DISTRICT  
WASTEWATER TREATMENT PLANT  
(UNDER JOINT POWERS AGREEMENT)**

**MINUTES**

**Cayucos Sanitary District Board of Directors:**

Robert Enns, President  
R.H. Bud McHale, Vice-President  
Harold Fones, Director  
Michael Foster, Director  
Shirley Lyon, Director

**City of Morro Bay City Council**

Janice Peters, Mayor  
Betty Winholtz, Vice-Mayor  
Noah Smukler, Councilmember  
Carla Borchard, Councilmember  
Rick Grantham, Councilmember

**Meeting Date:**

Wednesday, June 16, 2010 at 9:00 a.m.

**Meeting Place:**

Community Center - Studio Room  
1001 Kennedy Way  
Morro Bay, CA 93442

**Hosted By:**

City of Morro Bay

**CALL TO ORDER AND ROLL CALL**

Mayor Peters called the meeting to order at 9:04 a.m. and asked the record show all Council members are present. President Enns stated all members of the Cayucos Board are present except for Bud McHale.

Morro Bay Staff members present are Bruce Keogh, Andrea Lueker, Rob Schultz, Rob Livick, Dylan Wade and Kay Merrill.

Cayucos Staff members present are Bill Callahan, Tim Carmel and John Hanlon.

**PUBLIC COMMENT PERIOD**

Members of the audience wishing to address the governing bodies on Morro Bay-Cayucos Wastewater Treatment Plant (WWTP) business matters may do so at this time. By the conditions of the Brown Act, the governing bodies may not discuss issues not on the agenda, but may set items for future agendas. When recognized by the Chair, please come forward to the podium and state your name and address for the record. Comments should be limited to three minutes.

**A. NEW BUSINESS**

1. Discussion and Consideration of Alternative Delivery Methods for the WWTP Project

**Recommendation: Provide direction to staff**

2. Discussion and Consideration of Establishing a Value Engineering Process for the WWTP Project

**Recommendation: Provide direction to staff**

3. Discussion and Consideration of Alternative Wastewater Treatment Processes for the WWTP Project

**Recommendation: Provide direction to staff**

#### 4. Discussion and Consideration of a Construction Design Report (CDR) Proposal from PERC Water and/or Others

##### **Recommendation: Provide direction to staff**

Mayor Peters stated that Dylan Wade would present Item 1, under New Business, before the Public Comment Period due to time restraints for Mr. Wade.

##### **A.1. Discussion and Consideration of Alternative Delivery Methods for the WWTP Project**

Wade gave a presentation on Project Ownership and Operational Methods with the following highlights:

- Presented the pros and cons of Design Build and Design Bid Build which are the only available project delivery methods to Cities
- The pros and cons of Public Ownership, Public Private Partnership and Privatization as methods of owning and operating the treatment plant

Wade asked the Board if they had any questions

- Michael Foster, from the Cayucos Sanitary District Board of Directors, asked which method delivers the best value to the ratepayers
- Wade responded that until the contract is negotiated, the differences between Public Ownership and Public Private Partnership will not be apparent
- Foster, stated one way to mitigate that risk would be to have two parallel paths, having two plans instead of one
- Wade responded the resources available to the Board are limited and that is why we are hiring a Project Manager and running parallel paths

Mayor Peters asked if there are questions from the audience for Wade

- Natallia Merzoyan, Morro Bay resident, questioned the change in the timeline
- Wade explained the history of the timeline and the adoption of the time schedule
- Bill Martony, Morro Bay resident, asked if we will be designing the Oxidation Ditch as opposed to doing two parallel designs now
- Wade responded from an environmental review and CEQA perspective our EIR will review the Membrane Bioreactor (MBR) and look at the impacts
- Steve Griffith, Morro Bay resident, asked about the different risks associated with privatization
- Wade replied private parties do have different rules than public agencies. Going private allows more options for constructing the plant but also creates new risks
- Grant Crowl asked about chemicals with a tertiary filtration system and stated the other project has no chemicals added and is drinkable
- Wade replied it is illegal to drink effluent from a wastewater plant
- Smukler added one key difference is the footprints required for either system. With the (MBR) or the Sequencing Batch Reactors (SBR) system the smaller footprint creates more land surrounding the space available
- Wade responded different technologies require different footprints
- Al Barrow, resident Los Osos, asked about Design Build contracts
- Wade responded that Design Build contracts, traditionally, have a lower change order percentage than Design Bid Build contracts

- Foster, Cayucos Board member, asked if there is a financial analysis for the Oxidation Ditch
- Wade replied a risk analysis has not been done but an estimate of probable costs has been done
- Foster asked due to highly variable costs, does that help us step forward with the CDR?
- Wade recommended to continue the current approved plan in order to meet the time compliance schedule

## A.2. Discussion and Consideration of Establishing a Value Engineering Process for the WWTP Project

Rob Livick gave a staff presentation on peer review or value engineering. The highlights included:

- How to compare costs on different treatment methodologies and delivery methods
- To hire an outside consultant to look at potential projects, compare costs and provide recommendations, with an estimated cost of \$20,000 to \$30,000
- Livick clarified that comparisons have already been done for various projects including the Oxidation Ditch and the MBR plant and this Board selected the Oxidation Ditch as the preferred method. During the RFP process, various consultants presented their views on what would be best for the treatment plant upgrade and the consultants recommended the Oxidation Ditch
- Livick asked the board if it wants to pursue value engineering at this time

Mayor Peters opened Public Comment

- Jenny Brantlee, Morro Bay resident, spoke in favor of Public Private Ownership CDR

The following spoke in support of PERC Water or Two Parallel Paths:

- Barry Brannen, Morro Bay resident, Piper Riley, Los Osos resident, Linda Stedjee, Morro Bay resident, Bill Martony, Morro Bay resident, David Nelson, Morro Bay resident, Al Barrow, Los Osos resident, Steve Griffith, Morro Bay resident, Ann Reiss, Morro Bay resident, Daniel Crisick, Morro Bay resident, Grant Growl, Morro Bay resident, Rob Aragon, PERC Water Representative, Steve Heineigh, Cayucos resident, Dana Putnam, Morro Bay resident, Barbara Jo Osborne, Morro Bay resident, Johan Perslow, PERC Water Founder, Matt Makowetski, Morro Bay resident, Natallia Merzoyan, Morro Bay resident and Richard Margetson, Cayucos resident

The following spoke in favor of the current project:

- Keith Taylor, Morro Bay resident

Hearing no further comment, Mayor Peters closed the public comment period

## A.3 Discussion and Consideration of Alternative Wastewater Treatment Processes for the WWTP Project

- Steve Hyland, MWH Representative, gave a presentation on Design Criteria and explained the differences between the Oxidation Ditch Site Plan and the MBR Site Plan. He also presented cost estimates for the MBR site plan. He stated MWH was asked at the last meeting if they would prepare a CDR and he said no because MWH competed for the current contract they have. They prepared a cost comparison and estimate according to the comprehensive RFP. Hyland asked the Board to clarify whether the CDR should be for an MBR, Oxidation Ditch or an SBR and if the

delivery system should be for Design Build (DB), Design Build Operate (DBO) or Design Build Operate Finance (DBOF)?

- Mayor Peters asked Hyland if the Oxidation Ditch is more appropriate for this location.
- Hyland responded the Oxidation Ditch is the best economical approach for the current project including future reclaimed water
- Foster asked when we will find out what the issue is with the soil condition
- Hyland stated under the current schedule they will review the amendment to the facility master plan, get the draft EIR issued, get acceptance of the Design Concept from the JPA, then when we get Notice to Proceed with Final Design the first phase is Preliminary Design and authorization would be given to the geo-tech consultant to go out and do addition boring and testing and come back with recommendations
- Winholtz asked isn't soils part of the EIR process?
- Livick said there has been preliminarily soil investigations and boring which is enough to satisfy the EIR phase of the project

Mayor Peters asked if anyone from PERC Water would like to comment

- Perslow asked what specific experience MWH has with MBR's

Board members continued discussion regarding remediation costs, Title 22 Water, the State Revolving Fund, guaranteed and accelerated rates, cost effectiveness and cost savings and having a peer review done.

Mayor Peters motioned to have a peer review done and bring it back to the next meeting for consideration

MORRO BAY MOTION: Peters, Borchard 2<sup>nd</sup>  
VOTE: 3-2

CAYUCOS MOTION: Lyon, Foster 2<sup>nd</sup>  
VOTE: 3-1

Tim Carmel suggested some specific wording for the motion as follows:

“A proven agreement with Kitchell to perform a peer review analysis comparing the current proposed Waste Water Treatment Plant (WWTP) with the PERC proposal for an amount not to exceed \$25,000, once a preliminary CDR or equivalent is made available to Kitchell, subject to review and approval by City Attorney and District Council.”

CAYUCOS MOTION: Lyon, Foster 2<sup>nd</sup>  
VOTE: 3-1

The Board and City Council continued discussion regarding the CDR for PERC and the cost involved.

Smukler made a motion to direct staff and the City Attorney's to evaluate the CDR from PERC Water that's on the table and suggest adjustments to a designated Board representative. He suggests Mayor Peters as the representative and signator and do so within a week to initiate a CDR proposal from PERC Water.

MORRO BAY MOTION: Smukler, Winholtz 2<sup>nd</sup>

Smukler stated the motion needs to be amended and called upon Carmel regarding the week time-frame schedule. Carmel stated it should not be a problem.

Mayor Peters said the question on the table is: Do you want to spend \$75,000 for a CDR?  
Mayor Peters called the question.

VOTE: 2-2 Motion failed for lack of majority

Discussion continued between City Council, Board and Staff regarding support for a motion.

Perslow stated PERC would do a CDR at no cost provided he has staff support.

Smukler made a motion to direct staff to engage with PERC and provide the information and dialogue that will help them in developing the most accurate proposal for the community and JPA in a timely fashion.

MORRO BAY MOTION: Smukler, Winholtz 2<sup>nd</sup>

Andrea Lueker, City Manager, clarified staff will discuss information with representatives from PERC and make clear the points of contact, set clear guide lines and make clear how information will be shared.

VOTE: 4-0

CAYUCOS SAME MOTION: Fones, Foster 2<sup>nd</sup>

#### **ADJOURNMENT**

Mayor Peters adjourned the meeting at 12:39 p.m.

The next scheduled meeting will be hosted by the Cayucos Sanitary District on July 8, 2010

Agenda No. \_\_\_\_\_

Date: July 8, 2010

STAFF REPORT

**MORRO BAY-CAYUCOS J.P.A.  
WASTEWATER TREATMENT PLANT**

*to:* Honorable Mayor and City Council, City of Morro Bay  
Honorable President and Board of Directors, Cayucos Sanitary District

*from:* Bruce Keogh, Wastewater Division Manager

*date:* July 1, 2010

*subject:* WWTP Operations Report through May, 2010

*recommendation:*

This Department recommends this report be received and filed.

*fiscal impact:*

None

*summary:*

Attached, find copies of the Morro Bay-Cayucos Wastewater Treatment Plant monthly reports, from March 2010 to May 2010 and the WWTP flow summary, through May 2010. This information updates the item, from the April 8, 2010 meeting.

## STAFF REPORT

**MORRO BAY-CAYUCOS J.P.A.  
WASTEWATER TREATMENT PLANT**

**To:** Honorable Mayor and City Council, City of Morro Bay  
Honorable President and Board of Directors, Cayucos Sanitary District

**From:** Bruce Keogh, Wastewater Division Manager

**Date:** July 1, 2010

***Subject:***

Discussion and Consideration to Adopt the Draft Amendment #2 to the Facility Master Plan (FMP)

***Recommendation:***

Staff recommends that following discussion and consideration of the Draft Amendment #2 to the Facility Master Plan (FMP) that the Council and District Board: 1) adopt Amendment #2 to the FMP, and 2) select option B1 as the preferred disinfection strategy

***Fiscal Impact:***

By approving FMP Amendment #2, staff will authorize the completion of the Draft EIR and commencement of Final Design, the environmental and design consultants will be completing tasks authorized by previous Board Actions and MBCSD will be incurring the associated billings. Additionally, due to the tight timeline for the upgrade project, failure to adopt Amendment #2 at this time will push the environmental review further behind schedule. Currently the project is accruing fines of \$100 per day from the Regional Water Quality Control Board (RWQCB) for failure to complete this project task. Depending on the completion of the other tasks, and the overall project completion timeline, these fines may or may not be enforced by the RWQCB. The next major project task of performing the detailed design of the plant should not proceed until the environmental review is complete. Unless the environmental review process is further postponed, the plant design task should continue ahead of schedule.

***Summary:***

The topic of this staff report is the discussion and consideration to adopt Amendment #2 to the FMP which was developed by MWH as the initial phase of the design process. A copy of Amendment #2 is attached to the staff report. Adoption of Amendment #2 will allow the environmental consultants, Environmental Science Associates (ESA) to proceed with completion of the draft EIR based on the revised project description in Amendment #2. Adoption of Amendment #2 will also allow MWH to commence on the final design phase, the first task of which is the development of the preliminary design report, or 30% design.

***Background:***

The original FMP was developed by Carollo Engineers and was the topic of discussion at numerous JPA, City Council, and Sanitary District Board meetings between May 2006 and September 2007. The development of the FMP included numerous presentations and discussions on the rehabilitation requirements for the existing plant, current and projected flows and loads over the planning period, potential secondary and tertiary treatment alternatives, and biosolids treatment and disposal options. The FMP identified four treatment alternatives for upgrading and rehabilitating the existing plant to full secondary or tertiary treatment standards. Based on the discussion of the various treatment alternatives the Council and District Board voted to select recommendation #1A, tertiary treatment using an oxidation ditch and filtration with partial composting, as the preferred upgrade project. Recommendation #1A has an estimated project cost of \$28.1M (in June 2006 dollars).

During the environmental review process, the Wallace Group conducted a Flood Hazard Analysis that resulted in major modifications to the project description. Based on the results of the flood hazard analysis, at the September 8, 2009 JPA meeting, the City Council and the Cayucos Sanitary District Board voted to approve moving the new treatment plant structures and facilities to the area adjacent to the existing treatment plant but still largely within the existing plant site. They also voted to reaffirm that an oxidation ditch with filtration is the preferred treatment technology for a tertiary discharge to the ocean. These changes to the FMP constitute Amendment #1.

***Discussion:***

Amendment #2 represents the first task in the scope of work for the design phase of the project. MWH was tasked with reviewing the FMP and Amendment #1 to the FMP. Amendment #2 addresses the additions, deletions, and revisions to the FMP and FMP Amendment #1, in order to provide a final FMP. Most importantly, Amendment #2 contains the revised project description that will allow the environmental review process to proceed. The final FMP (Amendment #2) will be used in conjunction with the Environmental Impact Report (EIR) prepared by ESA to obtain the necessary permits required to continue the upgrade project.

In preparing Amendment #2, City and District staff met with MWH on numerous occasions to discuss the technical aspects of the upgrade project. Amendment #2 contains two appendices, in the form of technical memorandum, that discuss both flows and loadings and tertiary filtration and reuse in greater detail. Amendment #2 also documents the proposed changes to the FMP and Amendment #1. The changes to the treatment process between Amendments #1 and #2 include; the addition of grit removal in pretreatment, consolidation of screenings, grit removal, and sludge dewatering in a common Residuals Facility, addition of a secondary pump station, deletion of sludge thickening and thickened sludge storage facilities, and designing the tertiary filter and chlorine contact basin to accommodate the future implementation of Title 22 Reclaimed Water capability.

Technical Memo on the Disinfection Strategy:

Staff is requesting direction at this meeting from the Board and Council on their preferred tertiary filtration and disinfection strategy. Appendix #C contains a Technical Memorandum (TM) on Tertiary Filtration (TF)/Chlorine Contact Basin (CCB)/ Title 22 Considerations. The TM discusses two design and operational strategies for both the TF and the CCB. Based on the discussion in the TM, staff is recommending strategy B1 as this allows for redundant CCBs. Having redundant CCB's provides for; increased operational flexibility, facilitates future maintenance of the basins, and provides for a more cost effective implementation of future Title 22 capabilities. Implementing strategy B1 represents an additional \$240,000 to the project construction costs of the TF and CCB.

Technical Memo on Flows and Loadings:

In reviewing the FMP and Amendment #1, staff and MWH chose to take advantage of a larger data set for the analysis of the projected plant flows and loadings. Based on the inclusion of data from the last series of wet year events, the plant peak flows and loadings for use in the design have been revised. While the changes from using the enhanced data set do little to change the average flows, peak events have significantly higher values associated with them. These new flow parameters prepared from this analysis represent a reduced risk of spilling at the plant during peak flow events from both the FMP and Amendment #1.

Next Steps:

Environmental Review and Permitting Process:

Adoption of the Amendment #2 will allow the environmental review process to restart. Amendment #2 will provide ESA with the revised project description required to complete the draft EIR. Staff at ESA will incorporate that description and complete the appropriate analyses required to complete the draft EIR for public release and comment. Staff expects it will take a minimum of four weeks to make the required edits and incorporate City and District staff review and comments for release in the draft EIR. Staff will be proceeding with the goal of releasing the draft EIR for the forty-five day comment period on August 16. In addition, the current project schedule anticipates bringing the draft EIR to the Planning Commission for a presentation at the September 7, Planning Commission meeting.

**Based on the updated project schedule, the environmental review process is the critical path for the upgrade project at this time.** In order to complete the project in compliance with the adopted time schedule the Council and District Board must make decisions in a timely manner. As outlined in the project schedule (a copy of the project schedule is attached), the environmental and permitting process would start with the release of the draft EIR on August 16, and would include both Planning Commission and City Council approval before the required permits would be issued. This schedule calls for a Planning Commission hearing for Concept Plan review on November 15, and the Council certifying the EIR and approving the Coastal Development and Conditional Use Permit at their December 15 meeting.

It is important to note that currently MBCSD is behind schedule on the environmental review and permitting portion of Compliance Schedule contained in the NPDES permit. MBCSD was supposed to have completed and circulated a draft CEQA document by February 27, 2009 and based on adoption of the Amendment #2 tonight this will not be available until mid August 2010. The failure to complete this project milestone carries a potential penalty of \$100 a day. Total fine exposure to date, would be in the \$50,000 range. Staff is hopeful that with the completion of the EIR process, and the early start on the design phase, that the overall project schedule can be met. If the end dates are met, the Settlement Agreement states that any fines accrued on intermediate milestones would be waived.

Design:

Adoption of Amendment #2 will allow the design process to continue. Staff will issue a Notice to Proceed to MWH to begin the Final Design, the first phase of which is preliminary design, or 30% design, however detailed design beyond the 30% phase should not proceed until the permitting process is largely complete. The current project schedule includes a delay in the design process that is necessary to ensure that funds are not expended designing portions of the plant that the permitting process may modify. If adoption of the Amendment #2 further delays restarting the permitting process it is possible that the design process will also fall behind schedule.

RWQCB Review:

Staff will forward Amendment #2 to staff at the RWQCB for their consideration and comments. This would allow RWQCB an opportunity to review and comment upon the project and its progress; any significant comments provided by RWQCB staff could then be incorporated into the Environmental and Design tasks. Based on the submittal of the FMP, staff does not anticipate that RWQCB staff will provide comments that would change the project description.

***Conclusion:***

Staff recommends that following discussion and consideration of the Draft Amendment #2 to the Facility Master Plan (FMP) that the Council and District Board: 1) adopt Amendment #2 to the FMP, 2) select option B1 as the preferred disinfection strategy.

## **Updated Upgrade Project Schedule with Critical Milestones and Key Dates**

June 9, 2010: Open proposals for Project Management Services

June 17, 2010: MBCSD TAC meeting: Presentation of tertiary treatment/ Title 22 considerations

July 8, 2010: MBCSD JPA meeting: Approve Amendment #2 to the Facility Master Plan

July 9, 2010: 1) Notice to Proceed for final design to MWH (1<sup>st</sup> phase of final design is preliminary design phase) 2) Notice to Proceed for screen check for draft EIR to ESA

July 26, 2010: ESA to provide screen check draft EIR for staff review

August 9, 2010: Comments from MBCSD staff on screen check draft EIR due to ESA

August 12, 2010: MBCSD JPA meeting: Award contract for Project Management Services

August 16, 2010: Draft EIR released for public review for a forty-five day comment period

August 19, 2010: MBCSD TAC meeting

September 7, 2010: Presentation of draft EIR at a Public Hearing at the Planning Commission. This is an information only meeting, the PC is not taking action at this meeting

September 9, 2010: MBCSD JPA meeting

September 16, 2010: MBCSD TAC meeting

October 1, 2010: Public comment period closes for draft EIR (end of forty – five day comment period)

October 14, 2010: MBCSD JPA meeting

October 21, 2010: MBCSD TAC meeting

November 1, 2010: ESA completes response to comments (RTC) received on draft EIR and compiles Final EIR and Findings for Council adoption

November 11, 2010: MBCSD JPA meeting

November 15, 2010: Concept Plan review for CUP/CDP/Final EIR to Planning Commission; findings from the PC to be forwarded to Council for adoption

November 18, 2010: MBCSD TAC meeting

December 9, 2010: MBCSD JPA meeting

December 13, 2010: Council certifies Final EIR and approves CUP/CDP

December 16, 2010: MBCSD TAC meeting

December 20, 2010: City files Notice of Determination with County Clerk and State Clearinghouse; City files CUP and CDP with California Coastal Commission – starts a thirty day appeal period

January 13, 2011: MBCSD JPA meeting

January 19, 2011: Thirty day appeal period ends for the Notice of Determination; or MBCSD is notified that the CDP has been appealed to the CCC

January 20, 2011: MBCSD TAC meeting: Draft Preliminary Design Report

February 7, 2011: Value Engineering

March 1, 2011: Final Preliminary Design Report or 30% Design Complete

June 1, 2011: 60% Design Complete

October 5, 2011: 90% Design Complete

November 17, 2011: Advertise

January 11, 2012: Receive Bids

January 25, 2012: Award construction contract

February 8, 2012: Notice to Proceed to contractor

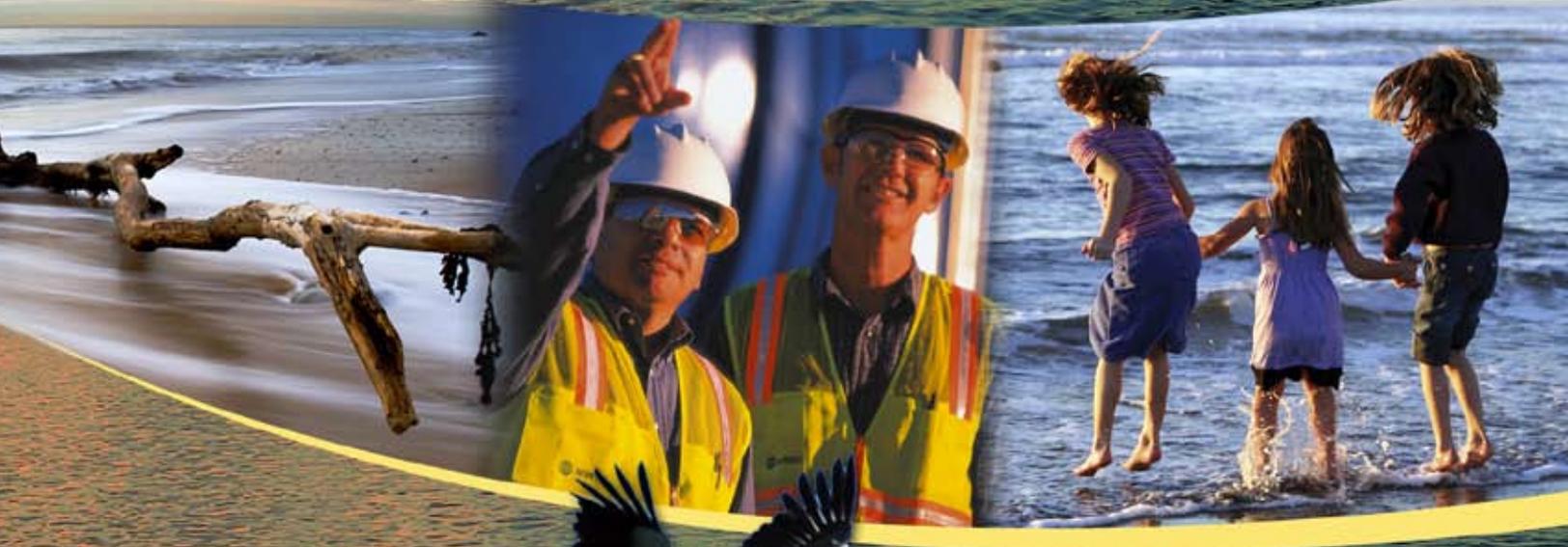
Schedule Updated: July 1, 2010



# Wastewater Treatment Plant Upgrade Project

JULY 2010

## Facility Master Plan Draft Amendment No. 2



**MWH**®

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*in association with*  
**EDA, Inc.**  
**Fugro West, Inc.**  
**RRM Design Group**

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# Acknowledgements

The MWH design team would like to acknowledge the assistance and cooperation of the City of Morro Bay and Cayucos Sanitary District staff during the preparation of the Facility Master Plan – Amendment No. 2 and in particular the following individuals:

- **Bill Callahan** – Cayucos Sanitary District Manager
- **Jon Hanlon** – AECOM
- **Les Girvin** – City of Morro Bay WWTP Supervisor
- **Bruce Keogh** – City of Morro Bay Wastewater Manager
- **Rob Livick** – City of Morro Bay Public Services Director/City Engineer
- **Dylan Wade** – City of Morro Bay Utilities / Capital Projects Manager

The major contributors to Amendment No. 2 from the MWH design team are:

- **Jon Blanchard** – Fugro Principal Geotechnical Engineer
- **Chad Stoehr** – Fugro Geotechnical Engineer
- **Pat Blote** – RRM Project Architect
- **Tony Keith** – RRM Landscape Architect
- **Rodger Sasaki** – MWH Principal Designer
- **Michael Skinner** – MWH Principal Designer
- **Mike Massaro** – MWH Project Engineer
- **Khalid Talaat** – MWH Project Engineer
- **Don Spiegel** – MWH Design Manager
- **Roger Stephenson** – MWH Technical Advisor
- **Steve Hyland** – MWH Project Manager

# Executive Summary

The City of Morro Bay and the Cayucos Sanitary District (MBCSD) have embarked on a program to upgrade their existing wastewater treatment plant (WWTP) to comply with full secondary treatment standards. Critical Project milestones are outlined in the Conversion Schedule contained in the NPDES Permit issued by the Regional Water Quality Control Board (RWQCB). The Conversion Schedule set forth in the Settlement Agreement with the RWQCB establishes that the MBCSD WWTP will be upgraded to provide full secondary treatment by March 31, 2014.

The WWTP Upgrade Project will be advanced in three phases:

- Planning and environmental evaluation phase with preparation of Facility Master Plan (FMP) and Environmental Impact Report (EIR), respectively.
- Final design phase with preparation of Contract Documents (specifications and drawings).
- Bidding and construction phase with demolition of the existing plant facilities after startup of the new facilities.

The purpose of this draft document, "Facility Master Plan - Amendment No. 2", is to finalize the FMP and to provide a project description for the EIR to facilitate completion of the planning and environmental phase of the Project. The general design criteria and treatment technology presented in Amendment No. 2 is similar to that presented in the draft FMP – Amendment No. 1. Design flows and loadings have been updated to reflect longer periods of record. The conceptual plant configuration has been adjusted to consolidate facilities and improve plant hydraulics. This amendment supplements, and where appropriate, supersedes details of the draft FMP and the draft FMP – Amendment No. 1 that were previously prepared.

The recommended WWTP Upgrade Project is based on the utilization of oxidation ditch treatment technology with tertiary filtration and project delivery with a conventional design-bid-build (DBB) approach. The proposed Project will consist of a new WWTP to replace the existing WWTP which must be demolished to mitigate flooding. The new WWTP will be constructed immediately to the south of the existing plant in the vicinity of the existing sludge drying beds and will be placed on engineered fill above the 100-year flood elevation.

The estimated project cost of the WWTP Upgrade Project recommended in the draft FMP – Amendment No. 1 was approximately \$27,400,000 with a corresponding estimated construction cost of \$20,300,000 in June 2006 dollars (ENR Index of 7700). When escalated to June 2010 dollars (ENR Index of 8800), the estimated project cost of the WWTP Upgrade Project is approximately \$31,300,000 with a corresponding estimated construction cost of \$23,200,000. These costs will be updated upon completion of the first phase of design (Preliminary Design).

Upon acceptance of the FMP – Amendment No. 2 and the draft EIR by MBCSD, the final design phase of the WWTP Upgrade Project can be authorized. The Project is currently on track to meet the tight compliance schedule.

# FMP - Amendment No. 2

## Introduction

The City of Morro Bay and Cayucos Sanitary District (MBCSD) have commenced the planning and design of the Wastewater Treatment Plant (WWTP) Upgrade Project with the development of the following documents:

- Draft Facility Master Plan (FMP) entitled “Wastewater Treatment Plant Facility Master Plan Report” dated September 2007 prepared by Carollo Engineers.
- Draft FMP – Amendment No. 1 entitled “Facility Master Plan Amendment No. 1” dated August 2009 prepared by Carollo Engineers.
- Draft Environmental Impact Report for the subject Project is currently under preparation by ESA.

The design team of MWH with EDA (surveying), Fugro (geotechnical), and RRM (landscape architecture and architecture) has been contracted by MBCSD to prepare a FMP – Amendment No. 2 as presented herein to complete the Facility Master Plan. The completed Facility Master Plan will consist of the draft Facility Master Plan, draft FMP – Amendment No. 1, and FMP – Amendment No. 2. Note that where differences occur between the above documents, the more recent document will prevail. The completed FMP will be coordinated with completion of the EIR. The completed FMP and EIR will be issued for public review and permitting processes after acceptance by MBCSD.

## Work to Date

Draft FMP. The draft FMP was predicated on an upgrade and rehabilitation of the existing WWTP. The existing WWTP consists of the following facilities:

- Headworks with influent screening, pumping, and aerated grit basin
- Primary clarifiers
- Trickling filters
- Solids contact aeration basin
- Secondary clarifier
- Chlorine contact basin
- Anaerobic digesters
- Sludge drying beds.

The draft FMP WWTP recommended retirement of the following facilities:

- Primary clarifiers
- Trickling filters
- Solids contact aeration basin
- Chlorine contact basin
- Digester No. 1.

The draft FMP recommended construction of the following facilities:

- Rehabilitation of existing headworks
- New oxidation ditches
- New secondary clarifier to operate in conjunction with the existing secondary clarifier
- New tertiary filtration
- New chlorine contact basin
- Reuse of existing chlorine building
- New sludge thickening
- Rehabilitation of Digesters No. 2 and No. 3
- New sludge dewatering
- Use of existing sludge drying beds for partial composting.

**Figure 1** shows a conceptual site plan of the recommended project that was presented in the draft FMP.

**Draft FMP – Amendment No. 1.** During the preparation of the draft EIR, a flood hazard analysis of the existing WWTP was conducted. A report entitled “Wastewater Treatment Plant Flood Hazard Analysis” dated August 7, 2009 prepared by the Wallace Group concluded that the existing WWTP site was subject to inundation from the 100-year storm event to depths ranging from 3 to 4.5 feet. After review of various alternatives to mitigate the potential flooding, relocation of the WWTP facilities was recommended. The new location is immediately to the south of the existing facilities and would be developed with engineered fill to raise the finished grade above the 100-year flood elevation.

The relocation of the WWTP facilities would require the demolition of the existing WWTP to preserve a floodway that would not worsen the flood elevations experienced by adjoining properties during storm events. The demolition of existing facilities would preclude their rehabilitation and continued use. Consequently, the draft FMP – Amendment No. 1 was prepared to evaluate alternatives for a revised approach to upgrade the existing WWTP.

The draft FMP – Amendment No. 1 recommended demolition of the following facilities:

- Headworks
- Primary clarifiers
- Trickling filters
- Solids contact aeration basin
- Secondary clarifier
- Chlorine contact basin
- Chlorination building
- Air release structure
- Anaerobic digesters
- Sludge drying beds
- Administration Building
- Maintenance Building

The draft FMP – Amendment No. 1 recommended construction of the following facilities:

- New influent pump station
- New screening facility
- New oxidation ditches
- New secondary clarifiers
- New RAS/WAS pump station
- New tertiary filtration
- New chlorine contact basin
- New chlorination building
- New air release structure
- New sludge thickening
- New thickened sludge holding tank
- New sludge dewatering
- New electrical building
- New standby power facility
- New Administration Building
- New Maintenance Building
- Relocation of household hazardous waste station

**Figure 2** shows a conceptual site plan of the recommended project that was presented in the draft FMP – Amendment No. 1.

The project cost of the WWTP upgrade recommended in the draft FMP was estimated to be approximately \$28,000,000 of which approximately \$4,000,000 was allocated as a contingency for flood mitigation. The project cost of the WWTP upgrade recommended in the draft FMP – Amendment No. 1 was estimated to be approximately \$27,400,000.

The incremental costs of additional facilities needed to replace facilities that would be demolished under draft FMP – Amendment No. 1 were largely offset by a reduction in the solids handling facilities. Anaerobic digestion and partial composting would be discontinued and the transportation of unclassified sludge for third party processing and disposal would be implemented.

**FMP – Amendment No. 2.** The intent of FMP - Amendment No. 2 is to achieve the following:

- Finalize the FMP as an aggregate document consisting of the draft FMP, draft FMP – Amendment No. 1, and FMP – Amendment No. 2.
- Provide project description for the draft EIR.
- Revise the flow and loading parameters by evaluation of longer periods of record for historical data.
- Incorporate adjustments to the treatment processes and conceptual site layout identified during the interview and negotiation process with the design consultant (MWH) and during the development of Amendment No. 2.

The revisions to the flow and loading parameters are discussed under the Project Description presented herein.

The key adjustments to the conceptual design presented in FMP – Amendment No. 1 are summarized as follows:

- Add grit removal as a pretreatment component to minimize deposition of grit in downstream facilities (oxidation ditches) that would take up valuable hydraulic basin volume. Periodic removal of the grit from the Oxidation Ditches would be disruptive to on-going plant operations and would be difficult to remove.
- Consolidate screenings, grit removal, and sludge dewatering in a common Residuals Facility to centralize truck traffic and better accommodate the potential for future odor control if desired in the future.
- Design Residuals Facility so that the screenings, grit, and sludge processes can be enclosed in a building with future construction if needed.

- Add a Secondary Pump Station to lift secondary effluent from the Secondary Clarifiers to the Tertiary Filter and Chlorine Contact Basin to reduce the height of the upstream facilities (Residuals Facility, Oxidation Ditches, and Secondary Clarifiers) and accommodate the hydraulic profile of the existing outfall.
- Provide a two-chamber chlorine contact basin to facilitate operation and maintenance.
- Design Tertiary Filter and Chlorine Contact Basin to accommodate the future implementation of Title 22 Reclaimed Water capability.
- Delete sludge thickening and thickened sludge storage facilities. Sequential thickening and dewatering can be difficult because the sludge conditioning for thickening can interfere with the sludge conditioning for dewatering. The storage of thickened sludge is problematic because mixing and aeration difficulties can lead to significant odor potential. The dewatering of waste activated sludge (WAS) directly, without thickening, has been successfully accomplished at many existing oxidation ditch plants.
- Add provisions for temporary sludge dewatering at the existing WWTP during construction of the WWTP Upgrade. The new WWTP will be constructed over the existing sludge drying beds and the drying beds will not be available for use during construction.
- Locate Maintenance Building in close proximity to Residuals Facility and Chemical Station to consolidate vehicle traffic associated with hauling residuals (e.g., screenings, grit, and sludge), chemical deliveries (e.g., polymer, hypochlorite, and bisulfite), and service deliveries (e.g., spare parts and lubricants). The Maintenance Building will also house the electrical room and the proposed proximity to nearby treatment facilities will more efficiently serve the associated major electrical loads.
- Locate Operations Building and Household Hazardous Waste station for accessibility and visibility for the public and visitors. Provide public access road for the public that is separate from service access road for staff and truck traffic associated with the treatment facilities.

A conceptual site plan and flow schematic of the project recommended in the FMP – Amendment No. 2 is shown in **Figure 3** and **Figure 4**, respectively. Note that the size, location, and orientation of the facilities shown in the conceptual site plan are subject to further refinement during the final design phase of the Project.

## Flow and Loadings

**Revised Flow and Loadings.** The influent wastewater flow and loadings presented in the draft FMP were established for a combined MBCSD build-out population that would be reached by Y2021 for the City of Morro Bay and Y2015 for the Cayucos Sanitary District. The flow and loading projections were based on historical record information gathered for a 5-year period from Y2002 through Y2006 at the time the draft FMP was prepared.

MBCSD staff expressed concern that this period of record is too limited for the following reasons:

- Annual flow and loading data are now available for Y2007 to Y2009.
- The period of record for Y2002 – Y2006 were relatively dry years.

Consequently, flow data from Y1995 through Y2009 (15 years) were gathered and evaluated to establish the basis of design for flow parameters. Loading data for BOD and TSS for the period from Y2002 through Y2009 (8 years) were also gathered and evaluated. The revised flow and loading parameters that were developed from the re-evaluation are summarized in Table A. The corresponding flow and loading parameters presented in the draft FMP are also shown for comparison.

Table A – Revised Flow and Loadings

Parameter	Unit	Draft FMP (a)	Amend. No. 2
<b>Period of Record</b>			
Flow	---	Y2002 – Y2006	Y1995 – Y2009
BOD and TSS	---	Y2002 – Y2006	Y2002 – Y2009
<b>Flow</b>			
Annual Average Day (AADF)	mgd	1.33	1.5
Avg. Peak Season Dry Weather (PSDF)	mgd	1.47	1.5
Average Day Maximum Month (ADMMF)	mgd	1.62	2.9
Peak Hour (PHF)	mgd	5.97	8.0
<b>Biochemical Oxygen Demand (BOD)</b>			
Annual Average Day	lb/day	3,800	3,500
Annual Max 30-Day	lb/day	---	4,700
Peak Season Dry Weather, Average Day	lb/day	5,000	4,200
Peak Season Dry Weather, Max Month	lb/day	----	5,500
<b>Total Suspended Solids (TSS)</b>			
Annual Average Day	lb/day	4,000	3,800
Annual Max 30-Day	lb/day	---	5,300
Peak Season Dry Weather, Average Day	lb/day	5,200	4,500
Peak Season Dry Weather, Max Month	lb/day	---	6,300
<b>Total Kjeldahl Nitrogen (TKN) (b)</b>			
Annual Average Day	lb/day	---	600
Annual Max 30-Day	lb/day	---	800
Peak Season Dry Weather, Average Day	lb/day	---	710
Peak Season Dry Weather, Max Month	lb/day	---	940

(a) From draft FMP Tables 3.11, 3.12, and 3.20.

(b) Note that TKN values are currently derived by assuming a TKN / BOD ratio of 0.17. Supplemental testing of influent wastewater samples will be conducted during Y2010 to obtain TKN data and modify the listed values if needed.

As can be seen, the inclusion of a longer period of record that captured prior wet weather years with higher rainfall has increased the values of flow parameters. The impact is small for average flow values, but more dramatic for peak flow values. The impact on BOD and TSS loadings by capturing more recent years does not have a major impact. The latter is expected given that the resident population has been relatively constant. Further information regarding the approach used for the evaluation of existing flow and loadings and the determination of the design flow and loadings is presented in a technical memorandum to MBCSD entitled "Revised Flow and Loadings" dated June 21, 2010 and prepared by MWH that is attached as Appendix A.

## Project Description

**Treatment Requirements and Objectives.** The current WWTP is required to meet the current NPDES Permit discharge requirements presented in **Table B**. Note that the requirements listed in **Table B** do not include the discharge limitations for such constituents as metals, non-carcinogens, carcinogens, and others for brevity and because the history of compliance with these constituents has not been an issue. The current 301(h) modified NPDES Permit addresses BOD and TSS limitations only. The existing WWTP was designed to meet all secondary treatment and the California Ocean Plan requirements.

Table B – NPDES Discharge Requirements

Parameter	Unit	Value
<b>Monthly Dry Weather Flow</b>	<b>mgd</b>	<b>2.36</b>
<b>Biochemical Oxygen Demand (BOD)</b>		
Average Monthly	mg/L	120
Instantaneous Maximum	mg/L	180
30-Day Average Percent Removal	%	30
<b>Total Suspended Solids (TSS)</b>		
Average Monthly	mg/L	70
Instantaneous Maximum	mg/L	105
30-Day Average Percent Removal	%	75
<b>Total Coliform Bacteria</b>		
30-Day Median	MPN / 100 ml	23
Maximum	MPN / 100 ml	2400
<b>Grease and Oil</b>		
Average Monthly	mg/L	25
Average Weekly	mg/L	40
Instantaneous Maximum	mg/L	75
<b>Settleable Solids</b>		
Average Monthly	ml/L	1.0
Average Weekly	ml/L	1.5
Instantaneous Maximum	ml/L	3.0
<b>Turbidity</b>		
Average Monthly	NTU	75
Average Weekly	NTU	100
Instantaneous Maximum	NTU	225
<b>pH</b>		<b>6.0 – 9.0</b>

The MBCSD has committed to full secondary treatment objectives that are significantly more restrictive than the NPDES Discharge Requirements listed in **Table B** for BOD and TSS. The treatment objectives of the MBCSD are to provide secondary treatment at all times and to provide tertiary filtration capacity equivalent to the peak season dry weather (PSDW) flow of 1.5 mgd. The secondary effluent quality suitable for routine tertiary filtration would dictate effluent BOD/TSS in the range of 10/10 to 15/15 mg/L. The tertiary effluent quality for BOD/TSS would be expected to be in the range of 2/2 to 5/5 mg/L.

**Treatment Concept.** The new WWTP will replace the existing WWTP that will be retired and demolished to mitigate area flooding during major storm events. An overview of the treatment concept for the proposed treatment processes is presented below. A more detailed discussion of each treatment process will be presented elsewhere. A general flow schematic of the recommended WWTP is presented in **Figure 4**.

Influent wastewater is delivered from the collection systems to the WWTP via gravity sewers and will be lifted with a new Influent Pump Station to the Residuals Facility. The Residuals Facility will include screening and grit removal units for pretreatment of the influent wastewater to remove inert debris, rags, plastics, and grit for protection of the downstream treatment processes. The Residuals Facility will also house the sludge dewatering facilities.

The cornerstone of the new WWTP will be the utilization of the oxidation ditch treatment technology. Oxidation ditches utilize an extended aeration activated sludge process with secondary clarifiers to achieve excellent removals of BOD, TSS, and NH<sub>3</sub> and to produce a high quality effluent suitable for tertiary filtration. The extended aeration will be supplemented with an anaerobic zone to produce a better settling sludge for reliable secondary clarifier performance and an anoxic zone to reduce aeration demand and recover alkalinity. The oxidation ditch technology provides reliable, robust biological treatment, can readily handle peak flows and loadings, and is easy to operate and maintain.

Tertiary filtration capacity that matches the average PSDW flow capacity of the new WWTP will be provided to further improve effluent quality. The effluent will be treated with a chlorine contact basin that utilizes hypochlorite (bleach) for disinfection and bisulfite to remove any chlorine residual prior to discharge. The treated effluent will be discharged to the existing ocean outfall system.

The new WWTP will include a new Operations Building to house administrative offices, laboratory, control room, locker rooms, break room, and conference room and a new Maintenance Building to house workshop, tools, spare parts, and electrical room. A standby power facility will be provided to provide electrical power during power outages. Space and access road will be provided for the relocation of the existing Household Hazardous Waste station.

**Hydraulic Profile.** The hydraulic profile of the new WWTP is critical for development of the location and configuration of the treatment facilities. The influent wastewater must be lifted from the influent sewer for delivery to the series of treatment processes and ultimately to reach the existing ocean outfall. The hydraulic profile presented in **Figure 5** tabulates the preliminary water surface elevations needed to convey wastewater through the treatment processes and in turn determines the height of the associated structures and hydraulic basins.

A Secondary Pump Station is recommended to lift secondary effluent from the Secondary Clarifiers to the Tertiary Filter and Chlorine Contact Basin for subsequent delivery by gravity to the existing effluent outfall. The influent wastewater could be lifted high enough by the Influent Pump Station to flow by gravity through all the downstream treatment facilities without a Secondary Pump Station. This will be reviewed in greater detail during final design. However, based on current information, the resultant height of the structures, in particular the Residuals Facility, to accommodate a single pump station configuration would be expected to be more expensive, complicate access for service and maintenance, and may exceed the building height limitation of the City of Morro Bay Code.

## Civil Sitework

**Site Preparation.** The site will likely require significant soil improvements for construction of the new WWTP facilities. The site is subject to settlement from the loading produced by fill and new structures and from seismic events. The site must also be protected from flooding by the Morro Creek watershed during major storm events.

Fugro West, Inc. has prepared a Geotechnical Study dated May 5, 2010 that is attached as Appendix B. The Geotechnical Study summarizes the geotechnical conditions of the site based on review of existing geotechnical reports, soils borings, and field testing conducted for past projects. The Geotechnical Study will also serve as the basis to develop a field program (soil borings and tests) to be conducted when final design commences and used to prepare a Geotechnical Report that will specifically address the WWTP Upgrade Project.

The initial key findings of the Geotechnical Study were prepared using existing geotechnical data available for the site from previous geotechnical studies and as-built construction records. Using this information, the main geotechnical considerations that will need to be addressed for the project are summarized as follows:

- Groundwater has been encountered at depths ranging from 7 to 13 feet below existing grade.
- The design seismic event is estimated to have a peak ground acceleration of approximately 0.34g based on procedures defined by the Building Code, about two times that of 2003 San Simeon Earthquake.
- Seismic events have the potential to cause liquefaction of underlying sand layers and could result in settlements of approximately 4 inches or more.
- Placement of fill to raise the new plant site above the 100-year flood elevation may cause settlement from 3 to 9 inches of underlying unconsolidated soils.
- The soil conditions encountered in the previous explorations of the site are heterogeneous, and the potential for settlement or liquefaction hazards to impact the site varies considerably over the footprint of the site. The estimated seismic and static settlements range from essentially none to the estimated amounts presented above.
- A range of soil mitigation approaches, structural foundation systems, or combination thereof that will prevent excessive damage to the new treatment facilities from a seismic event will be investigated during the final design phase of the Project.
- The geotechnical study conducted during final design will need to provide additional field exploration, laboratory testing, and engineering analysis to further characterize these considerations for the design and construction of the project, and as a basis to recommend suitable mitigations for seismic hazards.

The Wallace Group has prepared a report entitled “Wastewater Treatment Plant Flood Hazard Analysis” dated August 7, 2009 that concluded the existing WWTP site was subject to inundation from the Morro Creek watershed during a 100-year storm event to depths ranging from 3 to 4.5 feet. The site for the new WWTP will be developed with the placement of engineered fill to raise the new site above the 100-year flood elevation. Based on the current evaluation this will require raising the existing grade by approximately 5 feet to a nominal Elevation of 20 feet. This would place the grade of the new WWTP site approximately 1 foot above the predicted 100-year flood elevation.

**Facility Layout.** A conceptual plan of the new WWTP layout showing the relative location, size, and orientation of the WWTP facilities is shown on **Figure 3**. Note that the size, location, and orientation of the facilities shown are subject to further refinement during the final design phase of the Project. The conceptual layout shown is intended to accomplish the following objectives:

- Position public-access facilities (Operations Building and Household Hazardous Waste) at the “front face” of the new WWTP.
- Position employee-access facilities (Operations Building, Maintenance Building, and parking) in close proximity.
- Direct public-access traffic to primary access road.
- Consolidate residuals handling (screenings, grit, and sludge) in one location.
- Centralize service truck traffic associated with residuals hauling (screenings, grit, and sludge), chemical and fuel deliveries, and operation and maintenance items (e.g., spare parts and lubricants) for the Residuals Facility, Standby Power, Maintenance Building, and Chemical Station.
- Direct service truck traffic to secondary access road.
- Provide simplified, U-shaped flow path from existing influent sewer to Influent Pump Station to Residuals Facility to Oxidation Ditches to Secondary Clarifiers to Tertiary Filter to Chlorine Contact Basin to the existing outfall.
- Design Tertiary Filter and Chlorine Contact Basin for future addition of Title 22 Reclaimed Water capacity.

**Landscaping.** Landscaping for the interior grounds of the new WWTP site is expected to be minimal to reduce maintenance. The interior will generally be paved or rocked to accommodate routine truck traffic and occasional use of cranes around the perimeter of treatment facilities for operation and maintenance functions.

The perimeter of the new WWTP site is expected to be fenced for security and landscaped with trees, bushes, and or vines to provide a degree of natural screening of the WWTP plant interior from public view. The perimeter landscaping is intended to be low maintenance after the plantings are established.

**Demolition of Existing WWTP.** After construction of the new WWTP, the existing WWTP will be demolished to maximize the available space for the floodway. The demolition of the existing WWTP is intended to be part of the WWTP Upgrade Project and can begin after beneficial use of the new WWTP after startup.

MBCSD will conduct a hazardous material survey of the existing WWTP to determine if any materials such as asbestos, lead, or mercury are present and will require special handling and removal. Any such requirements will be included in the Contract Documents (Specifications and Drawings) for the WWTP Upgrade Project.

The following items regarding demolition of the existing WWTP that will be addressed in the Contract Documents include the following:

- Any equipment or materials desired for salvage by MBCSD.
- Depth below existing grade that existing facilities will be removed – likely in the range of 3-feet to 5-feet in depth.
- Underground structures below the depth of removal indicated above will be filled with engineered fill.
- Underground conduits to be filled with sand or grout – likely in the range of 8-inch to 12-inch diameter and larger.
- Surface treatment of site after demolition – either pavement or rock.

**Household Hazardous Waste Station.** The existing WWTP provides space for a household hazardous waste (HZ) station operated by the Integrated Waste Management Authority. The design intent for the new WWTP Upgrade Project is to continue to provide space and vehicle access for this facility. The station will be placed on engineered fill to raise the facility above the 100-year flood elevation. Due to space constraints the placement of engineered fill and the relocation of the HZ Station will be deferred until the second phase of the WWTP Upgrade Project construction after the existing WWTP facilities are demolished. Refer to **Figure 3** – Conceptual Site Plan for the proposed location of the HZ Station.

## Architectural

**General.** The architectural treatment for the Operations Building, Maintenance Building, and Residuals Facility will provide a consistent design theme that will be compatible with the surrounding site and with other elements of the WWTP Upgrade Project. Possible exterior treatment elements include reinforced concrete, concrete masonry block, or some combination of the above. The benefits of selecting concrete-based finish materials include visual appeal, cost effectiveness, low maintenance, and resistance to corrosion. Exterior ferrous metals will be avoided because of the marine salt air environment.

**Operations Building.** An Operations Building will be provided with administrative offices, laboratory, control room, locker rooms, break room, and conference room.

Refer to **Figure 6A** and **Figure 6B** for one example of exterior architectural treatment for the Operations Building utilizing the concrete-based materials discussed above. Note that the concept shown is presented for illustrative purposes and will be subject to changes and further refinement during the design phase.

**Maintenance Building.** A Maintenance Building will house work space for repair and servicing treatment plant equipment. The work space will include work benches, storage racks for spare parts and tools, and storage cabinets for lubricants and related gear. A bridge crane will be included for lifting and moving equipment items for repair and service.

The Maintenance Building will also include an electrical room that will house switchgear, motor control centers, and variable frequency drives for the treatment plant equipment.

Refer to **Figure 7** for one example of exterior architectural treatment for the Maintenance Building utilizing the concrete-based materials discussed above. Note that the concept shown is presented for illustrative purposes and will be subject to changes and further refinement during the design phase.

**Residuals Facility.** The Residuals Facility is currently configured for outdoor exposure with a 3-sided wall (west, north, and east) that provides visual screening of the screenings, grit, and sludge handling equipment. The screening walls will also block prevailing winds from the oceanside to minimize exposure to the salt air. The open side (south) will facilitate access for equipment maintenance. The screening walls will be designed to be consistent with the architectural treatment of the Operations Building and the Maintenance Building.

Refer to **Figure 8A** and **Figure 8B** for one example of exterior architectural treatment for the Residuals Facility utilizing the concrete-based materials discussed above. Note that the concept shown is presented for illustrative purposes and will be subject to changes and further refinement during the design phase.

## Treatment Facilities

The general treatment concept with pretreatment of influent wastewater, extended aeration with oxidation ditches and secondary clarifiers, tertiary filtration, effluent disinfection, and solids handling has been outlined above. A more detailed discussion of the individual treatment facilities consisting of plant processes and major equipment items is presented below. Refer to the conceptual site plan, plant flow schematic, and hydraulic profile shown in **Figure 3**, **Figure 4**, and **Figure 5**, respectively.

In many instances there are several equipment options available to perform a specific function for a given treatment process. Equipment items subject to further evaluation for selection will be noted in the descriptions below. The technical advantages and disadvantages along with associated costs of these equipment options will be evaluated in greater detail during the initial phase (Preliminary Design) of Final Design. The Design Team will work with MBCSD staff to select the options that provide the best value for the Project.

**Influent Pump Station.** The influent pump station will consist of submersible pumps located in a below-grade wet well. Multiple pumps with variable-speed drives will be provided to meet the expected range of influent flow with overlapping capacities to avoid gaps or steps in pumping delivery.

**Residuals Facility.** The Residuals Facility will include the following items:

- Mechanical fine screens
- Screenings conveyance
- Screenings washer/compactors

- Grit removal unit
- Grit slurry pumps
- Grit washer
- Solids dewatering units
- Polymer handling and feed system

Screening equipment suitable for the Project include center-feed drum screens, in-channel drum screens, or center-feed band screens. Screenings conveyance can be accomplished with shaftless screw conveyor or with a sluicing trough. Screenings washer/compactors can be hydraulic or rotary screw units. The washed and compacted screenings will be discharged into a residuals bin for off-site disposal. Screening equipment options will be evaluated and selected during Preliminary Design.

A grit removal unit suitable for the Project includes a mechanical vortex grit unit or a multi-tray vortex grit unit. Grit washer systems include screw classifier with cyclones or swirl concentrators. Washed grit will be discharged to a residuals bin for off-site disposal. Grit removal equipment options will be evaluated and selected during Preliminary Design.

Solids dewatering equipment suitable for the Project include belt presses, centrifuges, and rotary screw presses. A polymer mixing and feed system will be provided to condition the feed sludge to the solids dewatering unit. Dewatered solids will be discharged to a roll-off bin for off-site processing and disposal. Solids dewatering equipment options will be evaluated and selected during Preliminary Design.

One preliminary configuration of the Residuals Facility has been developed to facilitate development of the conceptual site plan and conceptual hydraulic profile shown in **Figure 3** and **Figure 5**, respectively. Center feed drum screens, mechanical vortex grit unit, and rotary screw presses were selected for illustrative purposes as representative equipment for the screening, grit removal, and solids dewatering functions, respectively. Note that these choices were made for purposes of developing the conceptual site plan and conceptual hydraulic profile. The final selection of the appropriate equipment will be made during Preliminary Design as outlined above. The selection of alternative equipment as well as the refinement of the design as the Project progresses will likely modify the preliminary configuration shown.

The preliminary configuration of the Residuals Facility assumes that the attendant equipment is installed outdoors as shown in **Figure 8A** and **Figure 8B**. An upper floor will be required to support equipment and provide access for operation and maintenance. Three exterior sides (west, north, and east) of the proposed Residuals Facility will be provided with a full-height wall to provide protection from prevailing winds and to provide architectural treatment of sides that would be visible to the public. The south side facing the interior of the plant campus and the top of the elevated deck would be open to facilitate access for residuals and equipment removal.

**Oxidation Ditches.** Oxidation ditches utilize an extended aeration activated sludge process with secondary clarifiers to achieve excellent removals of BOD, TSS, and NH<sub>3</sub> and to produce a high quality effluent suitable for tertiary filtration. The extended aeration will be supplemented with an anaerobic zone to produce a better settling sludge for reliable secondary clarifier performance and an anoxic zone to reduce aeration demand and restore alkalinity. The oxidation ditch technology provides reliable, robust biological treatment, can readily handle peak flows and loadings, and is easy to operate and maintain.

Aeration systems suitable for the Project include the following:

- Deck-mounted vertical-shaft surface aerators to supply the oxygen demand for treatment and the mixing energy to keep the mixed liquor solids in suspension.
- Fine-bubble diffusers installed at the floor of the oxidation ditch to supply the oxygen demand for treatment and submersible horizontal mixers that provide the mixing energy to propel the mixed liquor in the "racetrack" of the oxidation ditch basin. Air for the fine-bubble diffusers is provided by aeration blowers that would be located adjacent to the Oxidation Ditches.

The aeration system options for the Oxidation Ditches will be evaluated and selected during Preliminary Design. The major considerations in this evaluation will be the energy savings afforded by higher aeration efficiency of the fine-bubble system versus the higher initial cost of the fine-bubble system with blowers and the ease of operation and maintenance of the surface aerators.

**Secondary Clarifiers.** Secondary Clarifiers are circular tanks that provide gravity separation of the biological solids (mixed liquor) produced by the Oxidation Ditch. The biological solids settle and form a sludge blanket in the lower zone of the clarifier. The clarified effluent forms a clear water zone above the sludge blanket. The clarified or secondary effluent overflows effluent weirs and is routed to the Tertiary Filter and Chlorine Contact Basin for further treatment. The sludge in the lower zone settles and is withdrawn by pumps to the head end of the Oxidation Ditches as return activated sludge (RAS). The RAS delivers the biological solids from the Secondary Clarifiers back to the Oxidation Ditches for treatment of the influent wastewater.

A portion of the settled sludge is removed from the activated sludge system at periodic intervals as waste activated sludge (WAS). The WAS is pumped to the solids dewatering system at the Residuals Facility. The RAS and WAS pumps will be located between the Secondary Clarifiers.

**Secondary Pump Station.** The Secondary Pump Station will be provided to lift the secondary effluent from the Secondary Clarifiers to the Tertiary Filter and Chlorine Contact Basin. The supplemental pumping provided by the Secondary Pump Station is anticipated to be necessary to avoid excessive height for the upstream facilities, in particular the Residuals Facility. The need for the Secondary Pump Station will be evaluated and verified during Preliminary Design as previously mentioned.

**Tertiary Filter.** A tertiary filtration system will be provided with capacity that matches the PSDW average flow of the WWTP. The Tertiary Filter is anticipated to be a cloth filter or equivalent unit that will provide a high degree of suspended solids removal and would be suitable to produce Title 22 Reclaimed Water in the future.

**Chlorine Contact Basin / Chemical Station.** A Chlorine Contact Basin (CCB) similar in function to the existing unit will be provided for disinfection of the treated effluent. The CCB will be designed with suitable length to width ratio for effective disinfection and provided with two chambers to facilitate operation and maintenance functions. The Chlorine Contact Basin will be designed to accommodate future Title 22 Reclaimed Water production.

A Chemical Station with provisions for storage and feeding of sodium hypochlorite (liquid bleach) for disinfection and sodium bisulfite for dechlorination at the Chlorine Contact Basin discharge will be provided. Chemical storage and feed equipment similar to existing equipment will be furnished.

A Utility Water (UW) Station will be provided to deliver treated effluent for ancillary water demands such as spray water and seal water.

**Future Reclaimed Water.** Capability for future reclaimed water facilities to meet Title 22 requirements will be included in the Project. Provisions for an additional tertiary filter and reclaimed water pump station will be included with the design. Refer to the technical memorandum to MBCSD entitled "TF/CCB/Title 22 Considerations" dated June 16, 2010 and prepared by MWH that is attached as Appendix C for additional information regarding provisions for future reclaimed water and sizing of the Tertiary Filter and Chlorine Contact Basin units.

## Support Utilities

**Potable Water.** Potable water will be provided by extending the existing water main in Atascadero Road as a loop in and out of the new plant site using the public and service access road corridors. Connections for potable water uses within the plant will be protected with backflow preventers. The potable water loop will be provided with hydrants for on-site fire protection.

**Natural Gas.** Natural gas for building and water heating will be provided by connection to the existing gas main in Atascadero Road.

**Electrical Power.** Electrical power will be provided with a new electrical service from PG&E to serve the new WWTP. The new electrical service will include transformer and metering equipment.

**Standby Power.** A diesel engine-generator will be provided for standby power to operate the new WWTP in the event of an electrical power outage. The engine-generator set will be provided in a self-contained outdoor enclosure with fuel tank. The fuel tank will also be used for fueling WWTP vehicles.

## Temporary Solids Handling

Temporary solids handling facilities will be required to provide sludge dewatering during construction of the new WWTP. The new WWTP will be located in the portion of the site that contains the existing sludge drying beds. The sludge drying beds will be demolished for placement of engineered fill to raise the site above the 100-year flood elevation and to support the new treatment facilities.

During construction of the new facilities the existing WWTP will continue to operate and generate digested sludge. In lieu of routing the digested sludge to the existing sludge drying beds, the digested sludge will be dewatered with temporary sludge dewatering equipment and hauled off-site for disposal.

At this time it is anticipated that MBCSD will furnish and operate the temporary solids handling facilities. Two approaches that will be evaluated during the initial phase (Preliminary Design) of Final Design are the following:

- Leasing of temporary sludge dewatering equipment.
- Prepurchase of sludge dewatering equipment that would subsequently be relocated at the Residuals Facility for permanent installation as part of the WWTP Upgrade.

## Project Schedule

**RWQCB Conversion Schedule.** The Regional Water Quality Control Board (RWQCB) and MBCSD have agreed to a Conversion Schedule to achieve full secondary treatment with the WWTP Upgrade Project. Key milestones in the Conversion Schedule for the design and construction of the WWTP Upgrade Project are listed in Table C.

Table C – Conversion Schedule Design and Construction Milestones

Task	Milestone Date
Initiate Design	Sep 30, 2010
Issue NTP for construction	May 29, 2012
Complete construction and commence startup	Jan 31, 2014
Commissioning (Compliance with secondary treatment)	Mar 31, 2014

**EIR and Permits.** The Environmental Impact Report (EIR) for the WWTP Upgrade Project is being prepared by ESA. The EIR will be coordinated with the final Facility Master Plan consisting of the Draft FMP, Draft FMP – Amendment No. 1, and the FMP – Amendment No. 2.

Permits that are anticipated to be obtained for the WWTP Upgrade Project include the following:

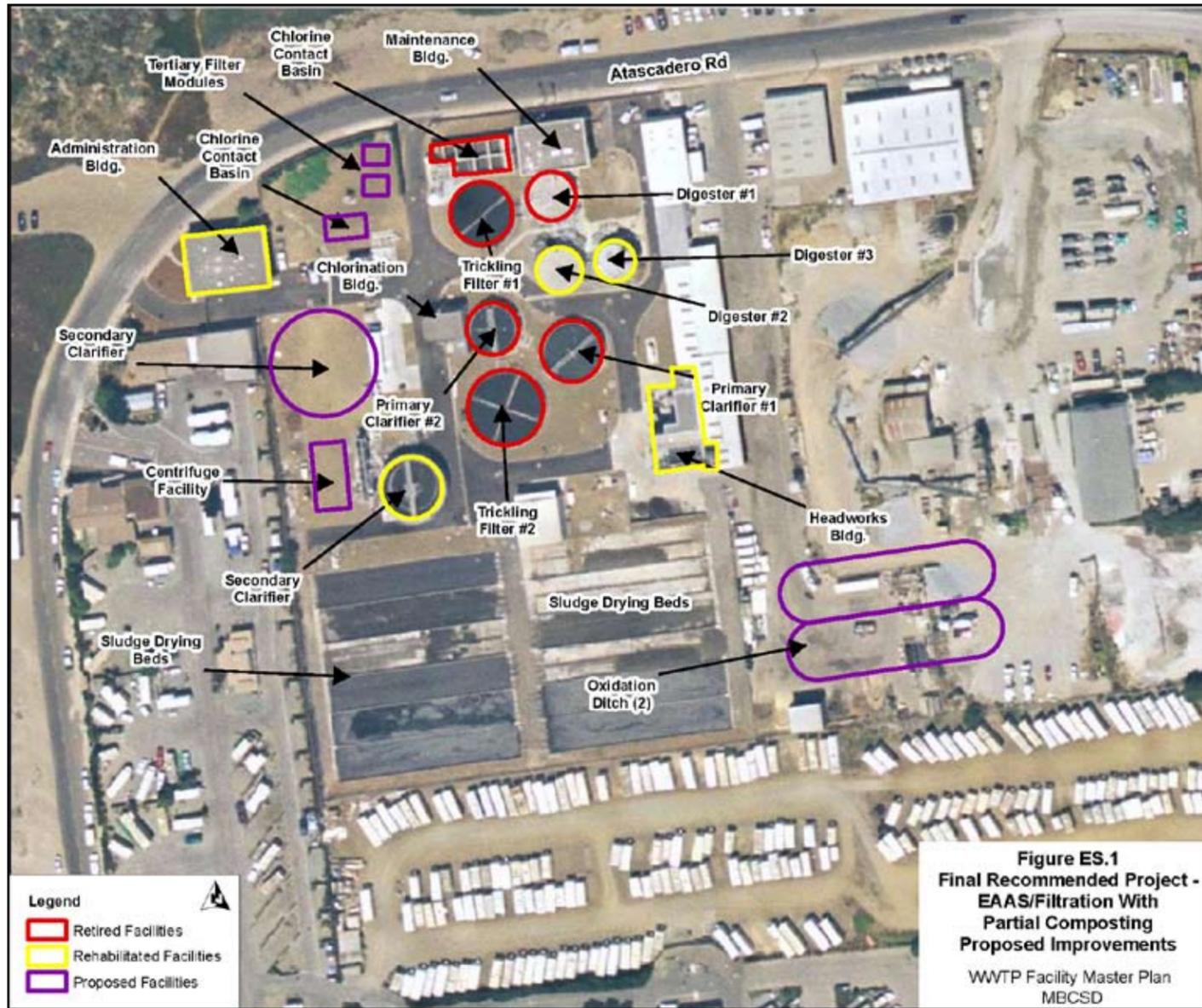
- City of Morro Bay Building Permit
- Californian Coastal Development Permit
- San Luis Obispo County APCD Permit for Standby Power
- Stormwater Pollution Prevention Plan

**Project Schedule.** The current Project Schedule is shown in **Figure 9**. The objective of the Project Schedule is to complete the remaining tasks in accordance with the Conversion Schedule milestone dates.

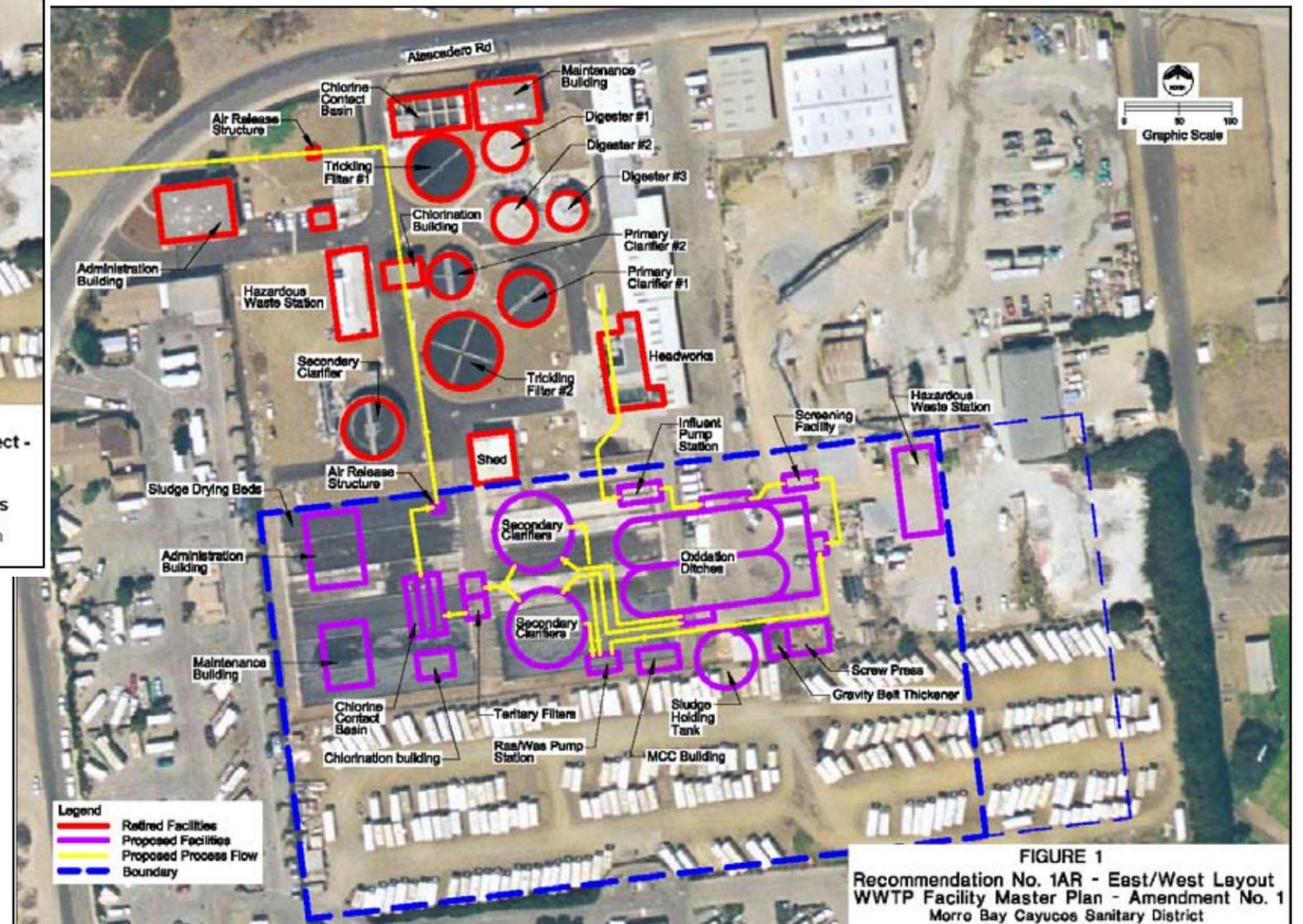
**Sequence of Construction.** The sequence of construction for the WWTP Upgrade Project is relatively straightforward, but must be conducted to minimize disruption to ongoing operation and maintenance activities at the existing WWTP. The preliminary list of critical activities that will be identified and described with project constraints in the Contract Documents (Specifications and Drawings) include the following:

- Temporary solids handling equipment.
- Site preparation for new WWTP site.
- Placement of engineered fill for new WWTP site.
- Construction of new WWTP Upgrade facilities.
- Startup and commissioning of WWTP Upgrade facilities.
- Demolition of existing WWTP.
- Placement of fill and sitework for new parking lot and relocation of the Household Hazardous Waste Station.

DRAFT



**FIGURE 1**  
**DRAFT FMP SITE PLAN**

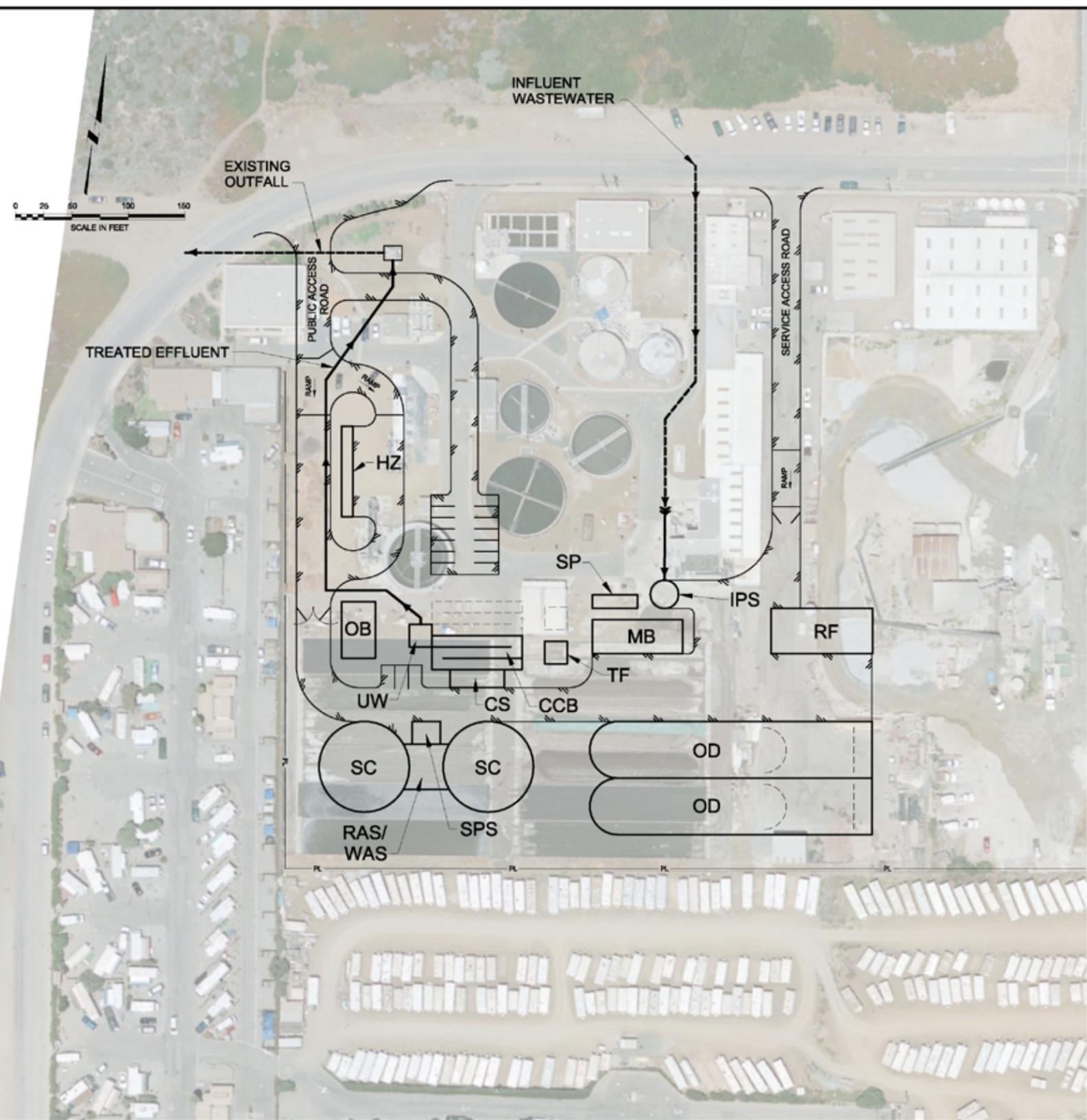


**FIGURE 2**  
**DRAFT FMP - AMMENDMENT NO. 1 SITE PLAN**

Plot Date: 22-JUN-2010 11:23

User: Atsushi

File: oxidation ditch-related site plan.dwg Model: Layout1 ColorTable: br.cfb DesignBspc: MWH\_tool\_Pentabris\_v89.pps PlotBspc: 0.063333.1



LEGEND

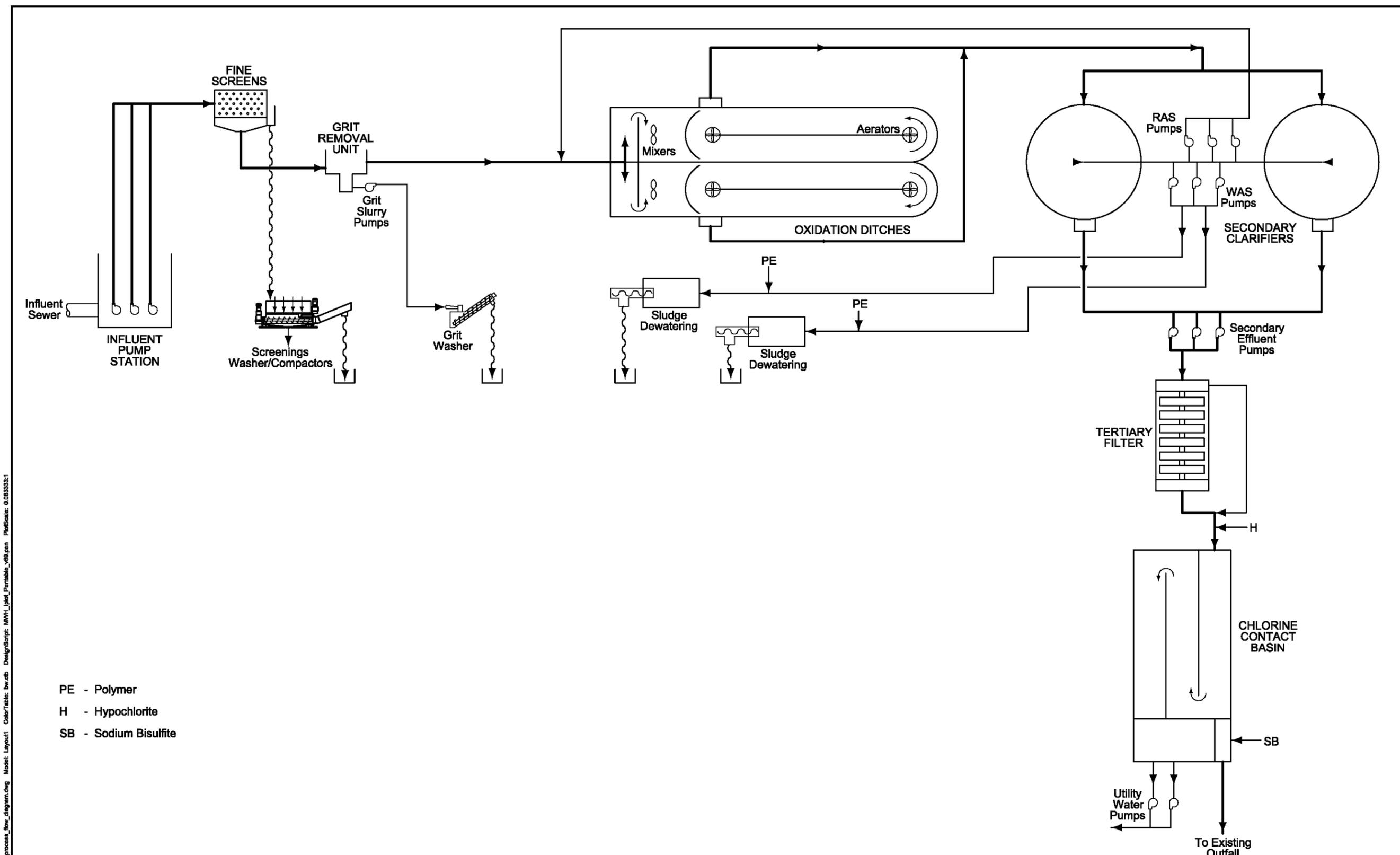
- CS CHEMICAL STATION
- CCB CHLORINE CONTACT BASIN
- HZ HOUSEHOLD HAZARDOUS WASTE
- IPS INFLUENT PUMP STATION
- MB MAINTENANCE BUILDING
- OB OPERATIONS BUILDING
- OD OXIDATION DITCHES
- RAS RETURN ACTIVATED SLUDGE
- RF RESIDUALS FACILITY
- SC SECONDARY CLARIFIERS
- SP STANDBY POWER
- SPS SECONDARY PUMP STATION
- TF TERTIARY FILTER
- UW UTILITY WATER
- WAS WASTE ACTIVATED SLUDGE

REV	DATE	BY	DESCRIPTION

SCALE	DESIGNED
1"=100'	S. HYLAND
	DRAWN
	R. SASAKI
	CHECKED



**FIGURE 3**  
**CONCEPTUAL SITE PLAN**



PE - Polymer  
 H - Hypochlorite  
 SB - Sodium Bisulfite

File: Oxidation Ditch-process\_flow\_diagram.dwg Model: Layout1 ColorTable: bw.ctb DesignScript: MWF\_Ljok\_Pennable\_v08.dgn PlotScale: 0.083333:1

REV	DATE	BY	DESCRIPTION

SCALE  
NO SCALE

DESIGNED S HYLAND  
 DRAWN D MASON  
 CHECKED \_\_\_\_\_

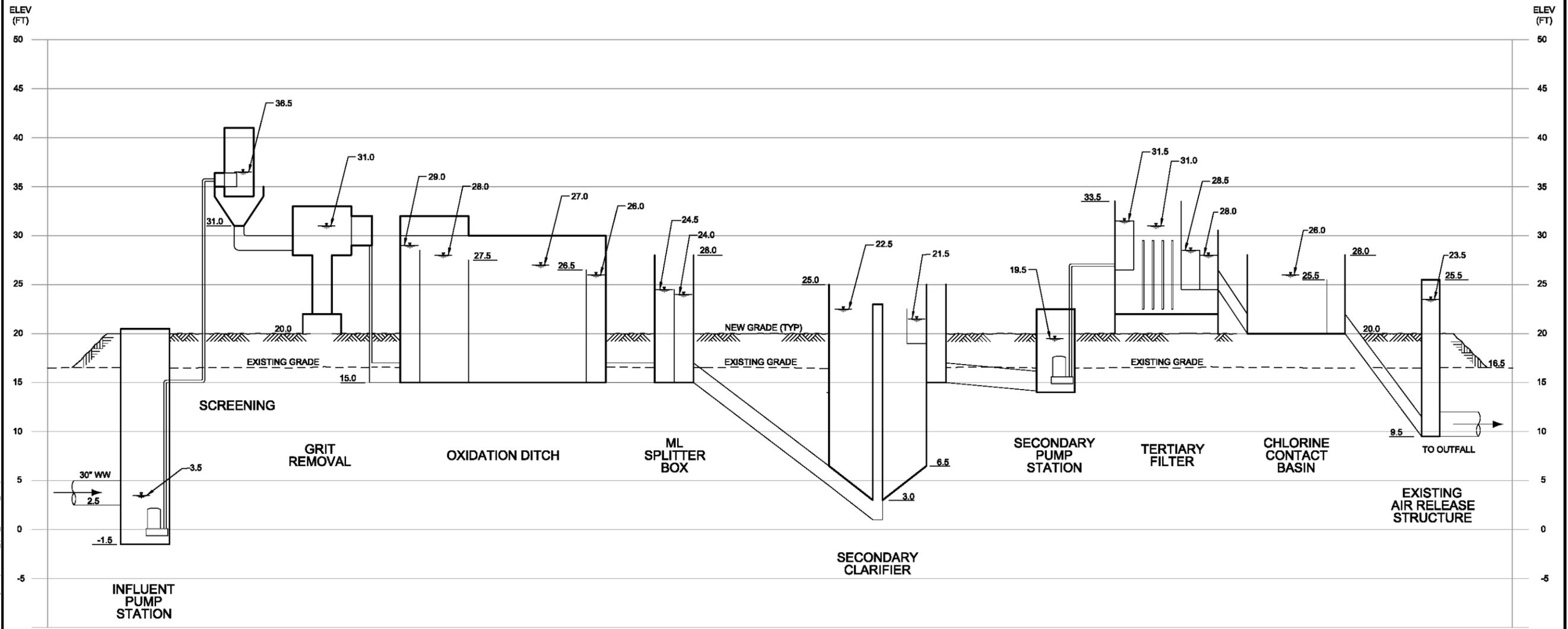


**FIGURE 4**  
**CONCEPTUAL FLOW SCHEMATIC**

Plot Date: 15-JUN-2010 07:37  
 User: rmasaki  
 File: oxidation ditch-hydraulic\_profile\_model.dwg Model: Layout1 ColorTable: bw.ctb DesignScale: MWH\_plt\_Pentable\_v8b.plt PlotScale: 0.08333331

**GENERAL SHEET NOTES**

- DATUM FOR ELEVATIONS IS NAVD 88
- CONCEPTUAL WATER SURFACE ELEVATIONS ARE SHOWN FOR PEAK DAY FLOW OF 5.6 MGD



REV	DATE	BY	DESCRIPTION

SCALE  
 VERT: 1"=10'  
 DESIGNED: S HYLAND  
 DRAWN: L BRADY  
 CHECKED:



**FIGURE 5**  
**CONCEPTUAL HYDRAULIC PROFILE**



**FIGURE 6A**  
**OPERATIONS BUILDING ENTRY**



**FIGURE 6B**  
**OPERATIONS BUILDING REAR**



**FIGURE 7**  
**MAINTENANCE BUILDING**

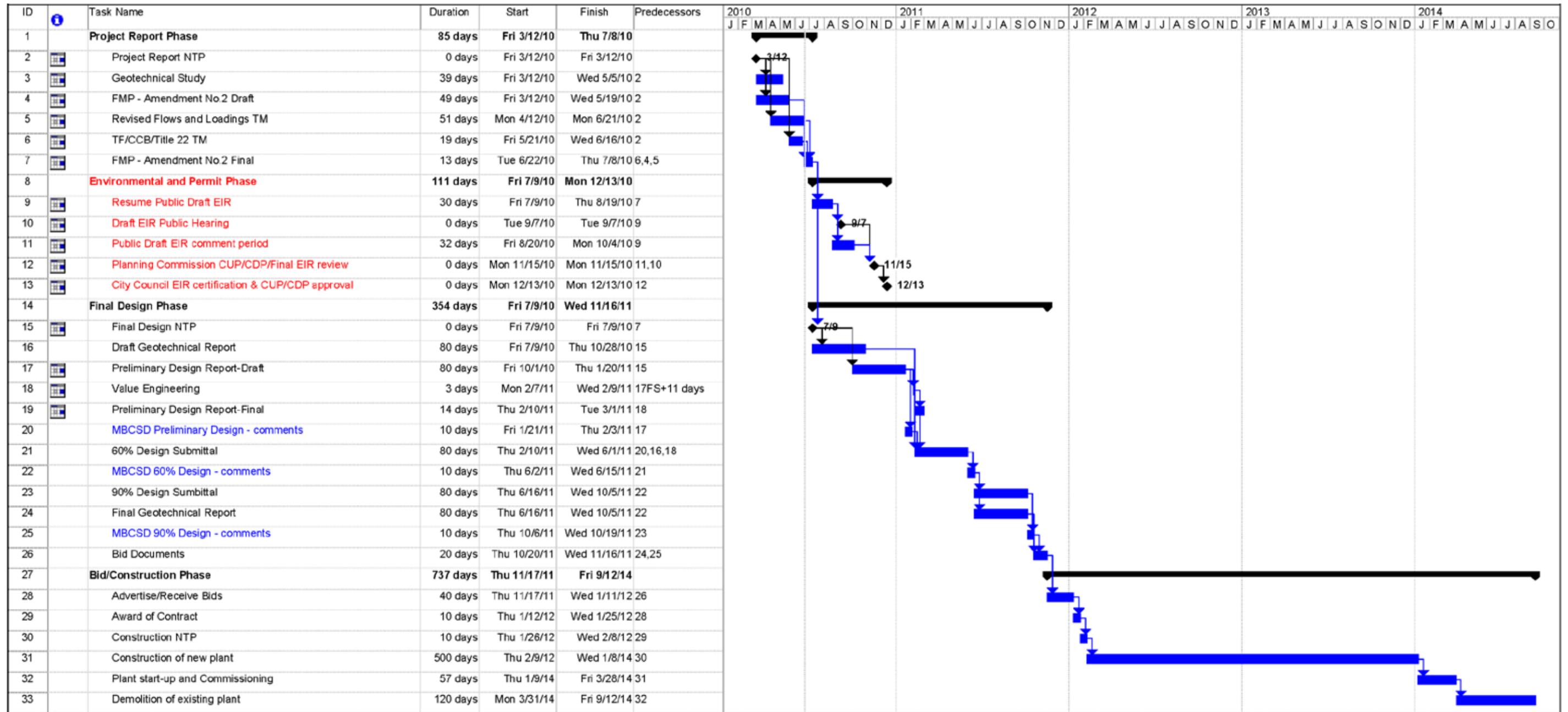


**FIGURE 8A**

**FIGURE 8A  
RESIDUALS FACILITY**



**FIGURE 8A  
RESIDUALS FACILITY REAR**



Project: Overview Project Schedule\_M Date: Tue 6/22/10

Task Progress Summary External Tasks Deadline

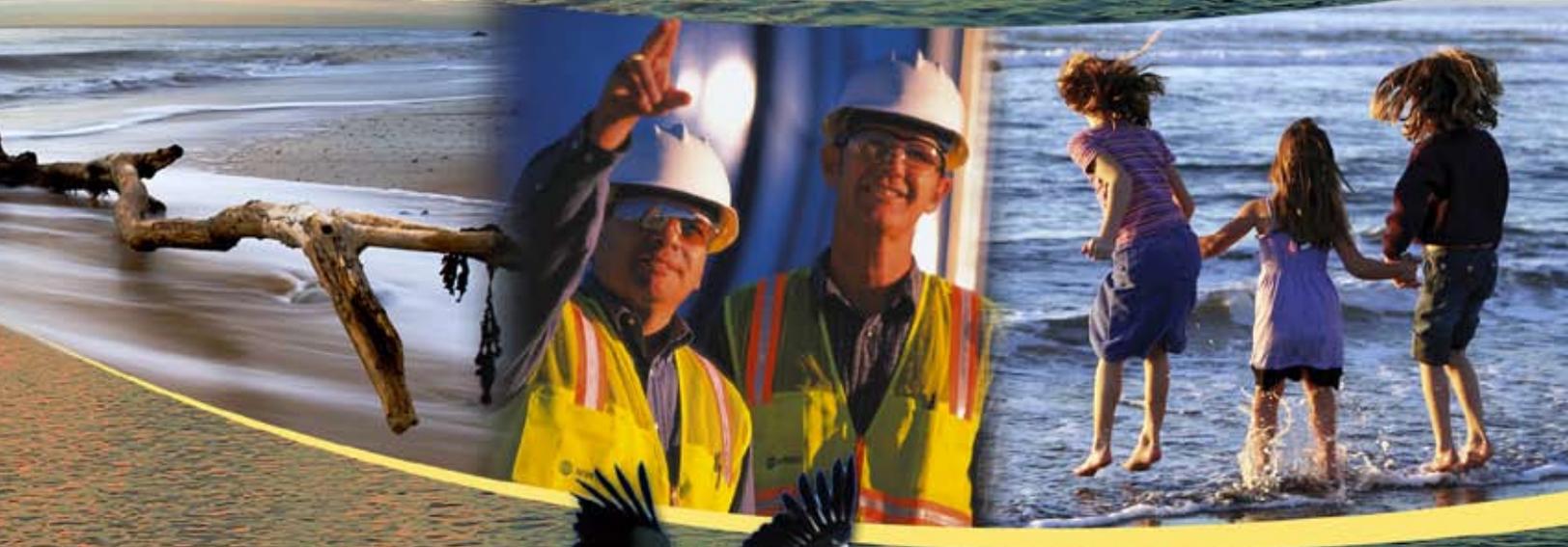
Split Milestone Project Summary External Milestone

**FIGURE 9  
PROJECT SCHEDULE**



APPENDIX A

## Revised Flows and Loadings TM



# MEMORANDUM



**To:** Bruce Keogh  
Bill Callahan  
Dylan Wade

**Date:** June 21, 2010

**From:** Steve Hyland

**Client:** MBCSD

**Subject:** MBCSD WWTP Upgrade  
Revised Flows and Loadings

**Reference:** 1008613.020101

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## Introduction

The influent wastewater flow and loadings presented in the draft FMP were established for a combined MBCSD build-out population that would be reached by Y2021 for the City of Morro Bay (MB) and Y2015 for the Cayucos Sanitary District (CSD). These flow and loading projections were based on historical record information gathered for a 5-year period from Y2002 through Y2006 at the time the draft FMP was prepared.

MBCSD expressed concern that this period of record is too limited for the following reasons:

- Flow and loading data are now available for Y2007 to the present.
- The period of record for Y2002 – Y2006 were relatively dry years.

Consequently, flow data from Y1995 through Y2009 (15 years) were gathered and evaluated to establish the basis of design for flow parameters. Loading data for BOD and TSS for the period from Y2002 through Y2009 (8 years) were also gathered and evaluated. The results of this re-evaluation are presented below.

## Existing Flow Data

The daily flow data were analyzed for the period of record from January 1995 through December 2009. The flow values reported for the period prior to August 2001 are based on effluent flow measurements with a propeller flow meter installed at the inlet to the chlorine contact basin. The flow values from August 2001 forward are based on influent flow measurements with a Palmer-Bowlus flume installed in the influent sewer upstream of the existing influent pump station. The influent flow measurements are more accurate and have been used for reporting to the Regional Water Quality Control Board (RWQCB) since the Palmer-Bowlus flume was installed.

The recorded effluent flow values from the propeller meter are consistently higher than the recorded influent flow values from the Palmer-Bowlus flume. Daily flow data for Y2005 were obtained for comparison of the influent Palmer-Bowlus flume and the effluent propeller meter. Y2005 was selected as having the highest range of flows for any annual period after August 2001 when the Palmer-Bowlus flume was installed.

The effluent flow data was plotted against its companion influent flow data for Y2005 as shown in **Figure 1**. A good correlation was obtained with a linear best-fit equation as follows:

$$\text{Plant Flow (mgd)} = [\text{Effluent Flow (mgd)} - 0.231 \text{ mgd}] / 1.046$$

Consequently, all plant flow readings prior to August 2001 based on the effluent propeller meter were corrected with the above equation and used for the analysis of plant flows. Two approaches were then used to reevaluate the corrected data as described below. Note that a different approach was used to evaluate the peak hour flow (PHF) that is separately described elsewhere in this memo.

The first approach was to evaluate the monthly flow data presented in the monthly reports. The average flow value for all months over the period of record was computed to establish the current annual average day flow (AADF). The average monthly flow value for the months of July and August over the period of record was analyzed to establish the current peak season dry weather (PSDW) average day flow and the PSDW maximum month flow. The PSDW period is important as it represents the highest loading to the WWTP due to the influx of visitors during the months of July and August. The highest monthly average flow value was selected for all the months over the period of record to establish the current average day maximum month flow (ADMMF) value.

The second approach was to evaluate the daily flow data and compute current average day flow and peak day flow for the period of record. The maximum value of the 30-day running average for the period of record was also computed to establish the current peak 30-day flow that corresponds to the peak month flow for comparison.

The results of the two approaches are presented in **Table A** along with the values presented in the draft FMP for comparison. The flow values for the longer period of record are generally greater in magnitude than the values presented in the draft FMP. This would be expected because the longer period of record includes annual periods of wet weather years with higher rainfall that would result in higher influent flows. The flow values based on the monthly approach and the daily approach are comparable and the selected values shown are the values considered the most representative of the given parameter.

**Table A – Existing Flow Values**

Parameter (a)	Unit	Draft FMP (b)	Monthly Values	Daily Values	Selected Values
Period of Record	---	Y2002 – Y2006	Y1995 – Y2009	Y1995 – Y2009	Y1995 – Y2009
AADF	mgd	1.15	1.24	1.25	1.25
ADMMF	mgd	1.39	2.66		2.66
Annual Peak 30-Day	mgd			3.55	3.55
Annual PDF	mgd			5.42	5.42
PSDWF, Average Day	mgd	1.25	1.32	1.32	1.32
PSDWF, Peak Month	mgd	1.35	1.70		1.70
PSDWF, Peak 30-Day	mgd			1.71	1.71
PSDWF, Peak Day	mgd			2.49	2.49

- (a) AADF = Annual Average Day Flow  
 ADMMF = Average Day Maximum Month Flow  
 PDF = Peak Day Flow  
 PSDWF = Peak Season Dry Weather Flow
- (b) From draft FMP Tables 3.5, 3.6, 3.7, and 3.8.

**Projected Flows**

The selected flow values for existing conditions from **Table A** were then used to calculate the design flows that would be projected to occur at build-out population. Three approaches were considered for the flow projections.

The first approach considered would follow the methodology used in the draft FMP. The annual average day flow was projected proportional to the population growth for MB and CSD. Flow projection factors were developed for each flow parameter that represented the average ratio of the particular flow parameter to the average annual day flow, i.e., ADMMF/AADF, PSDWF/AADF, and PHF/AADF for the period of record (Y2002 – Y2006). These flow project factors were then applied to the projected AADF flow value to determine the projected flow parameters. However, this approach does not appear correct for the following reasons:

- The flow projection factors should represent the maximum ratio for the period of record, not the average ratio, to be representative of the peak conditions that could be expected in the future.
- The flow projection factors assume that the annual infiltration and inflow (I&I) contribution increases proportionally to population growth. However, the increase in population is modest and will likely not result in any significant changes to the existing collection system because the anticipated population growth will be infill. Consequently,

although the baseline sanitary wastewater increases, there would likely be little, if any, change in I&I contributions.

Note that this approach assumes that the PSWF visitor population increases proportionally to the increase in resident population. This assumption is more difficult to judge, but if the current blend of full-time occupancy and part-time occupancy is the same at build-out, then this assumption would be reasonable.

The second approach considered would apply a multiplier based on the projected population at build-out. An initial build-out multiplier of 1.16 was calculated for the projected population for the City of Morro Bay and the Cayucos Sanitary District as shown in **Table B**.

**Table B – MBCSD Build-Out Multiplier**

<b>Description</b>	<b>Morro Bay</b>	<b>Cayucos</b>	<b>MBCSD</b>
Current Population	10,544 (a)	5,134 (c)	15,678
Est. Population At Build-out	12,500 (b)	5,730 (d)	18,230
Build-out Multiplier			1.16

- (a) Morro Bay average population for Y2002 – Y2006 calculated from data presented in Table 3.2 from draft FMP.
- (b) Morro Bay build-out population (Y2021) as listed in Section 3.3.1 and Table 3.11 from draft FMP.
- (c) Cayucos average population for Y2002 – Y2006 calculated from average of 2,567 equivalent dwelling units (EDUs) presented in Table 3.4 from draft FMP and multiplied by 2.0 capita per EDU.
- (d) Cayucos build-out population (Y2015) calculated from 2,865 equivalent dwelling units (EDUs) presented in Table 3.12 from draft FMP and multiplied by 2.0 capita per EDU.

The build-out multiplier was contemplated to be applied to all flow parameters as a conservative way to establish the design flow parameters. The use of the build-out multiplier is appropriate for projecting the AADF. However, this approach does not appear correct for the ADMMF, PSDWF, and PHF flow parameters for the following reason:

- The use of the build-out multiplier assumes that the annual infiltration and inflow (I&I) contribution increases proportionally to population growth. However, the increase in population is modest and will likely not result in any significant changes to the existing collection system because the anticipated population growth will be infill. Consequently, although the baseline sanitary wastewater increases, there would likely be little, if any, change in I&I contributions.

Note that this approach assumes that the PSWF visitor population increases proportionally to the increase in resident population. This assumption is more difficult to judge, but if the current blend of full-time occupancy and part-time occupancy is the same at build-out, then this assumption would be reasonable.

The third approach considered and adopted is based on the following assumptions:

- The projected AADF flow would be based on the build-out or residential population increase.
- The projected AADF increase due to build-out population growth would be added to all annual flow parameters (except PHF as separately discussed).
- No allowance for an increase in I&I due to build-out or residential population growth would be added to flow parameters. This assumption assumes that MB and CSD would continue to monitor and rehabilitate the existing collection systems to prevent deterioration that would allow an increase of I&I above current levels.
- An increase in PSDW flow parameters for visitor population contributions would be assumed to be proportional to residential population growth.

With this approach, the increase to existing annual flow values and existing PSDW flow values to determine design annual flow parameters and design PSDW flow parameters at build-out would be 0.21 mgd and 0.22 mgd, respectively, as shown in **Table C**.

**Table C – Projected Flow Increase**

<b>Description</b>	<b>Morro Bay</b>	<b>Cayucos</b>	<b>MBCSD</b>
Current Population (a)	10,544	5,134	15,678
Est. Population At Build-out (a)	12,500	5,730	18,230
Population Increase	1956	596	
Current Residential Contribution (b)	87 gpcd	65 gpcd (c)	
Future AADF Increase	0.170 mgd	0.039 mgd	0.21 mgd
Future PSDWF Increase (d)	0.180 mgd	0.041 mgd	0.22 mgd

(a) Refer to Table B.

(b) Refer to draft FMP Tables 3.9 and 3.10 for initial per capita values of 80 gpcd and 60 gpcd reported for MB and CSD, respectively. These values have been prorated by the ratio of 1.25 / 1.15 to reflect the increase in AADF presented in Table A for the longer period of record.

(c) Assumes 2 capita per EDU.

(d) The PSDWF increase is prorated by the ratio of 1.32 / 1.25 to reflect the increase in PSDWF – Average Day to AADF presented in Table A for the longer period of record.

The addition of the annual and PSDW flow increases to the selected flow values from Table A result in the design criteria shown in **Table D**. Design values from the draft FMP are also presented for comparison.

**Table D – Design Flow Parameters**

Parameter	Unit	Draft FMP (a)	Selected Values – Existing (b)	Build-Out Increase	Design Values
AADF	mgd	1.33	1.25	0.21	1.5
ADMMF	mgd	1.62	2.66	0.21	2.9
Annual Peak 30-Day Flow	mgd		3.55	0.21	3.8
Annual PDF	mgd		5.42	0.21	5.6
PSDWF, Average Day	mgd	1.47	1.32	0.22	1.5
PSDWF, Peak Month	mgd	1.62	1.70	0.22	1.9
PSDWF, Peak 30-Day	mgd		1.71	0.22	1.9
PSDWF, Peak Day	mgd		2.49	0.22	2.7

- (a) From draft FMP Tables 3.11, 3.12, and 3.20.
- (b) From Table A.

**Peak Hour Flow**

The peak hour flow value is difficult to determine because of limitations in the measurement of instantaneous flows and hydraulic constraints as described below. The peak flow value has been established by reviewing flow data recorded during peak day events and evaluation of the effective flow capacities of the existing influent pumps, primary clarifiers, and existing outfall.

Continuous flow strip chart readings for selected days with the highest recorded peak day flows were retrieved from files and reviewed with plant staff. The selected days occurred during historical wet years prior to August 2001; so the strip chart readings are based on the effluent propeller meter. As previously discussed the effluent propeller flow meter values need correction to correspond to the influent Palmer-Bowlus flume. The effluent propeller meter is calibrated with a maximum flow of 5500 gpm or 7.9 mgd (uncorrected) which corresponds to 6.5 mgd (corrected). For the selected peak flow days there are significant hours when the readings are “pegged” at 7.9 mgd (uncorrected) indicating that actual flow exceeded 6.5 mgd (corrected). The highest peak hour flow would occur during these periods, but the magnitude cannot be directly quantified because the flow strip chart is truncated at the upper calibration limit.

The pumping capacity of the existing influent pump station (three pumps installed) was investigated by looking at pump curves and estimating a system curve. The nominal capacity of each existing pump based on the original certified pump curves is approximately 3.3 mgd. The

influent pump performance has declined over the years because of wear and tear on the pump impellers. A recent rehabilitation of one of the existing pumps is believed to have increased the rehabilitated pump's capacity by approximately 20 percent and close to its original capacity.

Although designed to operate with two duty and one standby pump, during large wet weather events, all three pumps are needed to meet the influent flow demand. If all three pumps were operated in parallel at full speed, a theoretical peak hour flow as high as (3 pumps @ 3.3 mgd each =) 9.9 mgd could be achieved based on the original pump curves. However, if the past performance of the pumps has declined during the period of record used for evaluation of flow, then the effective influent pump station capacity may be on the order of 8.0 mgd (assuming 20 percent capacity reduction).

The determination of peak hour flow is further complicated because during the large wet weather events, the operation of the influent pumps was manually controlled to prevent surcharging of the primary clarifiers. Under these conditions one of the three influent pumps would be temporarily decreased in speed by operator control to reduce the flow to the primary clarifiers. Drawing G5 – Hydraulic Profile in the drawings dated October 1982 prepared by Brown and Caldwell include Note 1 which reads: “A new primary effluent pump station will be required under Stage 2 improvements to discharge flows greater than 6.64 mgd.” This note implies that at some flow rate greater than 6.64 mgd, the primary clarifiers will be surcharged.

When the influent pumps are manually operated to prevent surcharging of the primary clarifiers, the reduction in flow has been safely attenuated in the collection system. Without this attenuation an even higher peak flow would result, although the magnitude could not have been recorded (i.e., effluent flow meter pegged).

The hydraulic capacity of the existing outfall was investigated by reviewing three memos dated August 22, September 12, and September 30, 1991 prepared by City of Morro Bay Department of Public Works regarding the ocean outfall capacity. The results of the hydraulic analysis conducted by staff indicated that flow up to 8.0 mgd can be conveyed by the outfall without overtopping the existing air release structure. There is no record or reported observation that the air release structure has ever overflowed.

After review of the available information summarized above, the current peak hour flow is established at 8.0 mgd based on the following considerations:

- Reduction of effluent propeller meter flows by the correction factor previously discussed would reduce the “unseen” flow rate that is above the upper calibration limit of 6.5 mgd (corrected), but the magnitude of the corrected peak flow above 6.5 mgd is still unknown.
- The effective maximum pumping capacity of the influent pump station during the period of record for flow evaluation has likely been on the order of 8.0 mgd.
- The effective hydraulic capacity of the primary clarifiers before surcharging is expected to be 6.6 mgd or higher.
- The manual operation of the existing influent pumps during large wet weather events to prevent the primary clarifiers from surcharging reduces the peak flow reaching the plant by attenuation in the collection system.

- There is no indication that the nominal outfall capacity of 8.0 mgd has been exceeded.

The incremental flow increase of 0.2 mgd applied to other flow parameters has not been utilized for the peak hour flow parameter. The magnitude of peak hour flow is driven by the infiltration and inflow (I&I) in the collection system and is significantly greater than the sanitary wastewater flow. Given the inherent uncertainty of establishing the current peak hour flow parameter, the addition of the small flow increase of 0.2 mgd would not be relevant.

### **Existing Loading Data**

The loading parameters were established by analyzing the BOD and TSS values for the period of record from January 2002 through December 2009. The influent wastewater is routinely analyzed for BOD and TSS concentrations (mg/L) with 24-hour composite samples obtained on a weekly basis. The BOD and TSS values were first screened for outliers by setting aside all values greater than three standard deviations of the average value for the period of record. The remaining values were used to calculate loadings by multiplying the concentration (mg/L) times plant flow (mgd) for the corresponding day times a conversion factor (8.34) to calculate daily loading (lb/day). The plant flows used to calculate loadings for the period prior to August 2001 based on the effluent propeller meter were corrected as previously discussed.

The annual average loading values and annual maximum day loading values were calculated from the daily loading values for the period of record. In a similar manner, the PSDW average day values and maximum day values were calculated for the months of July and August over the period of record.

The daily loading values were then ranked in ascending order and plotted as a percent of the total values that are less than the given value. These plots of BOD and TSS are shown in **Figure 2** and **Figure 3**, respectively. From these plots, which represent a version of probability charts, the current loading values for the Maximum 30-Day were obtained by extracting the values at the (335 day / 365 day =) 91.8 percentile.

The loading values from these analyses are presented in **Table E** along with the draft FMP values for comparison. Note that the annual average values and PSDW average day values from the draft FMP are somewhat higher than the values computed from the daily loadings for the same period of record. This difference is believed to result from the calculation of draft FMP loadings from average flow and average concentrations for each year rather than the average daily loadings for each year. This can be seen by the comparison of loadings calculated from the daily values versus the draft FMP values for the same Y2002 – Y2006 period of record. The loading values based on the daily approach over the Y2002 – Y2009 period of record were selected as the most representative to use for projecting the design loading parameters.

**Table E – Existing BOD and TSS Loadings**

Parameter	Unit	Draft FMP (a)	Daily Values (b)	Daily Values (b)	Selected Values
Period of Record	---	Y2002 – Y2006	Y2002 – Y2006	Y2002 – Y2009	Y2002 – Y2009
<b>BOD</b>					
Annual Average	lb/day	3,100	3,020	3,000	3,000
Annual Max 30-Day	lb/day			4,090	4,090
Annual Max Day	lb/day			5,540	5,540
PSDW, Average Day	lb/day	3,750	3,520	3,590	3,590
PSDW, Max Month	lb/day			4,720	4,720
PSDW, Max Day	lb/day			5,540	5,540
<b>TSS</b>					
Annual Average	lb/day	3,350	3,300	3,260	3,260
Annual Max 30-Day	lb/day			4,560	4,560
Annual Max Day	lb/day			6,090	6,090
PSDW, Average Day	lb/day	4,080	3,790	3,860	3,860
PSDW, Max Month	lb/day			5,410	5,410
PSDW, Max Day	lb/day			5,920	5,920

- (a) The average values from draft FMP Tables 3.14 and 3.16 that appear to be calculated from average flow and average concentrations for each year.
- (b) Daily values calculated from daily loadings.

**Projected Loadings**

The selected loading values for existing conditions from **Table E** were then used to calculate the design loadings that would be projected to occur at build-out population. Two approaches were considered for the loading projections.

The first approach considered would follow the methodology used in the draft FMP. Influent BOD and TSS concentrations were assigned for average annual and average PSDW conditions and multiplied by their respective projected average day flows to calculate the design loadings. However, as discussed above this approach does not appear correct because the use of average flow values and average BOD and TSS concentrations overstates the BOD and TSS loadings.

The second approach considered and adopted was to increase the current loading values by the build-out multiplier of 1.16 presented in **Table B** for annual conditions. This approach assumes that the BOD and TSS loadings are proportional to the resident population of the City of Morro Bay and the Cayucos Sanitary District. The resulting incremental increase in annual loadings is then added to the current PSDW loadings to establish the PSDW design loadings. This approach assumes that the visitor loading contributions during the PSDW period (July and August) also increase proportionally to resident population. The resultant design BOD and TSS loading values are shown in **Table F**.

**Table F – Design Loadings**

<b>Parameter (a)</b>	<b>Unit</b>	<b>Draft FMP (b)</b>	<b>Selected Values (c)</b>	<b>Build-Out Increase</b>	<b>Design Values</b>
<b>BOD</b>					
Annual Average	lb/day	3,800	3,000	480	3,500
Annual Max 30-Day	lb/day		4,090	650	4,700
Annual Max Day	lb/day		5,540	890	6,400
<b>PSDW, Average Day</b>					
PSDW, Average Day	lb/day	5,000	3,590	570	4,200
PSDW, Max Month	lb/day		4,720	760	5,500
PSDW, Max Day	lb/day		5,540	890	6,400
<b>TSS</b>					
Annual Average	lb/day	4,000	3,260	520	3,800
Annual Max 30-Day	lb/day		4,560	730	5,300
Annual Max Day	lb/day		6,090	970	7,100
<b>PSDW, Average Day</b>					
PSDW, Average Day	lb/day	5,200	3,860	620	4,500
PSDW, Max Month	lb/day		5,410	870	6,300
PSDW, Max Day	lb/day		5,920	950	6,900
<b>TKN (d)</b>					
Annual Average	lb/day				600
Annual Max 30-Day	lb/day				800
Annual Max Day	lb/day				1100
<b>PSDW, Average Day</b>					
PSDW, Average Day	lb/day				710
PSDW, Max Month	lb/day				940
PSDW, Max Day	lb/day				1200

- (a) PSDW = Peak Seasonal Dry Weather
- (b) From draft FMP Table 3.20.
- (c) From Table E.
- (d) Note that TKN values are currently derived by assuming a TKN / BOD ratio of 0.17. Supplemental testing of influent wastewater samples will be conducted during Y2010 to obtain TKN data and modify the listed values if needed.

**Summary**

A summary of the design criteria developed for the WWTP Upgrade Project based upon the discussion above is presented in Table G.

**Table G – WWTP Upgrade Design Criteria**

<b>Parameter (a)</b>	<b>Unit</b>	<b>Design Values</b>
Flow		
AADF	mgd	1.5
ADMMF	mgd	2.9
Annual Peak 30-Day	mgd	3.8
Annual Peak Day	mgd	5.6
Peak Hour	mgd	8.0
PSDWF, Average Day	mgd	1.5
PSDWF, Peak Month	mgd	1.9
PSDWF, Peak 30-Day	mgd	1.9
PSDWF, Peak Day	mgd	2.7
BOD		
Annual Average	lb/day	3,500
Annual Max 30-Day	lb/day	4,700
Annual Max Day	lb/day	6,400
PSDW, Average Day	lb/day	4,200
PSDW, Max Month	lb/day	5,500
PSDW, Max Day	lb/day	6,400

TSS		
Annual Average	lb/day	3,800
Annual Max 30-Day	lb/day	5,300
Annual Max Day	lb/day	7,100
PSDW, Average Day	lb/day	4,500
PSDW, Max Month	lb/day	6,300
PSDW, Max Day	lb/day	6,900
TKN (b)		
Annual Average	lb/day	600
Annual Max 30-Day	lb/day	800
Annual Max Day	lb/day	1100
PSDW, Average Day	lb/day	710
PSDW, Max Month	lb/day	940
PSDW, Max Day	lb/day	1200

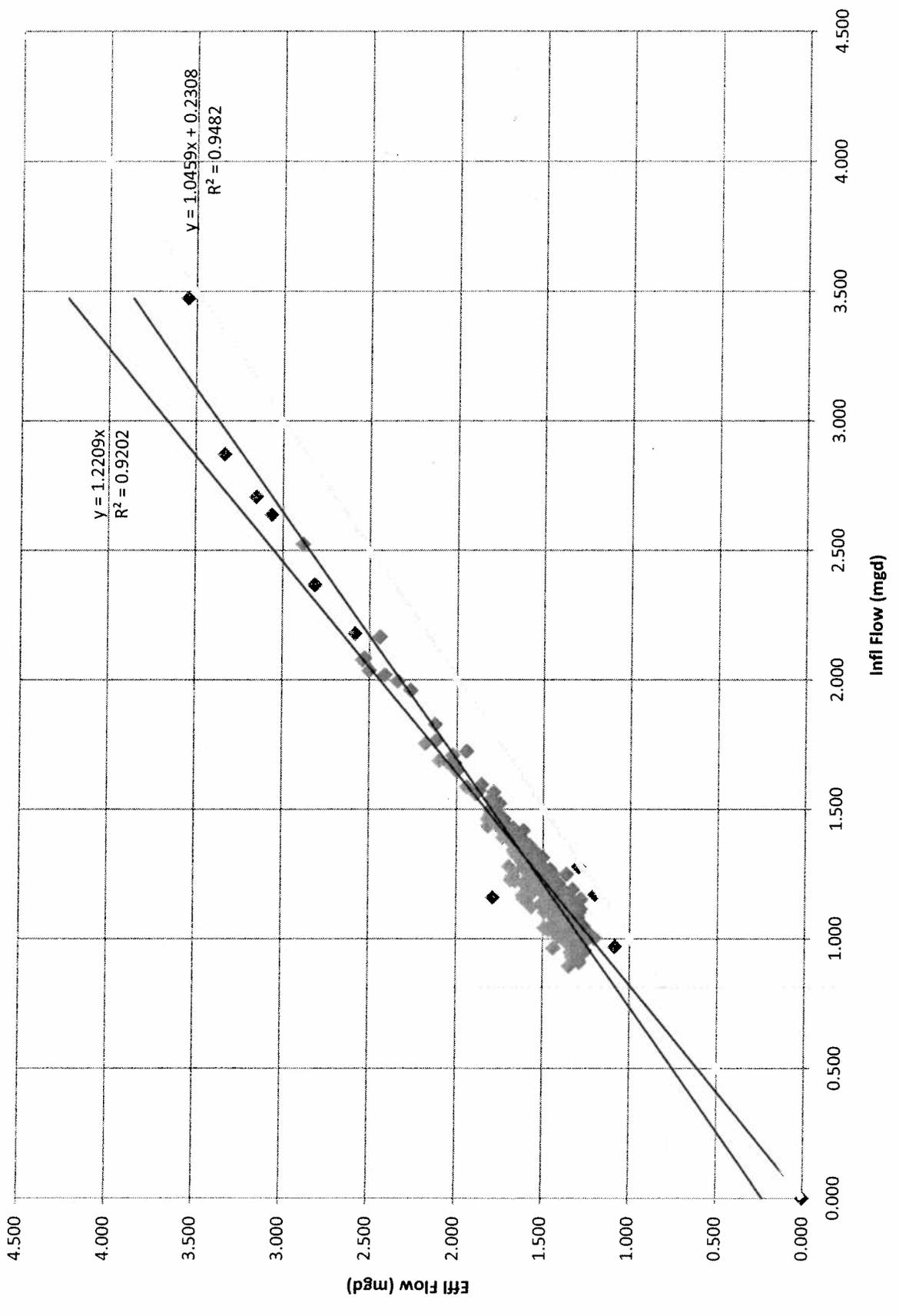
(a) PSDW = Peak Seasonal Dry Weather

(b) Note that TKN values are currently derived by assuming a TKN / BOD ratio of 0.17. Supplemental testing of influent wastewater samples will be conducted during Y2010 to obtain TKN data and modify the listed values if needed.

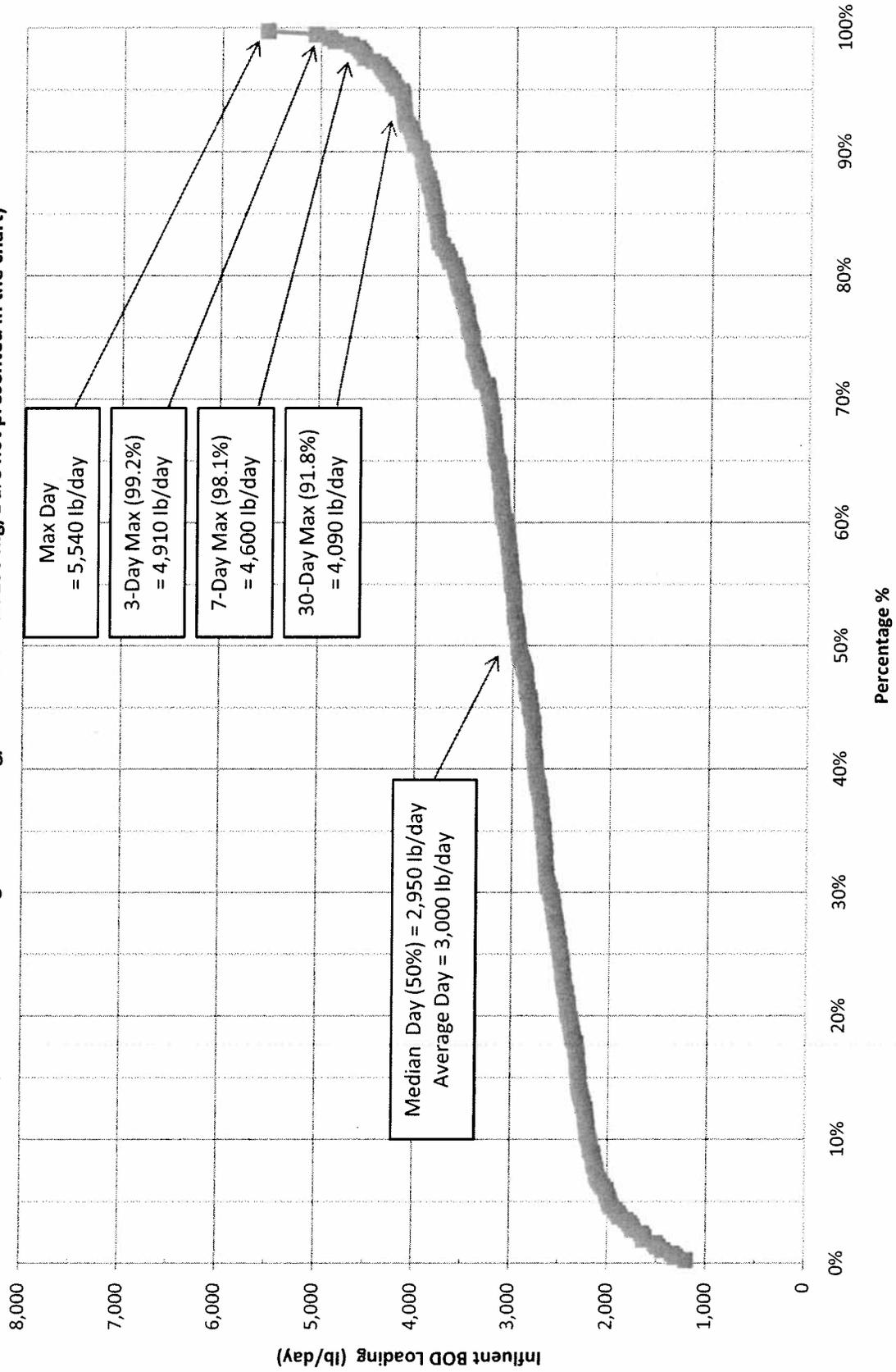
Please contact Steve Hyland if you have any questions.

c. Don Spiegel  
Roger Stephenson

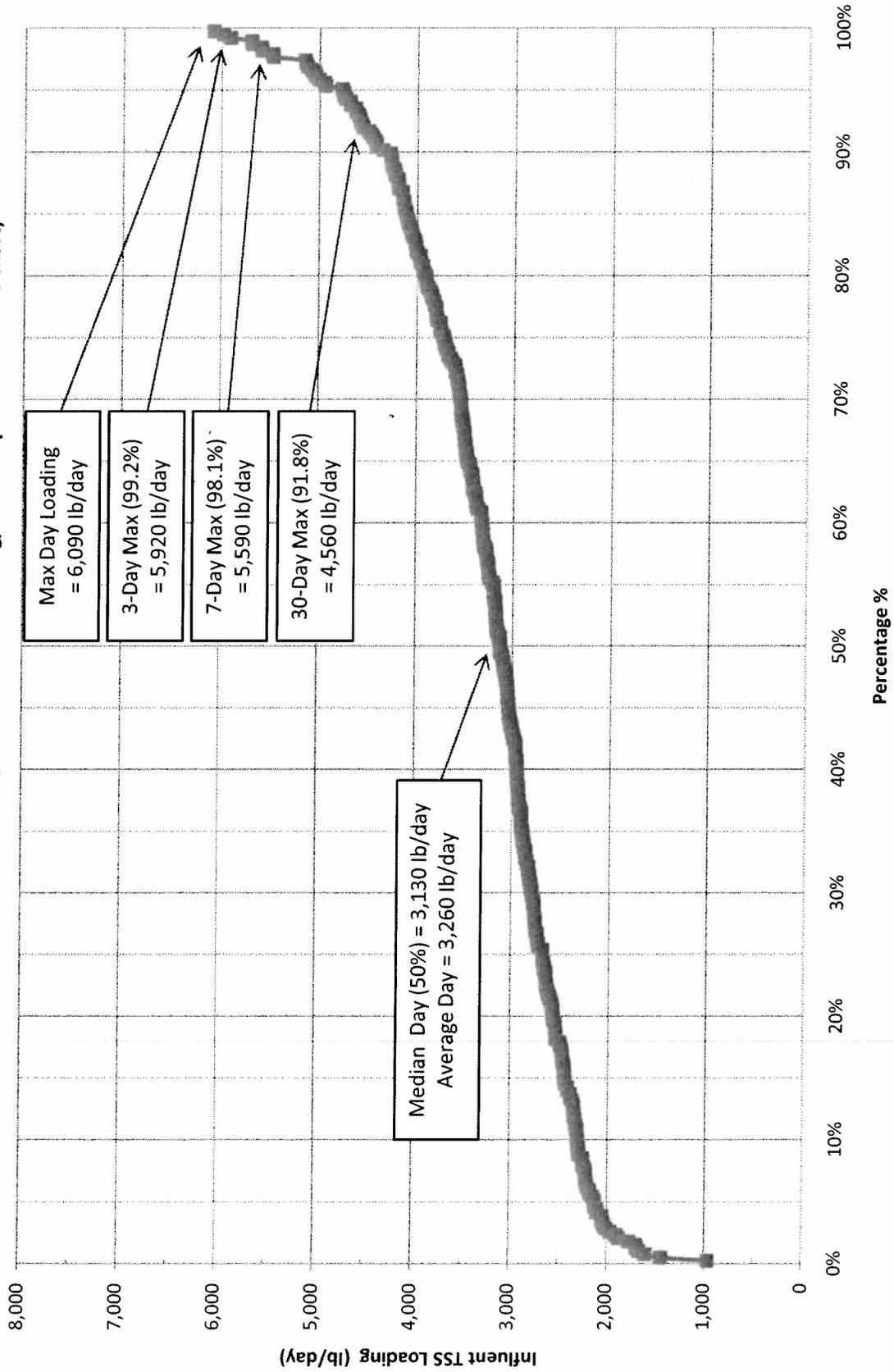
Figure 1 - Y2005 Effl Flow vs. Infl Flow

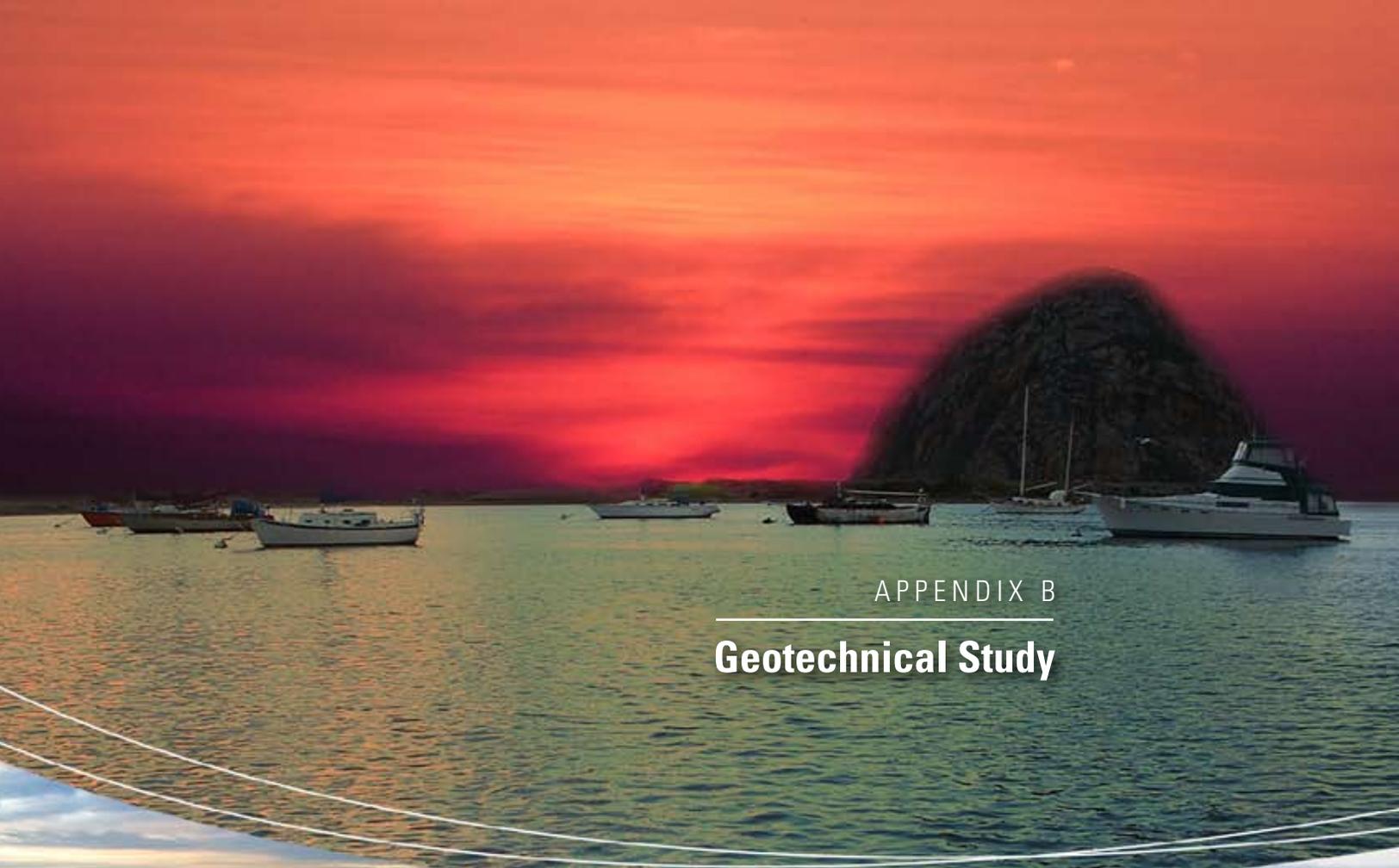


**Figure 2 - MBCSD BOD Data**  
**Influent BOD Loading Data Probability Distribution Chart (Jan 2002 to Dec 2009)**  
 (Outliers BOD data greater 550 mg/L and less than 150 mg/L are not presented in the chart)



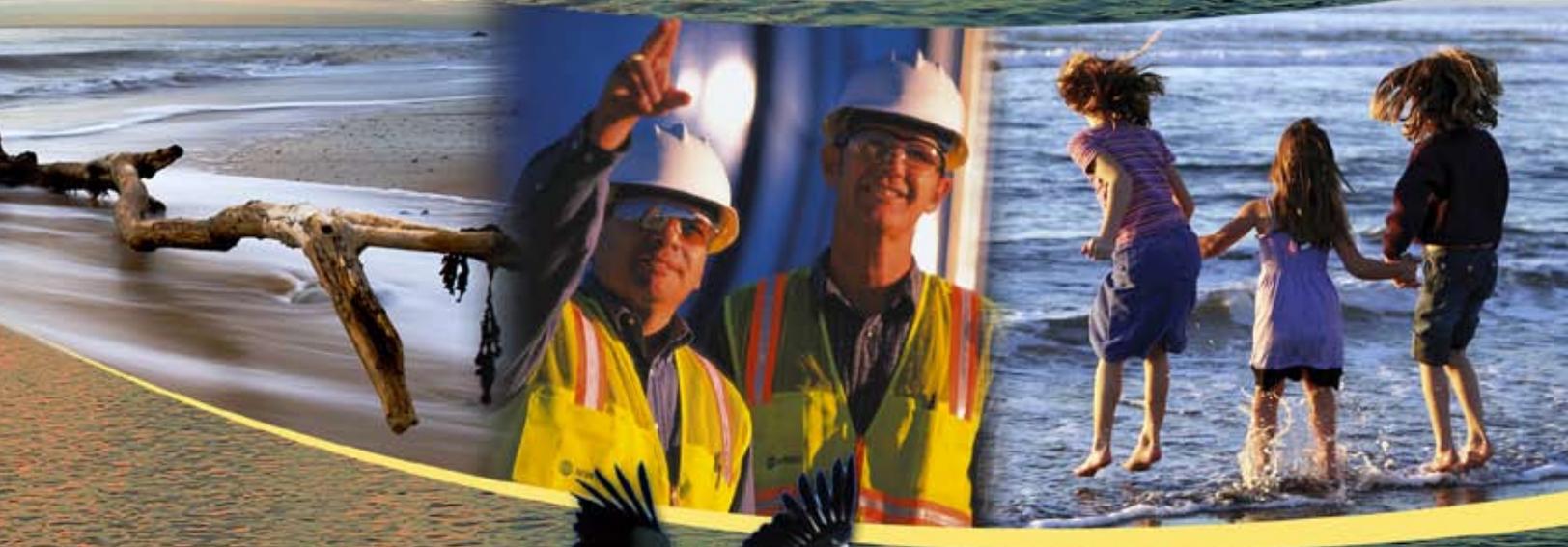
**Figure 3 - MBCSD TSS Data**  
**Influent TSS Loading Data Probability Distribution Chart (Jan 2002 to Dec 2009)**  
 (Outliers TSS data greater 750 mg/L and less than 100 mg/L are not presented in the chart)





APPENDIX B

## Geotechnical Study

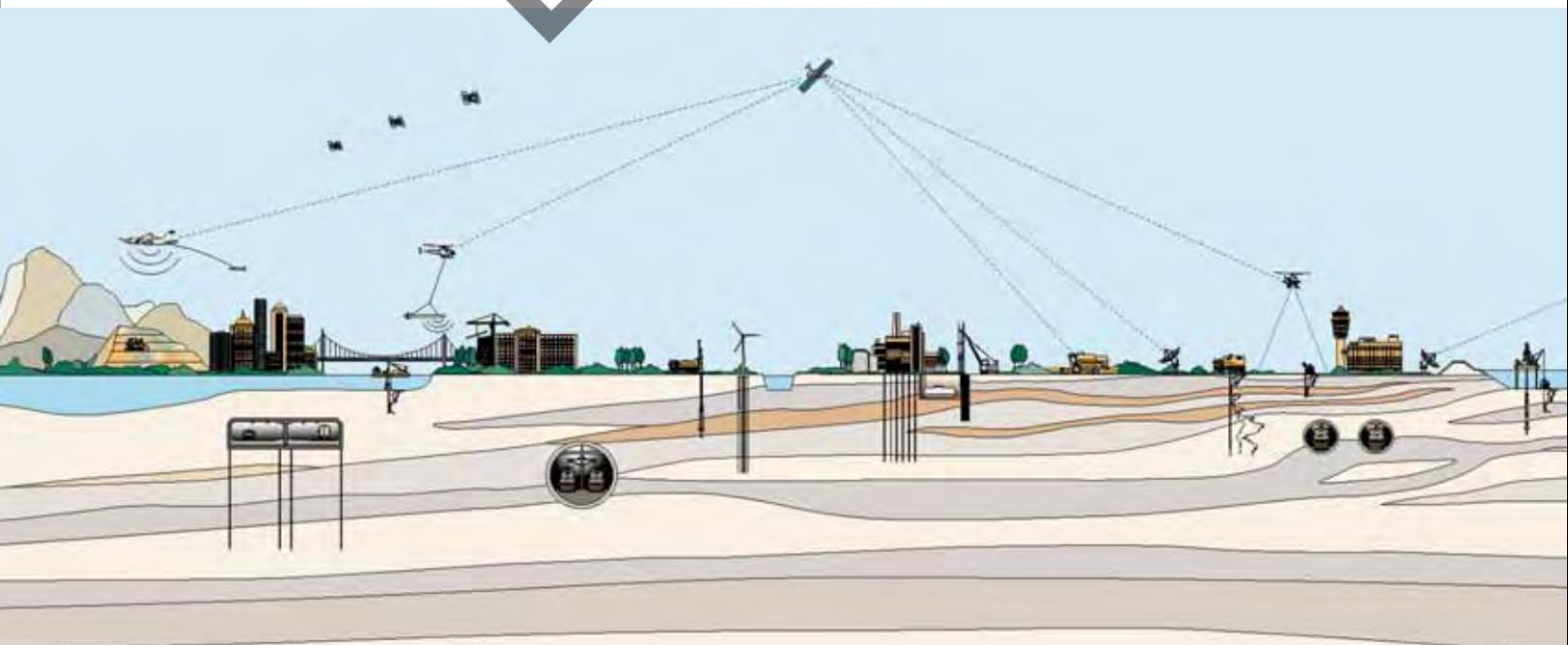


**PRELIMINARY GEOTECHNICAL REPORT  
MORRO BAY – CAYUCOS WASTEWATER  
TREATMENT PLANT UPGRADE  
160 ATASCADERO ROAD  
MORRO BAY, CALIFORNIA**

Prepared for:  
MWH Americas, Inc.

April 20, 2010

DRAFT





**FUGRO WEST, INC.**

660 Clarion Court, Suite A  
San Luis Obispo, California 93401  
**Tel: (805) 542-0797**  
Fax: (805) 542-9311

April 20, 2010  
Project No. 1445.010

MWH Americas, Inc.  
2121 N. California Blvd, Suite 600  
Walnut Creek, California 94596

Attention: Mr. Steve Hyland

Subject: Preliminary Geotechnical Report, Morro Bay – Cayucos Wastewater Treatment Plant Upgrade Project, 160 Atascadero Road, Morro Bay, California

Dear Mr. Hyland:

Fugro is pleased to submit this Preliminary Geotechnical Report for the Morro Bay – Cayucos Wastewater Treatment Plant Upgrade Project in Morro Bay, California. This report was prepared in accordance with the scope of services presented in our proposal dated October 29, 2009, and authorized under the consulting subcontract with MWH dated March 15, 2010.

The purpose of this report is to provide preliminary geotechnical considerations for design of the proposed upgrades to the wastewater treatment plant based on existing data from previous field explorations at the site. This report provides preliminary geotechnical considerations and opinions regarding site geology, soil and groundwater conditions encountered potential for the sites to be impacted by geologic hazards, and anticipated grading and foundation support for the proposed structures.

Please contact the undersigned if you have questions regarding this report, or require additional information.

Sincerely,  
FUGRO WEST, INC.

Jonathan D. Blanchard, G.E. 2312  
Principal Geotechnical Engineer

Chad Stoehr  
Staff Engineer II

Copies: 4 – Addressee, 1 PDF



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Historical Aerial Photographs 1937 through 2005
Historical Topographic Maps 1900 to 1995



## 1. PROJECT AND SITE DESCRIPTION

The project consists of upgrades to the existing Morro-Bay – Cayucos Wastewater Treatment Plant located at 160 Atascadero Road in Morro Bay, California. The site for the proposed improvements is located south of the existing wastewater treatment plant in the area of the existing sludge drying beds and adjacent land to the south and east. The location of the site relative to nearby streets and geographic landmarks is shown on Plate 1, Vicinity Map. The layout of the site, showing the preliminary layout of the proposed facilities is shown on Plate 2, Site Plan.

The main improvements associated with the project will include new administration and operation buildings, filters, oxidation ditches, and tank structures to replace the old facilities, improve treatment processes and withstand future demand. We expect the depth and height of below and above grade structures to range from approximately 5 to 20 feet below and 10 to 38 feet above existing grade, respectively. We understand from MWH that the current layout of the proposed facilities is subject to change as the project progresses.

The site is located approximately 1,000 feet east of the Pacific Ocean. The existing site grade ranges from approximately elevation (el.) 15 to 24 feet based on MB1 Exhibit 4.1 of the flood hazard analysis prepared by Wallace Group (2009). The terrain at the site vicinity is relatively flat lying ground near the mouth of Morro Creek located approximately 1,000 feet south of the site. Sand dunes and the beach border the site to the west. The site is bordered by a mobile home park to the west, trailer storage area to the south, Atascadero Road to the north, and Hanson's concrete plant to the east.

## 2. WORK PERFORMED

### 2.1 PURPOSE

The purpose of this report is to provide preliminary geotechnical considerations and opinions for the proposed improvements to the wastewater treatment plant. The primary geotechnical considerations evaluated for the project are characterization of the subsurface materials, geologic hazards, anticipated site preparation and grading for support of the improvements, and foundation considerations. The information provided herein is preliminary and is not intended for design of the project. A subsequent design-level geotechnical study will be performed for design of the improvements.

### 2.2 SCOPE

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

- ❖ Data review of existing plans and maps, subsurface data, geotechnical reports, construction records, and information obtained from our in-house files including published geologic maps, documents, and historical aerial photographs; and



- ❖ Preparation of this report summarizing the data obtained for the site, and our preliminary conclusions and recommendations regarding;
  - Geologic and seismic setting;
  - Soil and groundwater conditions encountered;
  - Potential for the site to be impacted by geologic hazards (such as strong ground motion, fault rupture, liquefaction, seismic settlement, landsliding, flooding, erosion, and expansive or collapsible soil conditions);
  - Need for mitigation of liquefaction, seismic settlement or other seismic related hazards, and a discussion of the types of mitigation that could be provided if needed;
  - Anticipated site grading and foundation support for the various structures;
  - Anticipated foundation types (such as piles or spread footings) for the various structures; and
  - Construction considerations relative to dewatering, excavation characteristics of the soils encountered, and need for shoring.

## 2.3 PREVIOUS STUDIES

As a basis for preparation of this report we reviewed previous reports, construction records and as-built information, and aerial photographs for the site. We also reviewed as-built plans, construction records, and a previous geotechnical report obtained from the City's archive records kept at the plant. Plant personnel assist in finding and obtaining these records from the archives.

### 2.3.1 Previous Reports

Geotechnical Consultants, Inc. (GTC) (1980) performed a design-level geotechnical investigation for previous improvements to the wastewater treatment plant. Subsurface data included standard penetration test (SPT) blowcounts obtained from 18-inch diameter bucket auger borings performed across the existing site. Earth Systems Pacific (ESP) (2009) performed a geotechnical feasibility study at the site as input to the Environmental Impact Report (EIR) for the proposed improvements. Field exploration for the study included hollow-stem auger borings and cone penetration testing (CPT). We were able to obtain the CPT data electronically, process the data in-house, and generate our own interpretation of the results. Logs of the CPT's generated by Fugro are included in Appendix A. During review of the ESP study, we observed that the boring information does not agree with the relative density ( $D_r$ ) we estimated from the CPT data, and therefore we suspect the boring information and drilling methods used by ESP may not be reliable. Logs of the borings performed by GTC and ESP are available electronically and will be included in the design level report.



### 2.3.2 Construction Records and As-Built Information

We reviewed construction records and as-built information from previous improvements to the plant in the early 1980's. The information included sub-soil stabilization and grading and paving plans (Brown and Caldwell, 1981), vibro-compaction reports (GKN Keller, 1983 and 1984), and confirmation and test borings performed during and after sub-soil stabilization (Pacific Geoscience, Inc. 1983 and 1984). The sub-soil stabilization was performed using deep compaction with stone columns. The limits of sub-soil stabilization performed in 1983 are shown on Plate 2, Site Plan. The stone columns were emplaced on a 6-foot triangular grid pattern, extended to el. 90 feet, and were intended to densify the soil to at least 75 percent relative density. The vibro-compaction reports included time and material quantity information at each stabilization location. A letter by GTC dated October 4, 1983 includes their evaluation of densification of the foundation soils after completion of the sub-soil stabilization and verification borings. The letter includes a discussion that with the exception of one, all SPT test results had densities exceeding 75 percent relative density. Letters by GTC dated December 20, 1983 and November 1, 1984 indicate that subsoil stabilization was not performed beneath a portion of the existing administration building due to the presence of existing operations building with basement and the presence of dumped fill for the old headworks building. A system of grade beams was used to provide additional foundation support for the existing administration building. Additionally, the letters suggest that the sub-soil stabilization may have been deleted below the maintenance building, and the building was supported on a mat of compacted fill due to the timing and cost of the stabilization.

### 2.3.3 Historical Aerial Photographs and Topographic Maps

We also reviewed selected historical aerial photographs and topographic maps obtained from Environmental Data Resources (EDR 2010a, 2010b) that dated back to 1937 and 1900, respectively. The EDR historical aerial photographs and topographic maps are included in Appendix B. The following is a summary of the photographs reviewed as part of this study.

#### Summary of Historical Aerial Photograph Review

Date	Scale	Source	Key observations
1937	1" = 555'	Army	Site is rural and vacant. Adjacent land use is mainly dry farming and row crops. The location of the existing site is covered with sand dunes and vegetation. The mouth of Morro Creek is cut to north and is cut 100 to 200 feet into the ocean-side of the sand dunes immediately west of the site. Highway 1 appears to be 2-lanes.
1949	1" = 555'	Aero	Similar to 1937 photo except dunes appear mostly denuded of vegetation and active. Mouth of Morro Creek has retreated to south of the existing site extending east-west near current its location. Some land development occurring east of Highway 1.



Date	Scale	Source	Key observations
1956	1" = 555'	Hycon	Improvements (possibly chlorine contact tank and biofilter) still evident at existing wastewater treatment plant are present at north end of site. Remaining site is still undeveloped. Unpaved access to the site terminates at plant. Appears site was constructed into the dune sands. Morro Creek fans west of the existing site. There is a moderate amount of development and new roads east of Highway 1.
1963	1" = 333'	Mark Hurd	Mouth of Morro Creek has migrated north and fans out west of the site. A pond and northerly bend has formed at the mouth of the creek less than about 100 feet west of the site. There is some type of access road through site and onto the beach at that location. An aggregate/concrete batch plant exists east of the site. Morro Bay High School exists north of Atascadero Road. There is significant development east of Highway 1. Highway 1 is 2-lanes in each direction with a full interchange at Atascadero Road.
1972	1" = 341'	Mark Hurd	Mouth of Morro Creek has receded or has been relocated south of the site. Wastewater treatment plant has expanded (Digesters 1 and 2, sedimentation tanks 1 and 2, biofilter 2 shown on 1981 plans), mobile home park is present west of the site, and Atascadero Road is paved and extends along current alignment to the large parking area now located immediately west of the site.. Southern end of the site is still undeveloped sand dunes with trails
1989	1" = 666'	USGS	Similar to 1972 photo and current site condition. Limits of the surrounding land development is similar to today Mobile home parking is present south of the site. Existing sludge ponds and 1980's plant improvements are present.
1994	1" = 666'	USGS	Similar to 1989 photo.
2002	1" = 666'	USGS	Similar to 1994 photo.
2005	1" = 604'	EDR	Similar to 2002 photo. Mouth of Morro Creek has migrated north on Oceanside of dune, and is immediately west of the existing site.

A wastewater treatment plant is not shown on the historical topographic map from 1951, but is shown on the 1965 map. Based on the review of the historical topographic maps, the plant was likely first constructed between 1951 and 1965. The historical topographic map from 1900 includes a lake that is present just north of the existing plant.

## 2.4 GENERAL CONDITIONS

This report is preliminary and is not intended for use in the design. Fugro prepared the conclusions, recommendations, and professional opinions of this report in accordance with the generally accepted geotechnical principles and practices at this time and location. This warranty is in lieu of all other warranties, either expressed or implied. This report was prepared for the exclusive use of MWH and their authorized agents only. It is not intended to address issues or conditions pertinent to other parties, projects or for other uses. The report and the drawings contained herein are not intended to act as construction drawings or specifications.

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



and are not intended to convey engineering judgment regarding potential hazardous/toxic assessment.

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

### 3. SITE CONDITIONS

#### 3.1 GEOLOGIC SETTING

The project is located in Morro Bay near the Pacific Ocean coastline, west of hills and mountains that are part of the Coast Ranges geologic and geomorphic province. That province consists of north-northwest-trending sedimentary, volcanic, and igneous rocks extending from the Transverse ranges to the south, into northern California. Rocks of the Coast Ranges province are predominately of Jurassic and Cretaceous age; however, some pre-Jurassic, along with Paleocene-age to Recent rocks are present. The surficial geology in the project vicinity, as mapped by Hall (1979), is shown on Plate 3.

As shown on Plate 3, the site is underlain by Holocene-age alluvial soils deposited primarily by nearby Morro Creek. The alluvial soils consist predominantly of interlayered sands and clays with varying fines and sand content, respectively. Hall maps Holocene-age dune sand deposits near the site along the coastline, and describes them as unconsolidated, white to brown windblown sand of actively moving sand dunes. We observed dune sand deposits bordering Atascadero Road north and west of the site and review of historical aerial photographs shows dune sands covering part of the site in 1937. The dune sand deposits change shape and extent based on storm events and wind and have likely been deposited over and within alluvial soils in the site vicinity.

#### 3.2 FAULTING

The majority of the faults within the Coast Ranges province and the Sierra de Salinas belt generally trend north-northwest. The California Geological Survey (CGS 2002) considers major faulting within the project vicinity to be related to the Los Osos fault, the offshore Hosgri fault, the San Luis Range fault zone (a compilation of several named fault strands), and the Rinconada fault. The CGS fault database consists of active and selected potentially active faults that are considered by the CGS to be capable of affecting regional seismicity in California. Terms used by CGS to describe fault activity are defined below.

**Active.** Faults that show evidence of displacement during the most recent epoch of geologic time, the Holocene, are classified as active. The Holocene epoch is generally considered to have begun about 11,000 years ago.



**Potentially Active.** Faults which displace geologic formations of Pleistocene age but show no evidence of movement in the Holocene period can be considered to be potentially active. Pleistocene time is the period between about two million years ago and 11,000 years ago.

**Inactive.** Faults which show no evidence of movement during the past two million years and show no potential for movement in the future are classified as inactive.

Fugro utilized the fault search routine in FRISKSP (Blake, 2000) to identify active and potentially active mapped faults and fault segments within a 62-mile radius of the project vicinity. The site coordinates (latitude and longitude) for the site were estimated to be 35.3799° latitude and -120.8604° longitude. Summarized below are eight (8) faults and fault segments that are considered by the CGS (2002) to be the most capable of producing high ground motion within the project vicinity. Additional information is presented in the CGS fault database (CGS, 2002).

### Summary of Fault Characteristics

Fault	Fault Type	Approximate Distance From Site (mile)	Maximum Moment Magnitude ( $M_w$ )	Fault or Fault Segment Length (km)	Activity
Los Osos (Irish Hills segment)	Reverse	5.4	7.0	44 ± 4	Active
San Simeon – Hosgri	Right-Lateral Strike Slip	7.7	7.5	169 ± 17	Active
San Luis Range (S. Margin)*	Reverse	14	7.2	64 ± 6	Potentially Active
Rinconada	Right-Lateral Strike Slip	15	7.5	190 ± 19	Potentially Active
Casmalia (Orcutt Frontal Fault)	Reverse	33	6.5	29 ± 3	Potentially Active
San Juan	Right-Lateral Strike Slip	36	7.1	68 ± 7	Potentially Active
Lions Head	Reverse	38	6.6	41 ± 4	Potentially Active
San Andreas (Parkfield)	Right-Lateral Strike Slip	41	6.5	36 ± 4	Active

\* San Luis Range includes segments of San Luis Bay, Oceano, Wilmar Avenue, Olson, and Santa Maria River faults

The project area is not located within a State of California designated Alquist-Priolo Earthquake Fault Zone (CGS, 1997) and no faults are shown trending through the site on published geologic maps.

The Cambria fault is the closest mapped fault to the project site. Additionally, the Oceanic fault is mapped within the project vicinity. The Cambria fault and Oceanic fault are not



included in the CGS fault model and consequently are not listed in the above table. However, the San Luis Obispo County Seismic Safety Element (County of San Luis Obispo, 1999) identifies the Cambria fault as potentially active, and there is historic seismicity associated with the Oceanic fault. Therefore, the faults are potential sources of strong ground shaking and ground rupture (or deformation) in the project area. A brief discussion of these faults and the Los Osos fault is provided below.

**Cambria Fault.** The Cambria fault is mapped approximately 1.3 miles northeast of the site. The northwest-trending fault is mapped locally as a reverse of thrust fault (Jennings, 1994; Kilbourne and Mualchin, 1980).

**Oceanic Fault.** The Oceanic fault is mapped by Hall (1979) approximately 5.5 miles northeast of the site and is attributed as the source of the 2003 M6.5 San Simeon Earthquake and would therefore be considered active. The northwest-trending fault is interpreted as a segment of the north/northwest-trending West Huasna/Oceanic fault zone. The West Huasna/Oceanic fault zone has been interpreted by Hall (1973) as a series of low- to high-angle reverse faults cut by a younger set of nearly vertical faults.

**Los Osos Fault.** The Los Osos fault zone is mapped the base of the hills south of the community of Los Osos (CGS, 2002; PG&E, 1988; Lettis & Hall, 1994; Asquith, 1997). Lettis & Hall (1994) describe the Los Osos fault zone as a series of discontinuous, subparallel and en echelon fault traces that extend from the offshore Hosgri fault zone to Lopez Reservoir, a distance of about 35 miles. Portions of the fault east of Los Osos near the City of San Luis Obispo have been zoned active and are designated as an Alquist-Priolo earthquake fault hazard zone by CGS.

### 3.3 SUBSURFACE CONDITIONS

The soil and groundwater conditions were characterized for the preliminary study based on the results of previous field explorations performed by ESP and GTC. The locations of the previous explorations are shown on Plate 2. Logs of our interpreted CPT soundings performed by ESP are presented in Appendix A. Correlations developed by Robertson and Campanella (1988) were used to classify soils encountered in the CPT soundings.

The site is underlain primarily by alluvium and dune sand deposits. The site for the existing plant appears to have been cut into the sand dunes that previously occupied the site. The alluvium and dune sand deposits were locally overlain by approximately 1 to 4 feet of artificial fill. The fill consisted mainly of medium dense to dense sand with varying fines and gravel content. The artificial fill is likely associated with site preparation and grading for the existing plant.

**Dune Sand Deposits.** Dune sand deposits were encountered beneath the artificial fill and at the existing ground surface across the site. ESP encountered dune sand deposits to depths ranging from approximately 10 to 25 feet below the existing ground surface that were interlayered with discontinuous 2-to-5-foot thick layers of soft to stiff silt and clay alluvium. GTC encountered approximately 5 to 10 feet of dune sand deposits beneath the artificial fill that was



underlain by alluvium to the maximum depth explored in their borings, approximately 40 feet below the existing ground surface. The dune sands consisted of predominantly medium dense to dense sand with varying fines content. Layers (less than 2 feet thick) of loose sand, silt and clay (possibly interbedded alluvium) encountered at various depths within the CPT soundings between approximately 10 and 17 feet below the existing ground surface.

**Alluvium.** Alluvium was encountered beneath the dune sand deposits to the maximum depth explored, approximately 55 feet below the existing ground surface in CPT-2. The alluvium consisted mainly of interlayered firm to stiff clay and silt and medium dense to dense sand. Layer of firm to stiff clay and silt are interbedded within the alluvium. An approximate 6-foot thick layer of medium dense gravel with sand and clay was encountered in ESP boring B-2. GTC and ESP encountered stiff to very stiff clay in selected CPT soundings and below a depth of approximately 25 to 30 feet.

### 3.4 GROUNDWATER

Groundwater was encountered at a depth of approximately 10 feet below the ground surface in borings performed by ESP in October 2009. Groundwater was encountered at depths between approximately 7 and 13 feet below the ground surface in borings performed by GTC in August 1980. We assumed a groundwater depth of 10 feet below the existing ground surface in our evaluation of the site conditions. Variations in surface and groundwater conditions will likely occur as a result of water table level fluctuations and migration of the mouth of Morro Creek, possible tidal and ocean front influences, changes in precipitation, irrigation, runoff, and other factors.

## 4. GEOLOGIC HAZARDS

The following geologic hazard assessment is based on review of previous studies performed at the site, published geologic maps, historical aerial photographs, and observations made during our site visits. Our assessment was performed to evaluate the potential for the project site to be impacted by geologic hazards.

### 4.1 SEISMICITY AND STRONG GROUND MOTION

#### 4.1.1 Historic Seismicity

The site is located within a seismically active region of Central California. A summary of Magnitude 2 and greater seismic events recorded from 1933 through March 2008 by the Advanced National Seismic System (ANSS, 2008) and Clark et al. (1994) are presented on Plate 6 - Historical Seismicity Map. Examples of relatively strong ground motion that has reportedly been experienced near the project area are the seismic events of 1830, 1857, 1913, 1916, 1917, 1952, 1966, 1980, and 2003.

The 1830 event is estimated to be an approximately M5 earthquake that occurred from a poorly located source near San Luis Obispo. The effects of the 1830 event were generally observed between the Los Osos and Rinconada faults. The 1857 event (the Fort Tejon



earthquake) occurred on the Mojave segment of the San Andreas fault, and reportedly resulted in damage in central and southern California. The 1913 event is estimated to be an approximately M5 earthquake that occurred along the southwestern margin of the San Luis/Pismo block near Arroyo Grande. The 1916 event is estimated to be an approximately M5 earthquake that occurred near Avila, possibly along the Los Osos fault or faults along the southwestern margin of the San Luis/Pismo block. The 1917 event is estimated to be an approximately M5 earthquake that occurred near Lopez Canyon between the Rinconada and West Huasna faults. The 1952 earthquake is estimated to be a M6 earthquake occurring within the Nacimiento Fault Zone. The 1966 event (the Parkfield earthquake) is estimated to be an approximately M6.0 earthquake that occurred on the San Andreas fault. The 1980 event is estimated to be an approximately M5 earthquake that occurred offshore near Point Sal along the Casmalia fault zone, and near its intersection with the Hosgri fault.

The epicenter of the 2003 San Simeon earthquake was located approximately 26 miles northwest of the project site. A ShakeMap for the site developed by the California Integrated Seismic Network (CISN 2003) shows that the project site likely experienced moderate ground motion during the M6.5 earthquake. The peak horizontal ground acceleration at the project site, as estimated from the ShakeMap, was likely about 0.15g.

#### **4.1.2 Ground Motion Study**

The ASCE (2005) design code and the California Building Code (CBC 2007) require structures to be designed for earthquake effects that are two-thirds ( $\frac{2}{3}$ ) of the Maximum Considered Earthquake (MCE) effects. The MCE is defined by comparing a probabilistic MCE, deterministic MCE and some lower boundaries.

Based on subsurface information presented by Earth Systems Pacific (ESP 2009) and GTC (1980), a soil profile was assumed for the attenuation relationships applied in the seismic hazard analyses. We approximated an average site shear wave velocity of 890 feet per second (270 meters per second) for the upper 100 feet (30 meters) of subsurface material. We performed a ground motion study in accordance with ASCE (2005) and the 2007 CBC. The estimated seismic conditions for the MCE were a magnitude 7.34 earthquake having a peak ground acceleration of approximately 0.34g at the site. The estimated MCE values are similar to those estimated by ESP: a 0.33g peak ground acceleration and magnitude 7.56 earthquake. The MCE is stronger than the estimated seismicity from the 2003 San Simeon Earthquake having an estimated 0.15g peak ground acceleration (approximately  $\frac{1}{2}$  the MCE) for the magnitude 6.5 event. Plotted acceleration response spectra will be provided in the design-level report for the project.

#### **4.2 SURFACE FAULT RUPTURE**

The site does not lie within an Alquist-Priolo fault rupture hazard zone. Based on our data review, no known active or potentially active faults trend toward or traverse the project site. Therefore, the potential for ground rupture to occur at the site appears to be low.



### 4.3 LIQUEFACTION

Liquefaction is the loss of soil strength due to an increase in soil pore water pressures that results from seismic ground shaking. Liquefaction typically occurs within relatively loose to medium dense sandy soil that is below the groundwater table. If those conditions are present and strong ground motion occurs, portions of the soil column could liquefy, depending upon the intensity and duration of the strong ground motion. Liquefaction analyses were performed for the MCE (M7.34, 0.34g) using CPT data from ESP (2009) and an assumed groundwater depth of 10 feet below the existing ground surface. A second analysis was performed to evaluate the potential for liquefaction using the estimated seismic data for the San Simeon Earthquake and to compare those results to the MCE.

The results of our liquefaction analyses for soils encountered in the CPT soundings is summarized graphically on Plate 6. The red line on the plate is the estimated CPT tip resistance that is needed to resist liquefaction for the seismic conditions considered. A blue zone between the red line and the CPT tip resistance indicates a zone of potentially liquefiable soil.

For the MCE, zones of soil were encountered in the CPT soundings that are considered potentially liquefiable. Potentially liquefiable soil conditions were generally within approximately 1- to 4-foot thick layers of loose to medium dense sand. The potentially liquefiable sand layers appear at two general locations in CPT-1 through CPT-3; near the groundwater level between approximately el. 10 to 3 feet and within the interbedded sand, silt, and clay between approximate el. -20 to -33. CPT-4 also encountered potentially liquefiable layers between approximate el. -2 to -10 feet. The potentially liquefiable soil layers were encountered as shallow as the depth to groundwater, 10 feet below the existing ground surface.

Plate 7 summarizes liquefaction analyses based on the estimated ground motion for the San Simeon Earthquake. The analysis was performed using a M6.5 for the San Simeon Earthquake with a corresponding peak ground acceleration of 0.15g. The results of the liquefaction analysis for the San Simeon Earthquake is summarized graphically on Plate 7. The results suggest the soil encountered in the CPT soundings would have a low potential for liquefaction using the estimated peak ground acceleration for the San Simeon Earthquake. The penetration resistance in each of the soundings exceeded the minimum CPT resistance that would be needed to cause liquefaction.

The results of the analyses are consistent with our discussions with plant personnel (Mr. Bruce Keogh, Mr. Les Girvin) whose accounts of the San Simeon Earthquake did not include evidence of liquefaction or seismic settlement. Plant personnel reported vertical cracks in the masonry walls of the electrical room and around a door in the administration building, and some separation near the IPS (influent pump station).

### 4.4 SEISMIC SETTLEMENT

Seismic settlement can occur in loose to medium dense, saturated or unsaturated soils as a result of consolidation or shakedown of the soil matrix in response to seismic shaking.



Loose to medium dense sand encountered within the dune sand deposits and alluvium is prone to seismic settlements in response to the estimated ground motion.

Seismic settlement analyses were performed in association with the liquefaction evaluation for the MCE summarized on Plate 6. The black line shows the estimated cumulative seismic settlement between the bottom of the sounding and the ground surface considering all soil layers. We estimate that the cumulative seismic settlement due to liquefaction is approximately 1 ½ to 3 ½ inches for the MCE, the majority of which is estimated to occur above el. -10 feet (within about 15 to 30 feet of the ground surface). However, liquefaction of soil layers within the lower portions of the soil column could limit seismic settlement. We estimate that an additional small amount (less than about ½-inch) of seismic settlement could occur in the sand layers above the groundwater table, for a total of up to about 4 inches of estimated settlement for the MCE. The estimated seismic settlement is expected to occur differentially over the site as a result of the complex and heterogeneous composition of the alluvium. As shown on Plate 7, of the estimated seismic settlement for the San Simeon Earthquake ground motion is negligible (less than about 1/8-inch).

#### **4.5 LATERAL SPREADING**

Lateral spreads can occur in loose, soft, or moderately dense and weakly cemented soils, or in association with liquefaction. We estimate there is potential for approximately 4 feet of lateral spread displacement to occur at the site based on procedures by (Youd, et. Al 2002), using the existing subsurface data, the results of our ground motion study, and if there were continuous liquefiable soil layers at the site that extended to the beach front (which appears unlikely). We therefore conclude for the preliminary evaluation that the potential for lateral spreading is uncertain, and should be further evaluated during the design-level to evaluate if there are sufficient, continuous liquefiable layers to present a significant hazard to the plant.

The preliminary analyses assumed continuous soil layers, and a gently sloping ground condition of approximately 0.8% based on elevations in Wallace Group (2009) report. We used the design earthquake moment magnitude of 7.34 and the modal R-distance of 8.5 miles (13.7 kilometers) from the probabilistic seismic hazard analysis using the USGS 2008 Interactive Disaggregation (beta) website. Average fine content and mean grain size were estimated from the results of laboratory testing by GTC and ESP for a thickness of liquefiable soil with  $N_{1(60)}$  less than 15 blows per foot of approximately 3 feet (1 meter).

#### **4.6 SUBSIDENCE AND COLLAPSE**

The site is located near the coast with shallow groundwater and is not in an area where the withdrawal of subsurface fluids is known to have caused ground subsidence. The soils previously encountered at site generally have low compressibility, and should not be susceptible to significant compression due to lowering of local water levels. The evaluation of the potential for subsidence or settlement, such as due to localized dewatering of soil layers, should be evaluated further during the design-level field exploration.



#### **4.7 LANDSLIDING/SLOPE INSTABILITY**

The project site is on relatively flat terrain away from slopes in a developed area of Morro Bay. It is therefore our opinion that there is a low potential for subsidence to impact the potential project site.

#### **4.8 EROSION**

Graded cut and fill slopes associated within the site development will be subject to sheet and rill erosion. Erosion of soils can be accelerated where soils are exposed directly to runoff and/or areas of concentrated storm runoff, such as at culvert outlets. Site drainage and landscape improvements can be designed to reduce the potential for soil erosion.

#### **4.9 EXPANSIVE SOILS**

Soil conditions near the ground surface generally consist of sand that have a low potential for expansion. No special mitigation to address expansive soils is anticipated. Naturally OCCURRING asbestos

Naturally occurring asbestos (NOA) is common in serpentine rock throughout San Luis Obispo County. The California Air Resources Board has identified serpentine rock as having the potential to contain asbestos. The dune sand and alluvium that underlie the site would not contain minerals classified as having a significant source of NOA. Therefore, it is our opinion that there is a low potential for NOA to impact the project.

#### **4.10 FLOODING AND INUNDATION**

A flood hazard analysis was performed for the site by the Wallace Group (2009). The Wallace Group identified that the site is within a designated FEMA flood zone and estimate flood elevations and flows associated with Morro Creek. We understand that the MWH design for the plant will include raising site grades and structures to mitigate flooding hazards for the project.

Inundation can occur when a large body of water is released typically in response to a failure or breach in a dam. The San Luis Obispo County Office of Emergency Services has a web site with inundation maps for dams and levees within the San Luis Obispo County<sup>1</sup>. The site is not downstream of large dams that could inundate the site in response to breach or failure. The nearest jurisdictional dam to the site is the Whale Rock Dam near Cayucos, located about 3 miles north of the site. The inundation zone for Whale Rock Dam does not extend near the site.

During reconnaissance of the watershed above site performed using Google Earth (www.google.com), we observed approximately 23 acres of agricultural ponds on a hill top approximately 5 miles upstream of the site. The ponds are located above the avocado orchards on the north side of Highway 41. The ponds are likely not jurisdictional, as determined by the

<sup>1</sup> [http://www.slocounty.ca.gov/OES/plans/Dam\\_and\\_Levee\\_Plan\\_Maps.htm](http://www.slocounty.ca.gov/OES/plans/Dam_and_Levee_Plan_Maps.htm)



California Division of Safety of Dams, because there is no record of an inundation map for the reservoirs which would be required for a jurisdictional dam. Given the location and size of the reservoirs it is unlikely the reservoirs present a significant inundation hazard to the site, however we do not have any other information about the reservoirs, their design or construction.

#### **4.11 TSUNAMIS**

Tsunamis are ocean waves generated in response to earthquakes. Tsunami waves can be generated by near or far field earthquakes, and a series of waves from a single earthquake can travel across the ocean in response to an earthquake carrying with them massive amounts of water. The Morro Bay-Cayucos Wastewater Treatment Plant is located approximately 20 feet above sea level and on coastal dunes that front the Pacific Ocean and Morro Strand State Beach. The Tribune news paper<sup>2</sup> reported that tsunami run-ups of several feet were recently observed in Morro Bay harbor in response to the February 2010 Chilean M8.8 Earthquake.

The State of California (2009) has created tsunami inundations maps for emergency planning, and shows the site as being within a designated tsunami inundation area. The map designates a potential runup to approximately elevation 34 feet in the site vicinity. The site is within the inundation zone indicated on the map. The map notes that the designated zone is not a complete inundation of the entire coastline below el. 34 feet, but designates areas that could be susceptible to or could need to be evacuated in response to a tsunami. The County and City of Morro Bay do participate in the tsunamis warning system described on the County web site.

### **5. CONCLUSIONS AND RECOMMENDATIONS**

We prepared the conclusions and recommendations for this report based on our preliminary geotechnical evaluation of the site conditions and a review of available geotechnical information for the existing plant. The conclusions are preliminary and subject to change based on information that will be obtained during the design-level geotechnical evaluation.

#### **5.1 SUMMARY OF FINDINGS**

- ❖ Based on existing data, the site is underlain primarily by dune sand deposits and alluvium consisting mainly of medium dense to dense sand and soft to stiff clay and silt. Previous grading performed as part of the site's development has resulted in flattening of the dunal terrain that previously occupied the site, filling of low areas, and cuts in to the dune sand. Groundwater was encountered at depths ranging between approximately 7 and 13 feet below the existing ground surface in previous investigations.
- ❖ The site is located within a seismically active region of Central California that has been subjected to strong ground motions in response to historical earthquakes that have occurred in relatively close proximity to the site, such as the M6.5 San Simeon Earthquake in 2003. There was limited structural damage to the plant in response to

<sup>2</sup> <http://www.sanluisobispo.com/2010/02/27/1047602/chile-earthquake-causes-surge.html>



- the 2003 earthquake; however, we know of no reports to suggest there was evidence of liquefaction or seismic settlement in response to the earthquake. Our analyses suggest that the ground motions from the San Simeon Earthquake were insufficient to trigger liquefaction at the site and were also less than the ground motions that will be used for design. Plant personnel reported vertical cracks in the masonry walls of the electrical room and around a door in the administration building, and some separation near the IPS (influent pump station). The design of the facility should consider the potential for the site to be subject to strong ground motion in response to nearby or regional earthquakes.
- ❖ The design earthquake (MCE) is a M7.34 event having a corresponding peak ground acceleration of about 0.34g. Based on the conditions encountered, there is a potential for liquefaction and seismic settlement to impact the design of the proposed improvements. The potentially liquefiable soils were mainly encountered in the sandy soils above el. -10 feet (within the upper 15 to 30 feet of the site) and in thin (less than 1 foot) isolated sand layers encountered below clayey alluvium at depths of about 40 to 45 feet. The liquefaction hazards appear to vary significantly over the site, and consideration and mitigation for the hazard could vary during design.
  - ❖ The excavation for selected below grade structures may extend below potentially liquefiable soils or help limit the impact of seismic settlement that could occur in association with liquefaction. If design of the proposed improvements cannot withstand the estimated seismic settlements, subsurface stabilization such as deep foundations, vibrocompaction with stone columns, excavation and replacement, or other methods could be used to help mitigate the hazard.
  - ❖ The site is located within designated flood and tsunami inundation zones. Development should consider the proximity of the site to the Pacific Ocean and nearby Morro Creek and the potential for flood and tsunami inundation.
  - ❖ We understand that up to 7 feet of new fill will be placed to raise the site above estimated flood levels. We preliminary estimate (using presumptive values) that placement of the fill could cause approximately 3 to 9 inches of settlement due to compression of relatively soft to firm clay layers encountered in the CPT soundings, and that the settlement could take several months to occur. A settlement waiting period may be needed to allow for the settlement to occur prior to construction of the improvements. The design and construction of the proposed improvements should consider settlement of the underlying soils as a result of placement of the new fill.
  - ❖ If design of the proposed improvements can withstand the estimated seismic settlement or subsurface stabilization is performed in advance of their construction, we expect that typical 1- to 2-story structures, below grade structures, and moderately loaded structures could be supported on shallow foundations supported on compacted fill. Deep foundations or ground improvement can be used to help limit settlement, and should be evaluated as part of the design-level geotechnical study. Relatively heavy structures such as tall buildings or large tanks will need to consider the potential for total and differential settlement of the underlying fine



grained layers encountered at the site and may require special attention relative to settlement and seismic hazards during design.

## 5.2 SEISMIC CONSIDERATIONS

### 5.2.1 Preliminary Seismic Data

Structures should be designed to resist the lateral forces generated by earthquake shaking in accordance with the building code and local design practice. This section presents seismic design parameters for use with the 2007 California Building Code (CBC). The CBC is based on the 2006 International Building Code (IBC). The site coordinates and USGS interactive web page “Seismic Design Values for Buildings” (USGS 2008) was used to obtain seismic design criteria. Based on these criteria, the preliminary seismic data for use with code-based designs are:

**Preliminary Seismic Data**

California Building Code	Seismic Parameter	Value
Site Coordinates	Latitude, degrees	35.3799
	Longitude, degrees	-120.8604
Section 1613.5.1 Figure 1613.5	S <sub>s</sub> , Seismic Factor, Site Class B at 0.2 sec	1.246
	S <sub>1</sub> , Seismic Factor, Site Class B at 1 sec	0.482
	Site Class	S <sub>D</sub> , Stiff soil
Section 1613.5.3 Table 1613.5.3(1)	F <sub>a</sub> , Site Coefficient for Site Class D	1.002
Section 1613.5.3 Table 1613.5.3(2)	F <sub>v</sub> , Site Coefficient for Site Class D	1.518
Section 1614A	S <sub>MS</sub> , Site Specific Response Parameter for Site Class D at 0.2 sec.	1.126
	S <sub>M1</sub> , Site Specific Response Parameter for Site Class D at 1 sec.	0.630
	S <sub>DS</sub> = 2/3 S <sub>MS</sub>	0.751 (S <sub>DS</sub> value from project design response spectrum in design level report should be used for design)
	S <sub>D1</sub> = 2/3 S <sub>M1</sub>	0.420 (S <sub>D1</sub> value from project design response spectrum in design level report should be used for design)

Based on the seismic design parameters calculated by the USGS interactive web page “Seismic Design Values for Buildings” (USGS, 2008), and per 2007 CBC Section 1613.5.6, structures of Occupancy Category I, II, III, and IV (defined in 2007 CBC Table 1604.5) should be designed according to Seismic Design Category “D”. Plotted acceleration response spectra will be provided in the design-level report for the project.



### **5.3 LIQUEFACTION AND SEISMIC SETTLEMENT**

Subsoil stabilization using vibro-replacement with stone columns was performed at the site for improvements to the plant in the 1980's. The stabilization was specified to densify and decrease the liquefaction potential of soils under the site. Plate 2 shows the approximate limits of subsoil stabilization performed in specific areas of the existing plant, north of the currently proposed improvements. Because the San Simeon Earthquake appears to have generated ground motions insufficient to cause liquefaction at the site, the historic data is not representative of the liquefaction hazards that could impact the site for the design earthquake event or evaluate the benefits of the past subsoil stabilization.

As discussed in Sections 4.3 and 4.4, zones of potentially liquefiable soil were encountered in the CPT soundings that vary in continuity and aerial extent. The preliminary estimates of seismic settlement for soil conditions at the site range from small amounts of settlement to up to approximately 4 inches without grading. Because of the heterogeneous nature of the soils encountered, the estimated total settlement is likely to occur differentially over the site and some structures. Below grade structures may locally extend below potentially liquefiable soil layers or help to reduce the estimate settlement; however, further evaluation of that scenario should be evaluated during the design-level geotechnical study.

Some building structures can typically be designed with stiffened slabs or grade beams to help tolerate differential and seismic settlement. However, if the design of the proposed improvements cannot withstand the estimated seismic settlement, structures may need to be supported on deep foundations, excavation and replacement, or ground modification methods such as vibro-compaction with stone columns (such as the subsoil stabilization previously performed) could be performed in advance of construction of structures to reduce the potential seismic settlement and liquefaction. Because of the heterogeneous nature of the site, the foundation support, seismic settlement hazard, and mitigation will likely need to be performed on a site-by-site, structure-by-structure basis during design.

### **5.4 SETTLEMENT FROM NEW FILL CONSIDERATIONS**

We understand that up to approximately 7 feet of new fill will be placed in areas of the site to raise it out of the flood plain. Placement of the new fill should consider the potential for settlement due primarily to consolidation of the soft to firm silt and clay layers encountered beneath the site. We preliminarily estimate that about 3 to 9 inches of post-construction settlement could occur at various locations over the site due to placement of the fill, and that the settlement could take several months or more to occur. The use of wick drains to accelerate the settlement, settlement waiting periods, and better characterization of the subsurface conditions should be addressed in the design-level report. The settlement will likely need to be allowed to occur prior to construction of the improvements to reduce the potential for differential settlement of the structures and the need for deep foundations.



## **5.5 SITE PREPARATION AND GRADING CONSIDERATIONS**

### **5.5.1 Clearing and Grubbing**

Clearing and grubbing should be provided to prepare the site for grading. Demolition areas within the proposed limits of above grade and below grade structures should be cleared of old foundations, existing pavements, and soils disturbed by the construction. Depressions or disturbed areas left from clearing and grubbing should be replaced with compacted fill.

### **5.5.2 Above Grade Structures and Buildings**

The near surface soils encountered generally consisted of loose to medium dense sand. Site preparation and grading will be needed to provide relatively uniform support for at-grade structures, buildings supported on shallow foundations, equipment slabs or other improvements. Grading would likely consist of removing the upper approximately 3 to 5 feet of the existing soils and replacing that material with compacted fill. The excavation should typically extend at least 5 feet outside the proposed building or structure footprint. Prior to placing the compacted fill, the bottom of the excavation should be graded such that a relatively uniform thickness of fill will be provided below the foundations, and be compacted to prepare for subsequent fill placement.

### **5.5.3 Below Grade Structures**

We expect that excavations for below grade structures will extend to approximately 10 to 20 feet below the existing ground surface. Based on the results of our field investigation, we expect that the deep excavations below approximately 10 feet will likely encounter groundwater and/or wet subgrade conditions. For preliminary design, we recommend the design consider that approximately 1 to 2 feet of open graded gravel or permeable material, wrapped in geotextile, will be provided over the bottom of the excavation to stabilize the subgrade and provide a suitable working mat for construction of below grade structures. Dewatering and shoring systems will likely need to be provided in association with the construction of below grade structures as discussed in this report.

## **5.6 FOUNDATION DESIGN CONSIDERATIONS**

Site conditions relating to seismic settlement and consolidation of the soft ground due to fill placement should be addressed prior to designing structure foundations as previously discussed in this report. If liquefaction and post-construction settlement is mitigated in advance of foundation construction, below grade and lightly loaded structures can likely be supported on shallow foundations.

We expect that typical 1-to 2-story and moderately loaded structures (wall loads less than about 4 kips per foot, column loads less than 50 kips) can likely be supported on spread footing foundations bearing in compacted fill materials. Larger structures, if proposed, should be evaluated during the design-level and may need to consider the use of deep foundations to limit settlement. Below grade structures (sedimentation basins and oxidation ditches) typically impose less load on the foundation support soil and can likely be supported on a thickened mat



type foundation or slab. If those structures are to be constructed above existing site grades, they will likely need to be support on deep foundation or improved ground. For preliminary design, spread footing foundations founded in compacted fill or mat foundation for below grade structures can be designed using a maximum allowable bearing pressure of 2,000 to 3,000 pounds per square foot. Continuous footings should be designed with a width of at least 1 foot. Isolated pad footings should be at least 1.5 to 2 feet square. Spread footing foundations should be embedded at least 1.5 feet into compacted fill material, and at least 2 feet below the lowest adjacent exterior grade or finished slab elevation whichever is deeper.

The recommended maximum allowable bearing pressure can typically be increased for each additional foot of footing width or embedment exceeding the recommended minimums depending on the depth to groundwater at the footing location. The toe pressure for retaining walls or eccentrically loaded footings can exceed the recommended maximum allowable bearing pressure provided the resultant static force acts within the middle third of the footing.

### **5.6.1 Settlement Considerations**

Structures will result in additional settlement of the foundation support soil in addition to settlement associated with seismic hazards and fill placement that were previously discussed in this report. For structures whose foundations are placed near existing grade on compacted fill material, settlement of the foundation soil is likely to occur in response to elastic loading of the soils and as a result of compression of the compacted fill material itself. We expect that total and differential settlements for footings bearing in compacted fill will generally be less than 1-inch for the maximum allowable bearing pressures described above and one to two-story above grade structures.

Relatively large or heavily loaded above and below grade structures will need to consider total and differential settlements of the underlying soft to stiff fine grained layers encountered within the sand. If soft soil is present near the base of below grade structures, the foundation soil could be prone to greater amounts of settlement. Settlement of below grade structures should be further evaluated in our design level geotechnical report based on the anticipated foundation types and depths.

### **5.7 GRADED SLOPES**

Graded cut and fill slopes likely can be designed to a slope inclination of 2h:1v or flatter. Retaining structures or reinforced slopes can be provided to allow for steeper slopes, if needed.

### **5.8 DRAINAGE AND EROSION CONSIDERATIONS**

Drainage should be provided such that surface water does not run over slopes or pond on pavements, slabs, or adjacent to foundations. Downspouts should be provided to collect roof drainage and direct the water to drainage pipes or areas away from the building. Landscaping and maintenance of slopes should be provided to assist vegetation to be established on slopes, and reduce the potential for erosion. The top of slopes should be graded to direct drainage away from the slopes, or be provided with dikes and ditches that will direct surface water to



controlled drainage structures. Concentrated flows and runoff should not be permitted to discharge onto slopes. Down drains, solid pipes, or lined ditches should be provided to carry water to the base of slopes. Energy dissipation and erosion control devices should be provided at the outlet of drainage pipes and in areas of concentrated flow and runoff to reduce the potential for erosion.

## **5.9 CONSTRUCTION CONSIDERATIONS**

### **5.9.1 Excavation**

The dune sand deposits and alluvium encountered beneath the project site consist of medium dense to dense sand and firm to stiff fine-grained materials. These types of soils likely can be excavated with typical heavy-duty construction equipment in good working order.

### **5.9.2 Use of On-site Soil**

On-site soil consisting of sandy-type material that is free of organics, oversized rocks, pavements, and other deleterious materials should be suitable for use as compacted fill in building and pavement areas. Sandy materials should also be suitable for placement as backfill around below grade structures. The clayey on-site soils should not be considered suitable for use as structure backfill, or fill to be placed below building and pavement areas. The on-site soils likely are not suitable for select material such as backfill for pipelines and base for roadways. On-site soil excavated from below the groundwater table will likely not be suitable for compacted fill as excavated. Drying or treating the soils may help to reduce the water content of the excavated material and make the material suitable for compaction.

### **5.9.3 Dewatering**

We expect that excavations extending approximately 5 to 10 feet or more below existing site grades (depending on location) could encounter groundwater at the time of construction. The depth to groundwater can fluctuate at the site due to its proximity to the ocean and nearby Morro Creek. The contractor should be responsible for both designing and maintaining the dewatering system for construction. Gravel will likely need to be placed over the base of excavations to help stabilize the wet subgrade and provide a working mat for construction. Dewatering facilities, such as sump pits, wells, and well points should be designed with filters such that sand and fine-grained materials are not removed from the soil during dewatering operations. Dewatering facilities should be installed prior to beginning excavation, and time should be allowed for lowering of the groundwater table before beginning excavation. Shoring systems, such as continuous sheet piling, should be embedded adequately below the base of the excavation to cutoff groundwater and help stabilize the base of the excavation.

### **5.7.2 Temporary Slopes and Shoring**

The soil encountered in previous investigations consists of loose to medium dense sand and soft to firm clay and silt and should not be considered capable of maintaining a stable vertical slope. Temporary slopes should be braced or sloped according to the requirements of



OSHA. Based on review of OSHA guidelines and the soil conditions encountered within the anticipated depths of excavation, temporary slopes without shoring should be excavated at inclinations of 1.5h:1v or flatter. Vertical shoring consisting of sheet piles or similar construction systems can be provided in lieu of flattening slopes, if needed, to limit the size of the excavation or to protect adjacent structures.

Where excavations are in close proximity to existing structures, shoring systems should be designed with consideration of the adjacent foundation and structural loads. The shoring should be designed for the additional load and have provisions to reduce the potential for settlement of adjacent structures, pipelines, or roadways. Generally, surcharge loads from existing structures can be neglected if the structure is behind a 1:1 line projected upwards from the nearest bottom edge of a shored trench excavation, or the building is setback at least 10 feet horizontally from properly sloped excavations. If excavations are made within this zone of influence, the contractor should design the slope or shoring system for the additional surcharge load.

## 6. CONTINUATION OF SERVICES

The geotechnical considerations in this report are intended for preliminary planning and estimating costs associated with developing the site. The recommendations are preliminary based on existing subsurface information. A more comprehensive design-level geotechnical investigation will be completed in support of the final design of the proposed improvements.

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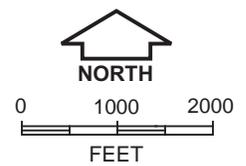
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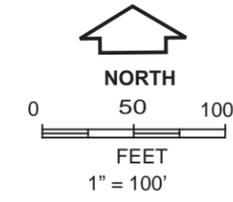
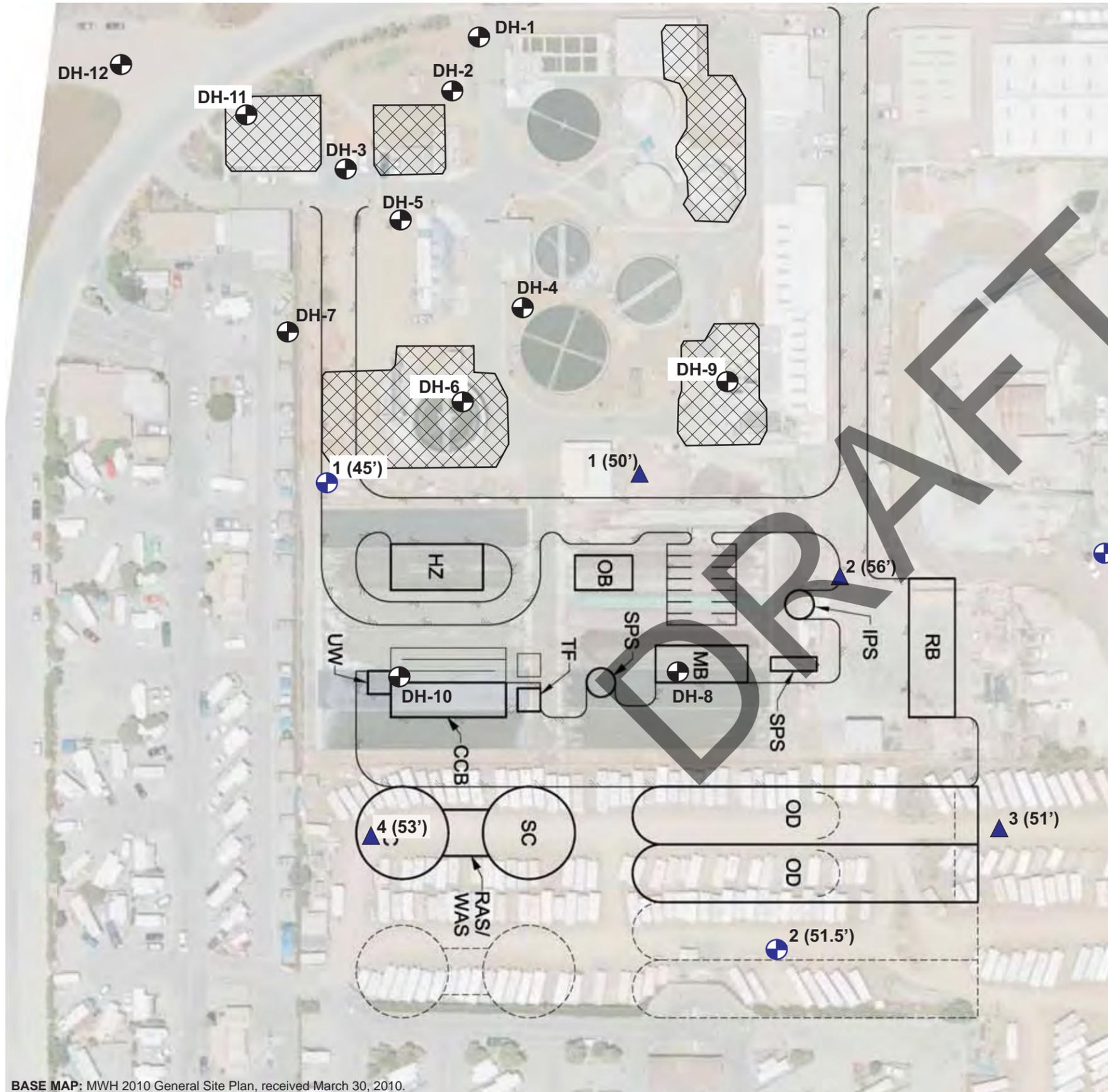
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BASE MAP SOURCE: USGS 7.5' Morro Bay North 1995 Quadrangle.



**VICINITY MAP**  
Morro Bay- Cayucos WWTP Upgrade Project  
160 Atascadero Road  
Morro Bay, California



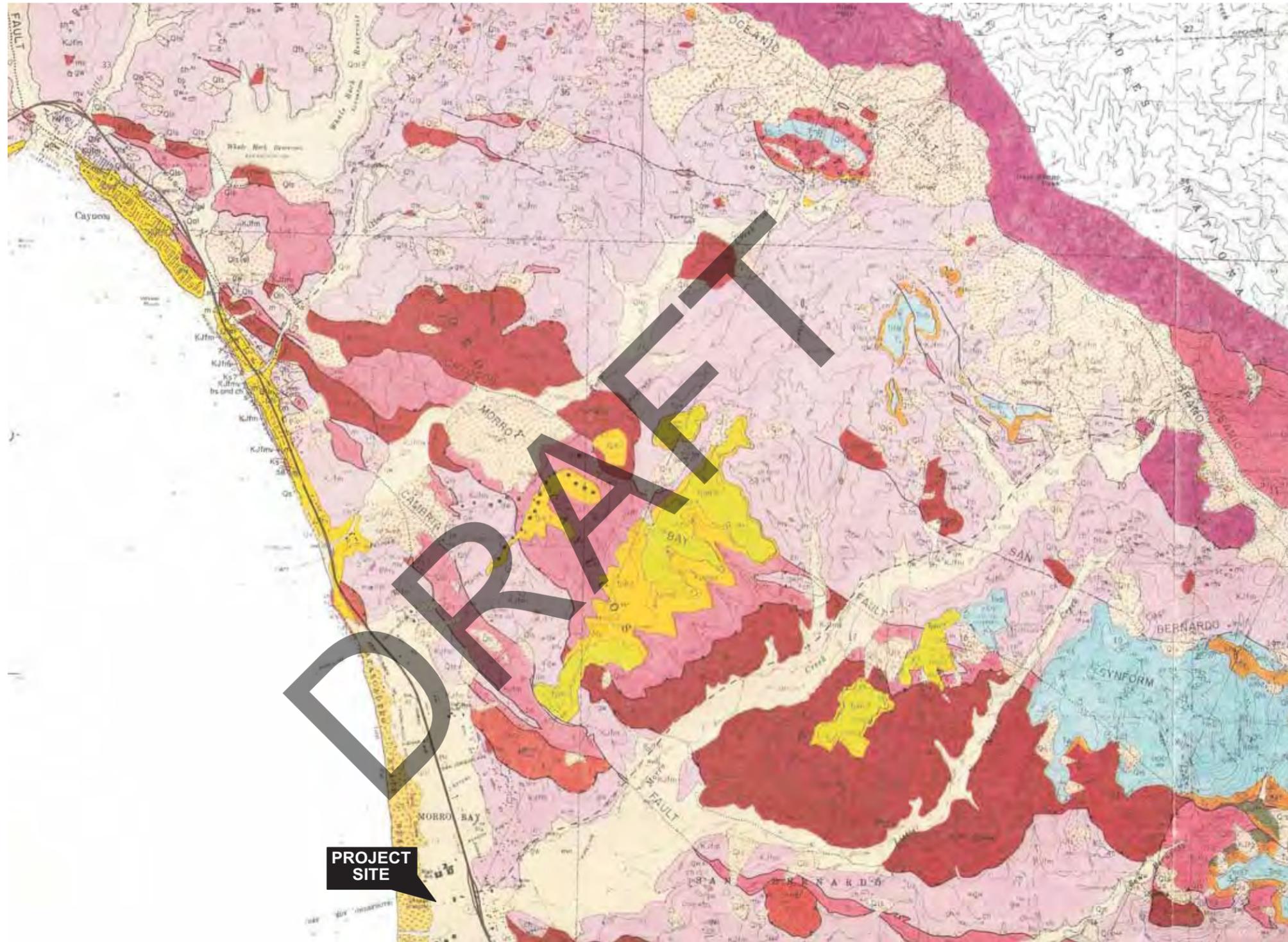
**LEGEND**

- 1 (20') Earth Systems Pacific hollow-stem auger boring - October 2009
- 1 (20') Earth Systems Pacific CPT sounding - October 2009
- DH-1 Geotechnical Consultants, Inc. boring - September 1980
- Limits of 1983 subsoil stabilization
- CCB** CHLORINE CONTACT BASIN
- HZ** HOUSEHOLD HAZARDOUS WASTE
- IPS** INFLUENT PUMP STATION
- MB** MAINTENANCE BUILDING
- OB** OPERATIONS BUILDING
- RAS** RETURN ACTIVATED SLUDGE
- RB** RESIDUALS BUILDING
- SC** SECONDARY CLARIFIERS
- SP** STANDBY POWER
- SPS** SECONDARY PUMP STATION
- TF** TERTIARY FILTER
- UW** UTILITY WATER
- WAS** WASTE ACTIVATED SLUDGE

All locations and dimensions are approximate.  
Dimensions and layout may be distorted relative to overlay on aerial photography.  
Plant layout is preliminary and subject to change.

**SITE PLAN**  
Morro Bay - Cayucos WWTP Upgrade Project  
160 Atascadero Road  
Morro Bay, California

MAP UNITS	
<b>Qal</b>	Alluvial deposits
<b>Qs</b>	Dune sand deposits
<b>Qls</b>	Landslide deposits
<b>Qpr</b>	Paso Robles Formation
<b>Tpm</b>	Pismo Formation, Miguelito member
<b>Tpe</b>	Pismo Formation, Edna member
<b>Tpes</b>	Pismo Formation, Edna member, siltstone
<b>Top</b>	Obispo Formation, perlitic glass and breccia
<b>Tr</b>	Rincon Shale
<b>Td</b>	Dacite, porphyritic-aphanitic dacite
<b>Tdf</b>	Dacite, fine-grained dacite or flow facies
<b>KJfg</b>	Franciscan Rocks, Graywacke and micrograywacke
<b>KJfmv</b>	Franciscan Rocks, Metavolcanics
<b>KJfm</b>	Franciscan Rocks, Mélange
<b>ch</b>	white, red, or green chert
<b>mv</b>	metavolcanic
<b>gw</b>	graywacke
<b>s</b>	Serpentinite



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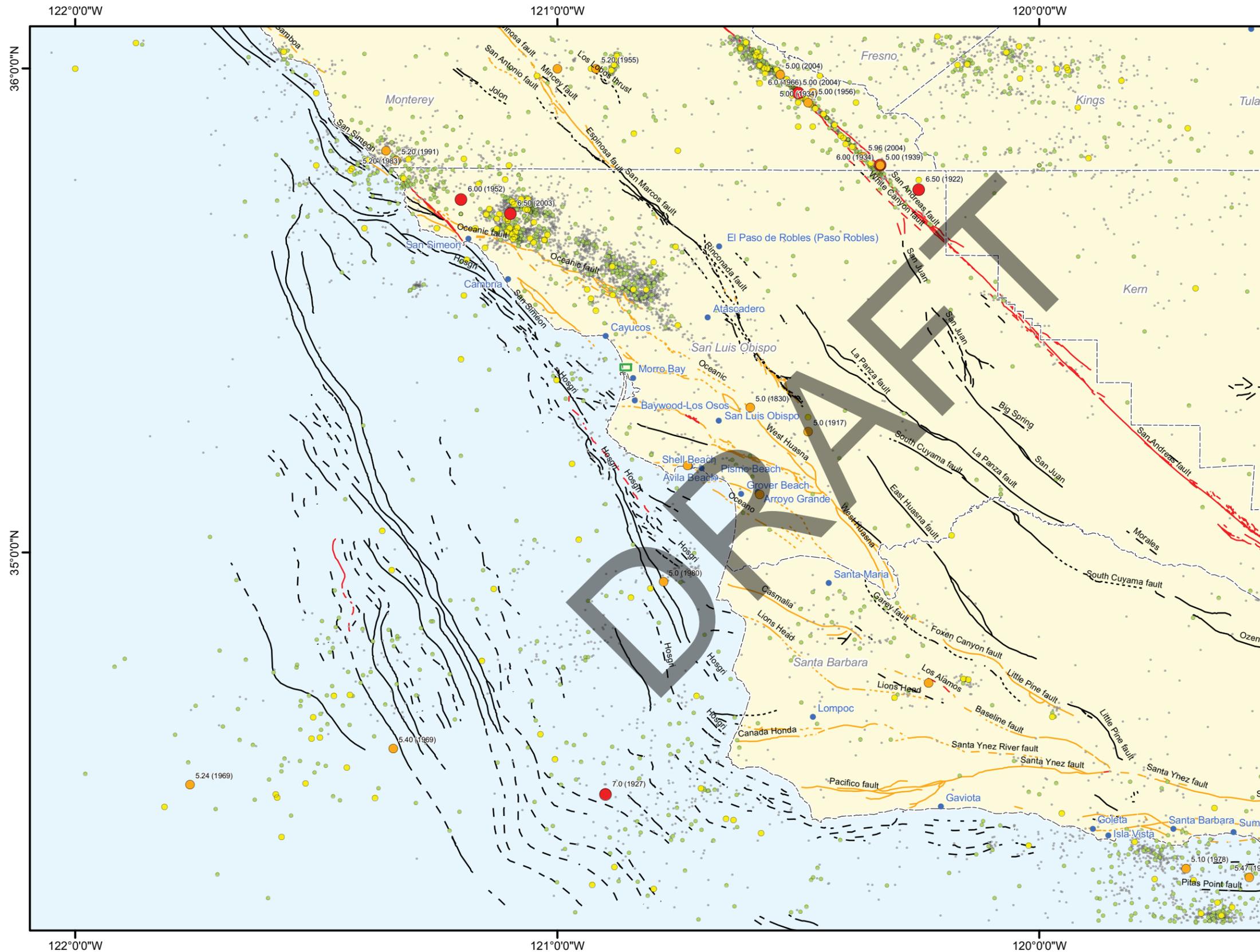
**BASE MAP SOURCE:** Geologic Map of the the San Luis Obispo-San Simeon Region, USGS Misc. Investigations Series Map I-1097, Sheet 3 of 3 (Hall, et al., 1979).

LEGEND	
---?---?---	Contact - Dashed where approximately located or inferred; queried where doubtful; dotted where concealed
---?---?---	High-angle fault - Dashed where approximately located or inferred; dotted where concealed and inferred; queried where uncertain. Arrows show relative direction of movement on cross sections when known; queried where uncertain.
---?---?---	Thrust or reverse fault - Dashed where approximately located or inferred, dotted where concealed and inferred; queried where concealed or doubtful. Sawteeth on upper plate. Dip of fault plane between 30° and 80°

---?---	Photo lineament - Queried where uncertain
---?---	Synform - Trace of axis at surface. Dashed where approximately located. Flanks coverate downward in folds and in rocks whose stratigraphic sequence is unknown.
---?---	Antiform - Trace of axis at surface. Dashed where approximately located. Flanks diverge downward in folds and in rocks whose stratigraphic sequence is unknown.
---?---	Strike and dip of beds uncertain

Marker beds	
○-○-○-○-○	Conglomerate or gravel bed
---?---	Sandstone
---?---	Siltstone or diatomaceous
△-△-△-△-△	siltstone
▲-▲-▲-▲-▲	Tuff
30 ↘	Strike and dip of flow banding
x 6193	Megafossil locality - U.C.L.A. locality number
Vollmer	Ranch name/property owner

**REGIONAL GEOLOGIC MAP**  
Morro Bay - Cayucos WWTP Upgrade Project  
160 Atascadero Road  
Morro Bay, California



**Legend**

Project Vicinity

**Earthquake Magnitude**  
Magnitudes equal to and greater than 5 are labeled.

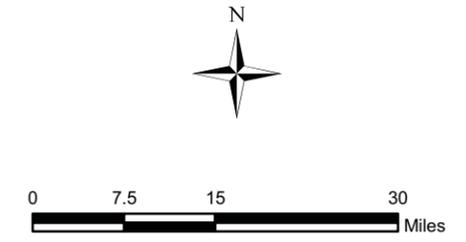
- 2.0 - 2.9
- 3.0 - 3.9
- 4.0 - 4.9
- 5.0 - 5.9
- >6.0

**Faults** (dashed where inferred, dotted where concealed)

- Active Fault
- Potentially Active Fault
- Inactive Fault

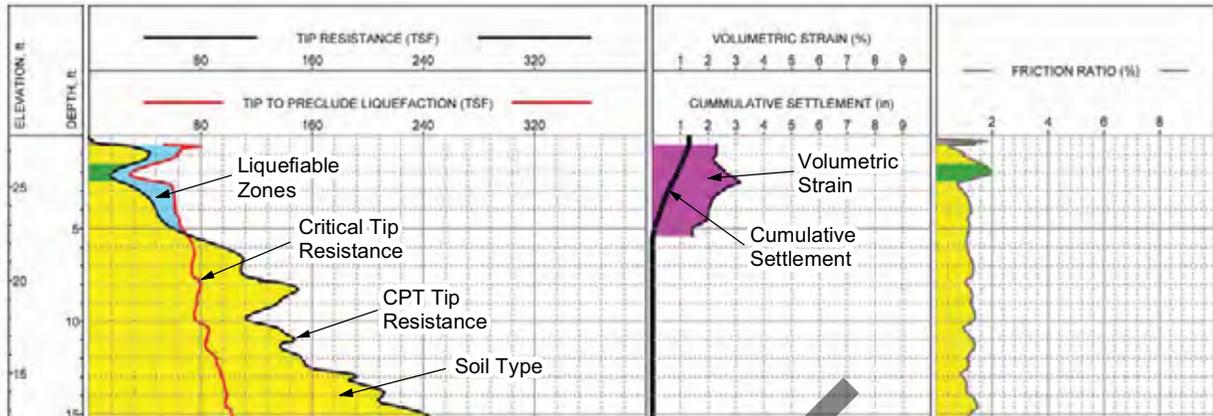
**Source:**

- 1) Earthquake Data:  
Earthquake epicenters from:  
a) ANSS Composite Catalog Search, 1933 to 2008, <[www.ncedc.org/anss/](http://www.ncedc.org/anss/)> (downloaded March 2008)  
b) "Seismotectonic framework, coastal central California", Seismotectonics of the Central California Coast Range, Special Paper 292, Geological Society of America, 1994.
- 2) Faults:  
a) Bryant, 2005  
b) Jennings, 1994

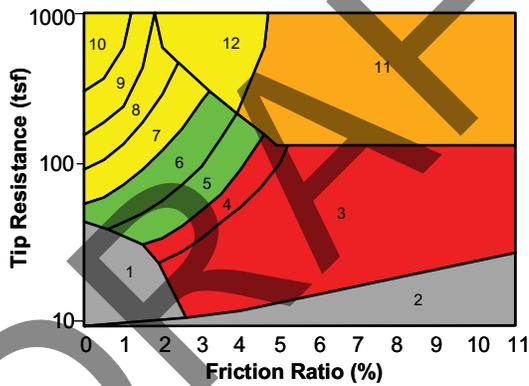


**HISTORICAL SEISMICITY MAP**  
Morro Bay – Cayucos WWTP Upgrade Project  
Morro Bay, California

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**COLOR LEGEND FOR FRICTION RATIO TRACES**



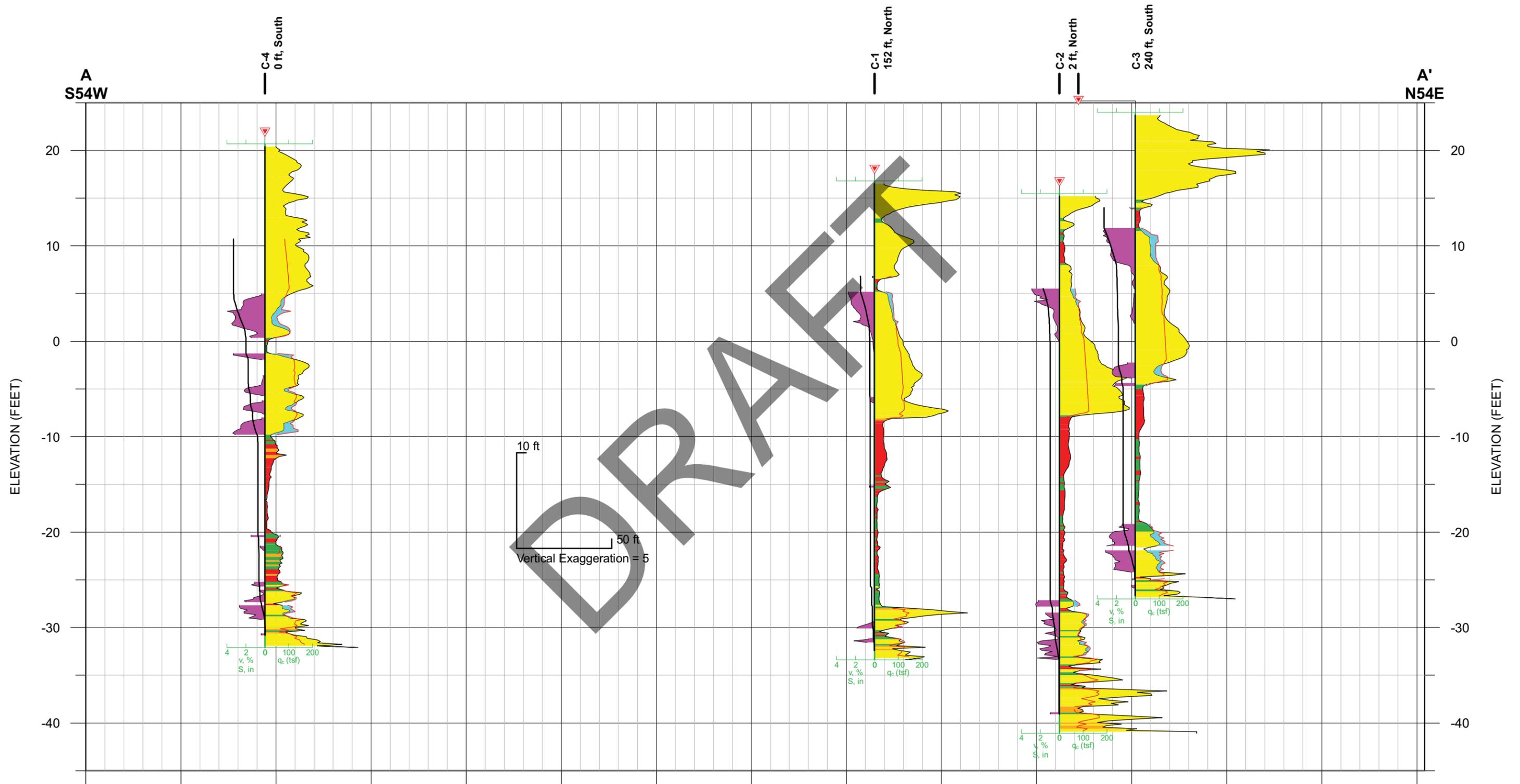
Zone	Soil Behavior Type	U.S.C.S.
1	Sensitive Fine-grained	OL-CH
2	Organic Material	OL-OH
3	Clay	CH
4	Silty Clay to Clay	CL-CH
5	Clayey Silt to Silty Clay	MH-CL
6	Sandy Silt to Clayey Silt	ML-MH
7	Silty Sand to Sandy Silt	SM-ML
8	Sand to Silty Sand	SM-SP
9	Sand	SW-SP
10	Gravelly Sand to Sand	SW-GW
11	Very Stiff Fine-grained *	CH-CL
12	Sand to Clayey Sand *	SC-SM

\*overconsolidated or cemented

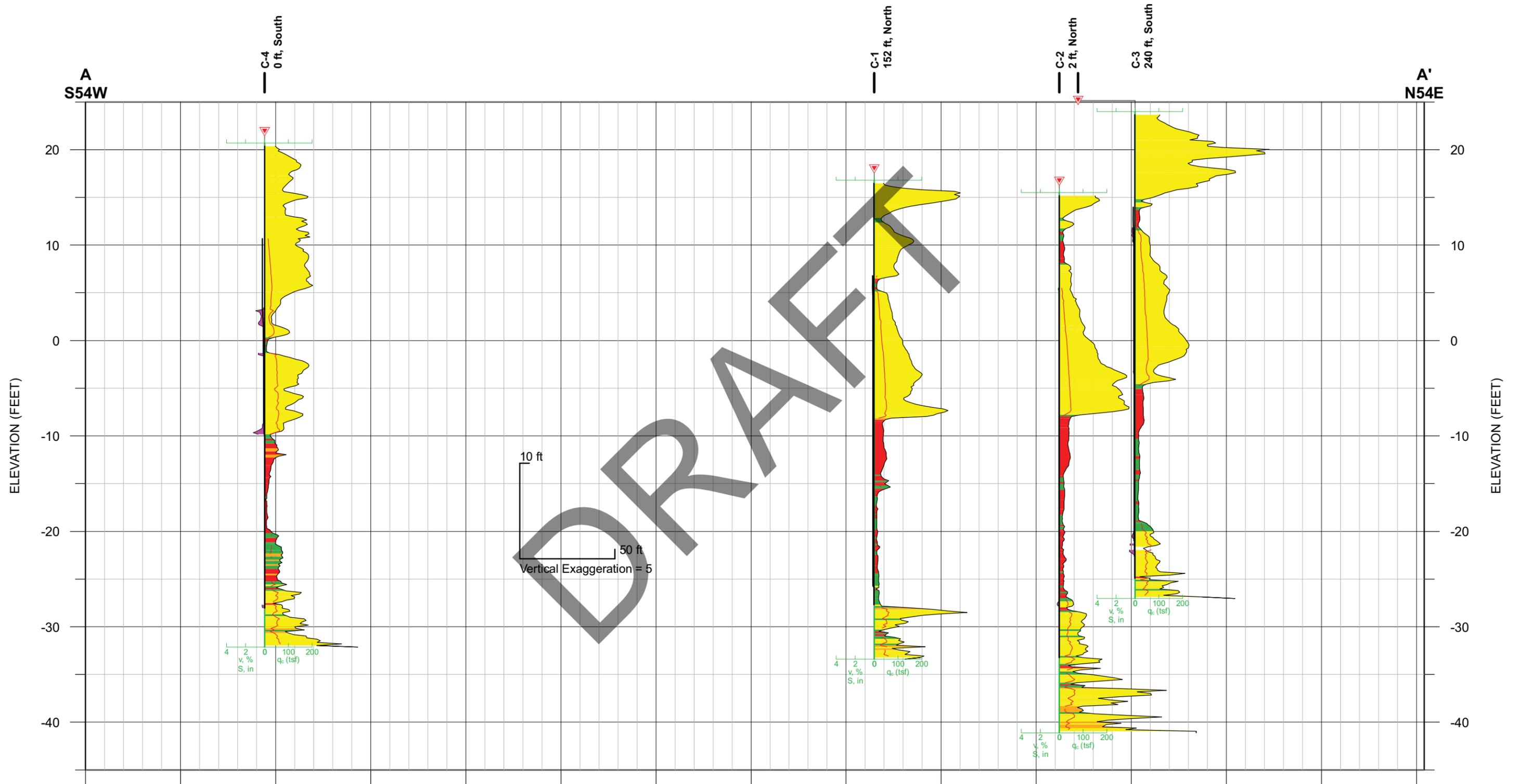
**CPT CORRELATION CHART**  
**(Robertson and Campanella, 1988)**

**KEY TO LIQUEFACTION LOGS**

Morro Bay – Cayucos WWTP Upgrade Project  
Morro Bay, California



**LIQUEFACTION CROSS SECTION A-A'**  
**M = 7.34, P.G.A. = 0.34 g**  
Morro Bay – Cayucos WWTP Upgrade Project  
Morro Bay, California



**LIQUEFACTION CROSS SECTION A-A'**  
**M = 6.5, P.G.A. = 0.15 g**  
Morro Bay – Cayucos WWTP Upgrade Project  
Morro Bay, California

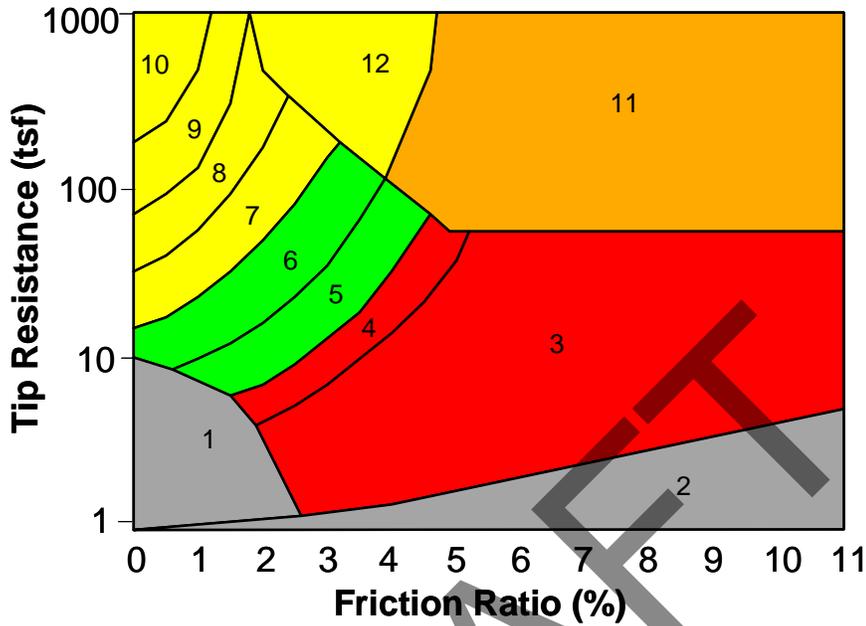
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APPENDIX A



COLOR LEGEND FOR FRICTION RATIO TRACES



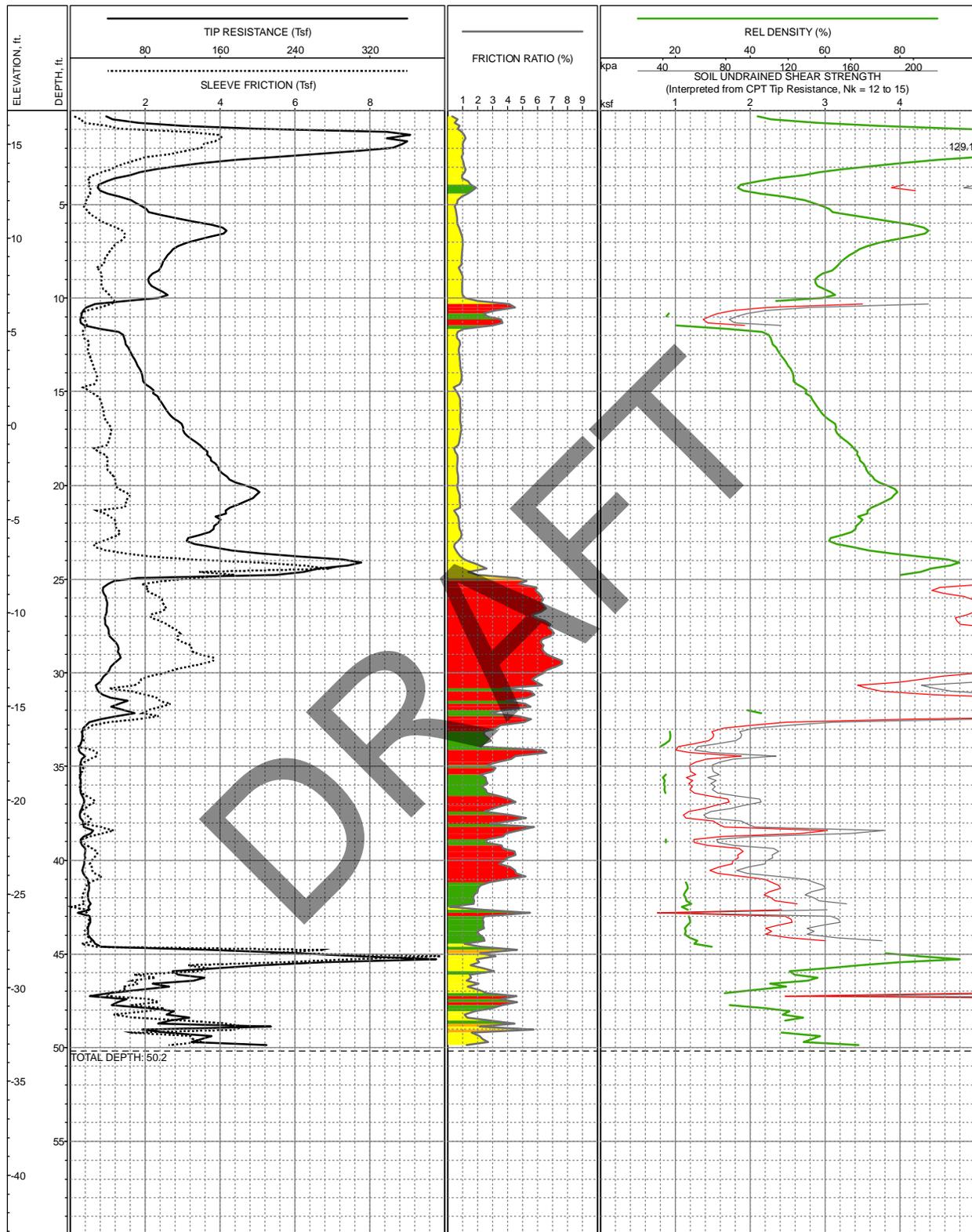
Zone	Soil Behavior Type	U.S.C.S.
1	Sensitive Fine-grained	OL-CH
2	Organic Material	OL-OH
3	Clay	CH
4	Silty Clay to Clay	CL-CH
5	Clayey Silt to Silty Clay	MH-CL
6	Sandy Silt to Clayey Silt	ML-MH
7	Silty Sand to Sandy Silt	SM-ML
8	Sand to Silty Sand	SM-SP
9	Sand	SW-SP
10	Gravelly Sand to Sand	SW-GW
11	Very Stiff Fine-grained *	CH-CL
12	Sand to Clayey Sand *	SC-SM

\*overconsolidated or cemented

CPT CORRELATION CHART  
 (Robertson and Campanella, 1988)

KEY TO CPT LOGS

Morro Bay – Cayucos WWTP Upgrade Project  
 Morro Bay, California

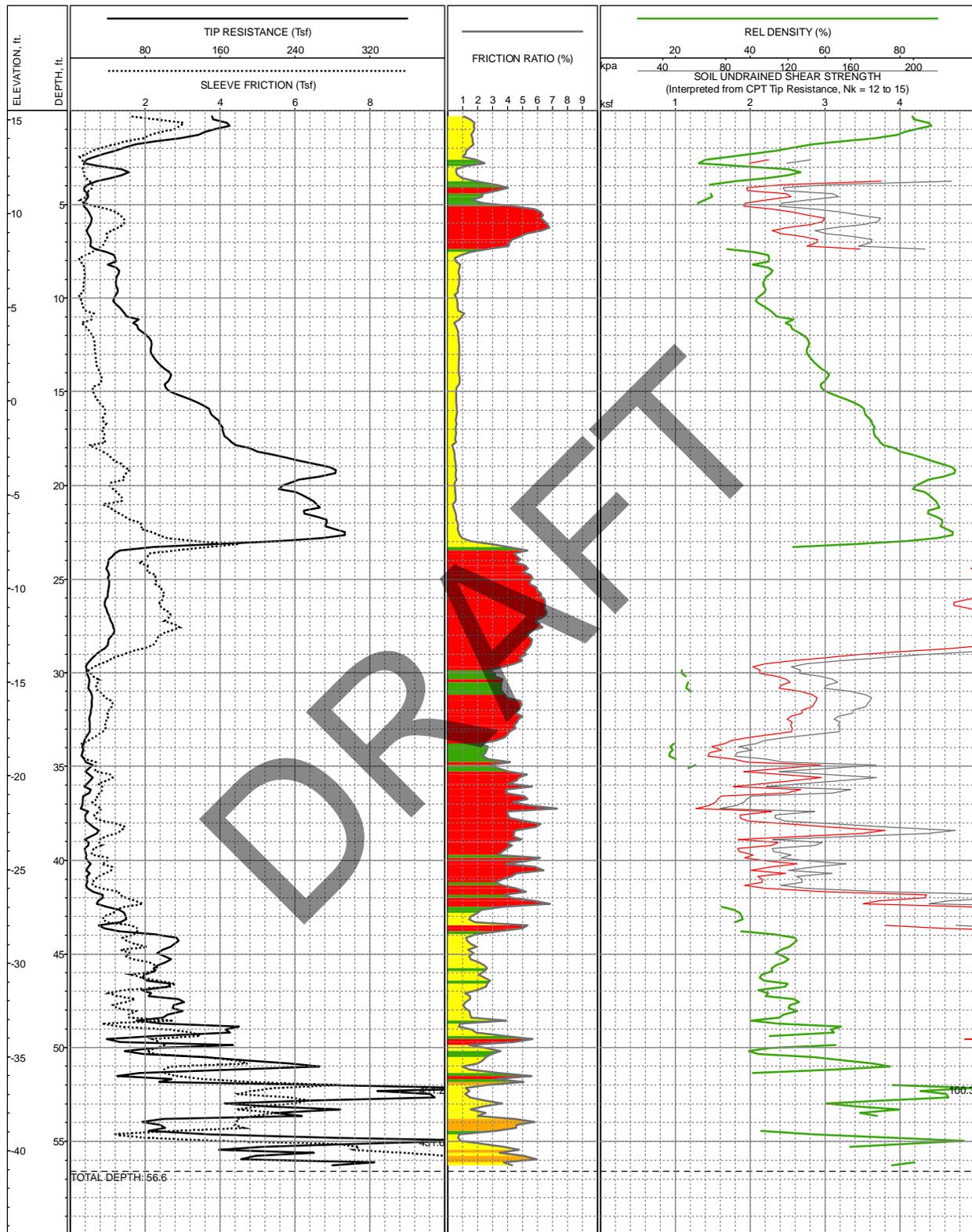


LOCATION: Approx. 25' East of Existing Storage Shed  
 SURFACE EL: 16.8ft +/- (NAVD88)  
 COMPLETION DEPTH: 50.2ft  
 TESTDATE: 10/16/2009

EXPLORATION METHOD: Cone Penetrometer  
 PERFORMED BY: Earth Systems Pacific  
 REVIEWED BY: J Blanchard

**LOG OF CPT NO: C-1**  
 Morro Bay – Cayucos WWTP Upgrade Project  
 Morro Bay, California

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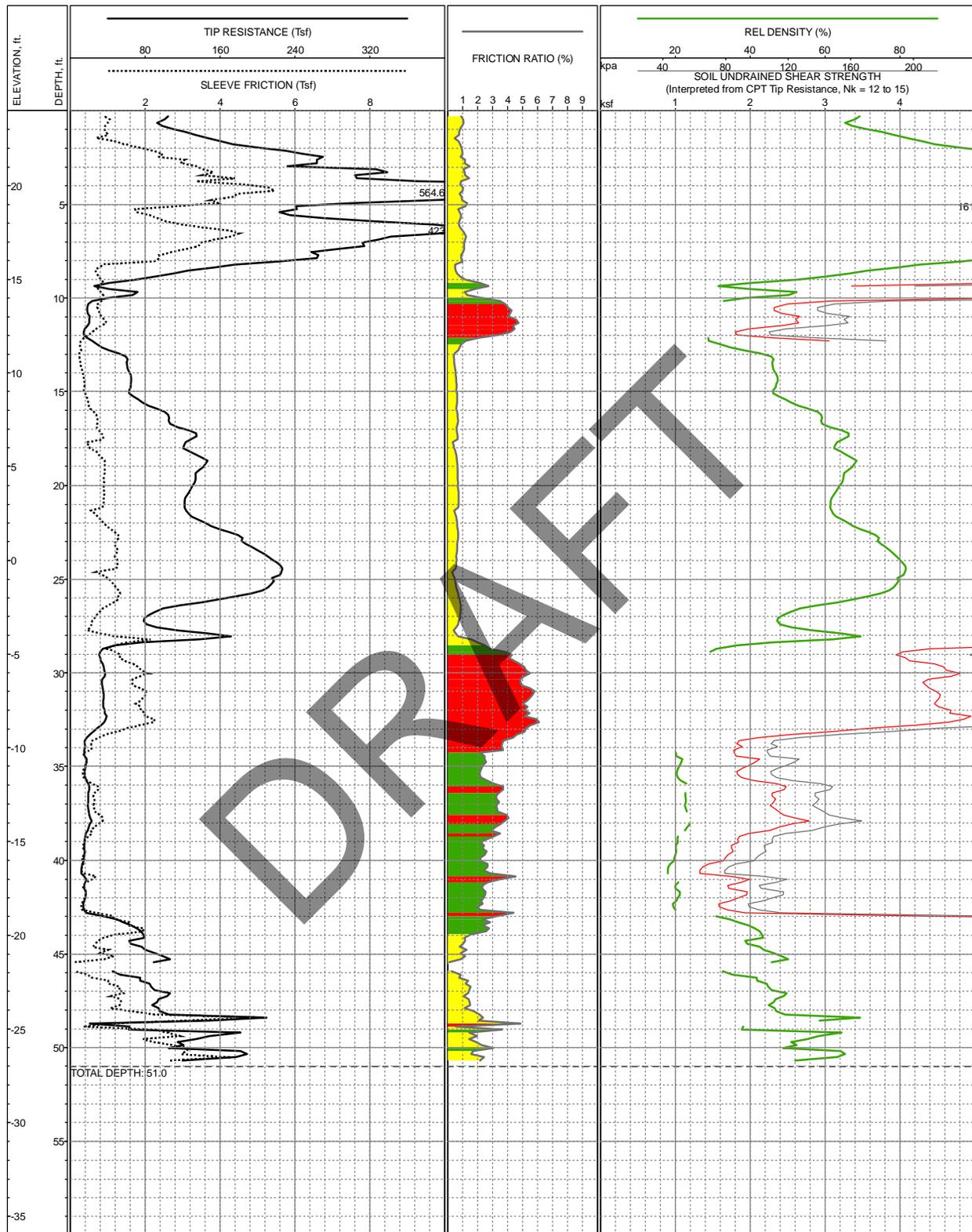


LOCATION: Approx. 25' North of Preliminary IPS Location  
 SURFACE EL: 15.5ft +/- (NAVD88)  
 COMPLETION DEPTH: 56.6ft  
 TESTDATE: 10/16/2009

EXPLORATION METHOD: Cone Penetrometer  
 PERFORMED BY: Earth Systems Pacific  
 REVIEWED BY: J Blanchard

**LOG OF CPT NO: C-2**  
 Morro Bay – Cayucos WWTP Upgrade Project  
 Morro Bay, California

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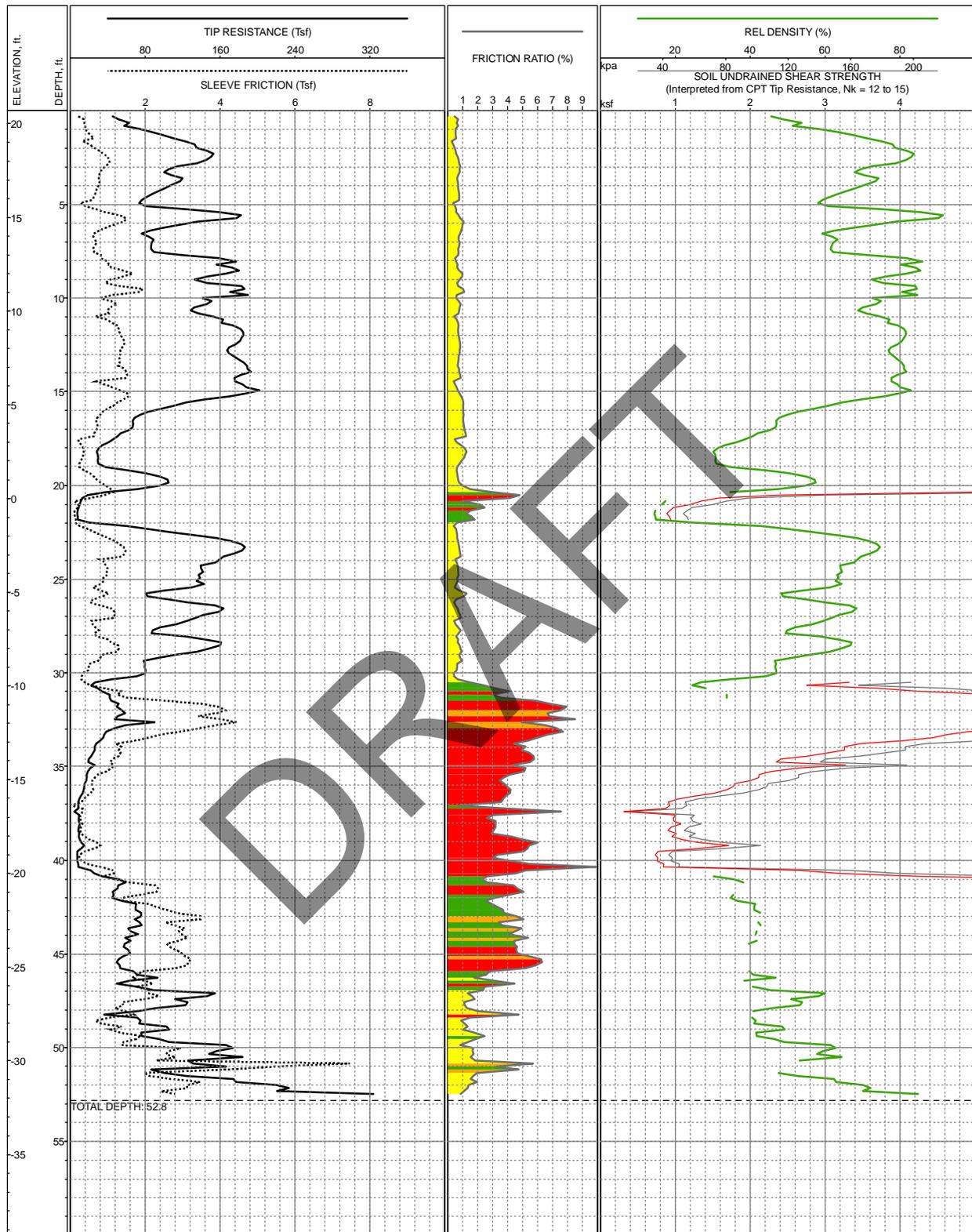


LOCATION: approx. 15' East of Preliminary Oxidation ditches Location  
 SURFACE EL: 24.0ft +/- (NAVD88)  
 COMPLETION DEPTH: 51.0ft  
 TESTDATE: 10/16/2009

EXPLORATION METHOD: Cone Penetrometer  
 PERFORMED BY: Earth Systems Pacific  
 REVIEWED BY: J Blanchard

**LOG OF CPT NO: C-3**  
 Morro Bay – Cayucos WWTP Upgrade Project  
 Morro Bay, California

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LOCATION: Area of Preliminary Secondary Clarifier Location  
 SURFACE EL: 20.7ft +/- (NAVD88)  
 COMPLETION DEPTH: 52.8ft  
 TESTDATE: 10/16/2009

EXPLORATION METHOD: Cone Penetrometer  
 PERFORMED BY: Earth Systems Pacific  
 REVIEWED BY: J Blanchard

**LOG OF CPT NO: C-4**  
 Morro Bay – Cayucos WWTP Upgrade Project  
 Morro Bay, California

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APPENDIX B

**Morro Bay WWTP**

160 Atascadero Road  
Morro Bay, CA 93442

Inquiry Number: 2728018.2  
March 29, 2010

**The EDR Aerial Photo Decade Package**

DRAFT

# EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDRs professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

**When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.**

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***Thank you for your business.***  
Please contact EDR at 1-800-352-0050  
with any questions or comments.

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**Date EDR Searched Historical Sources:**

Aerial Photography March 29, 2010

**Target Property:**

160 Atascadero Road  
Morro Bay, CA 93442

<u>Year</u>	<u>Scale</u>	<u>Details</u>	<u>Source</u>
1937	Aerial Photograph. Scale: 1"=555'	Flight Year: 1937	Army
1949	Aerial Photograph. Scale: 1"=555'	Flight Year: 1949	Aero
1956	Aerial Photograph. Scale: 1"=555'	Flight Year: 1956	Hycon
1963	Aerial Photograph. Scale: 1"=333'	Flight Year: 1963	Mark Hurd
1972	Aerial Photograph. Scale: 1"=341'	Flight Year: 1972	Mark Hurd
1989	Aerial Photograph. Scale: 1"=666'	Flight Year: 1989	USGS
1994	Aerial Photograph. Scale: 1"=666'	Flight Year: 1994	USGS
2002	Aerial Photograph. Scale: 1"=666'	Flight Year: 2002	USGS
2005	Aerial Photograph. 1" = 604'	Flight Year: 2005	EDR

DRAFT



INQUIRY #: 2728018.2

YEAR: 1937

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DRAFT

INQUIRY #: 2728018.2

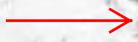
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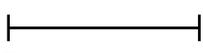


DRAFT



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YEAR: 1956

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DRAFT

INQUIRY #: 2728018.2

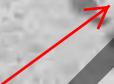
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DRAFT

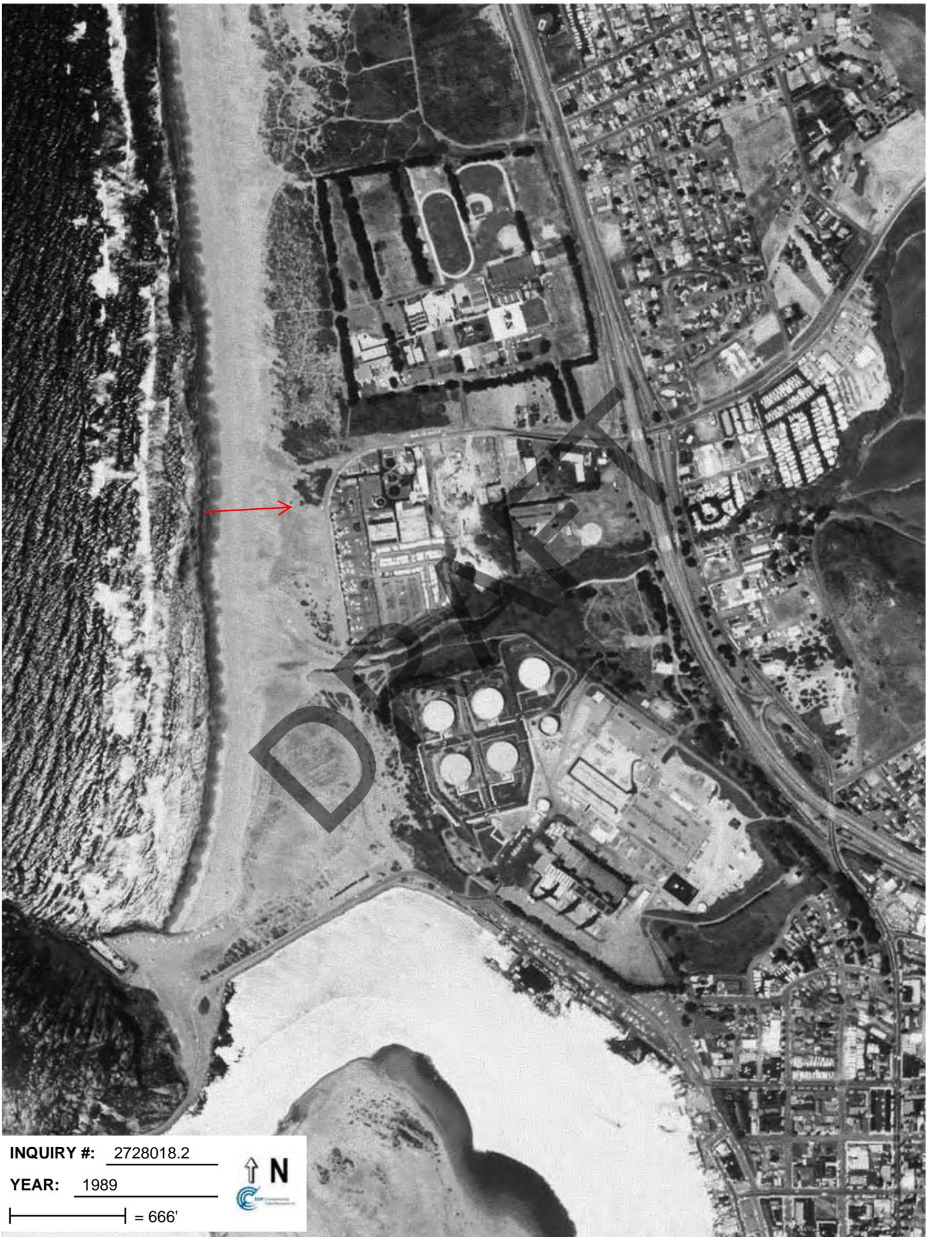


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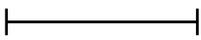
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INQUIRY #: 2728018.2

YEAR: 1989

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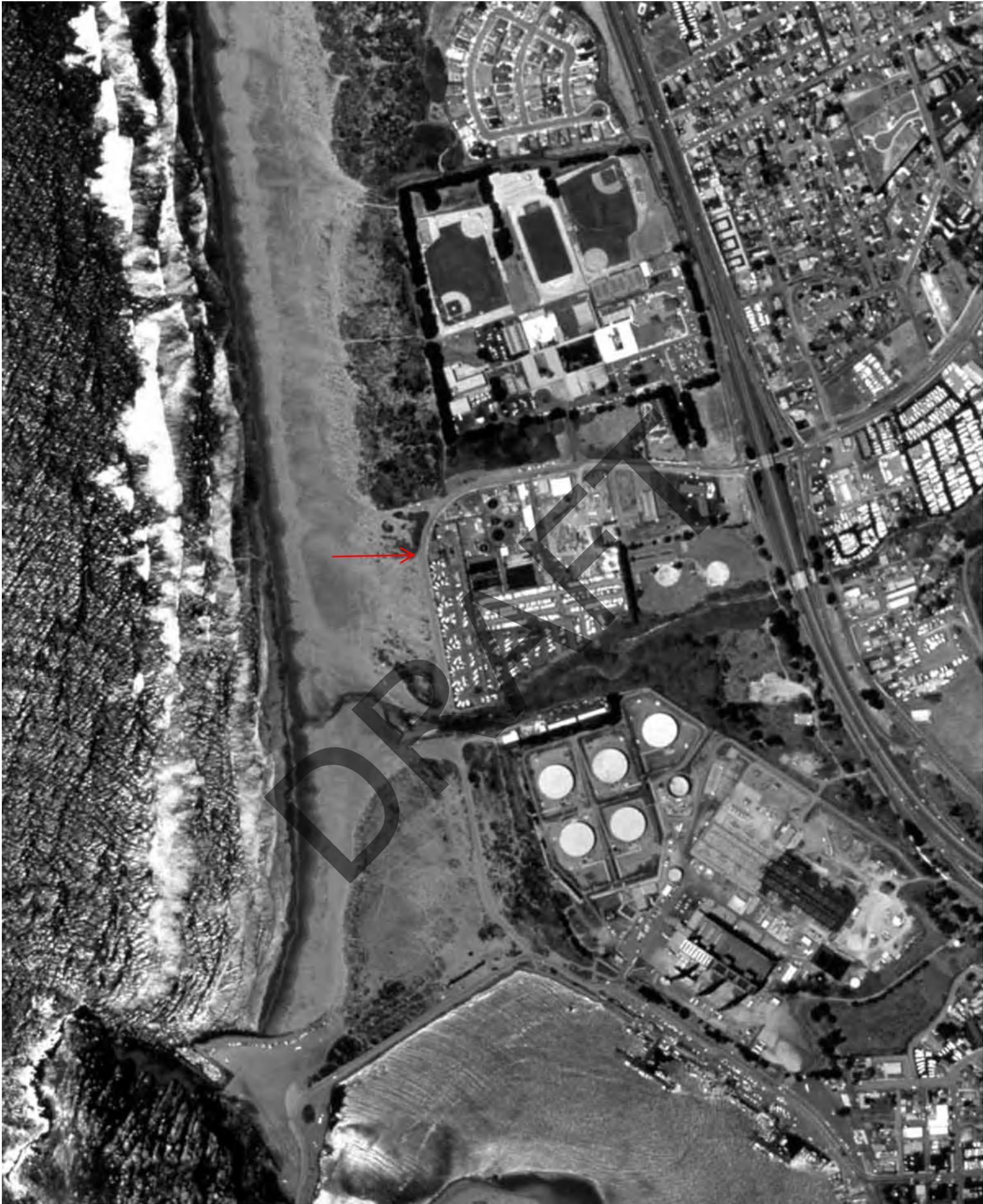


INQUIRY #: 2728018.2

YEAR: 1994

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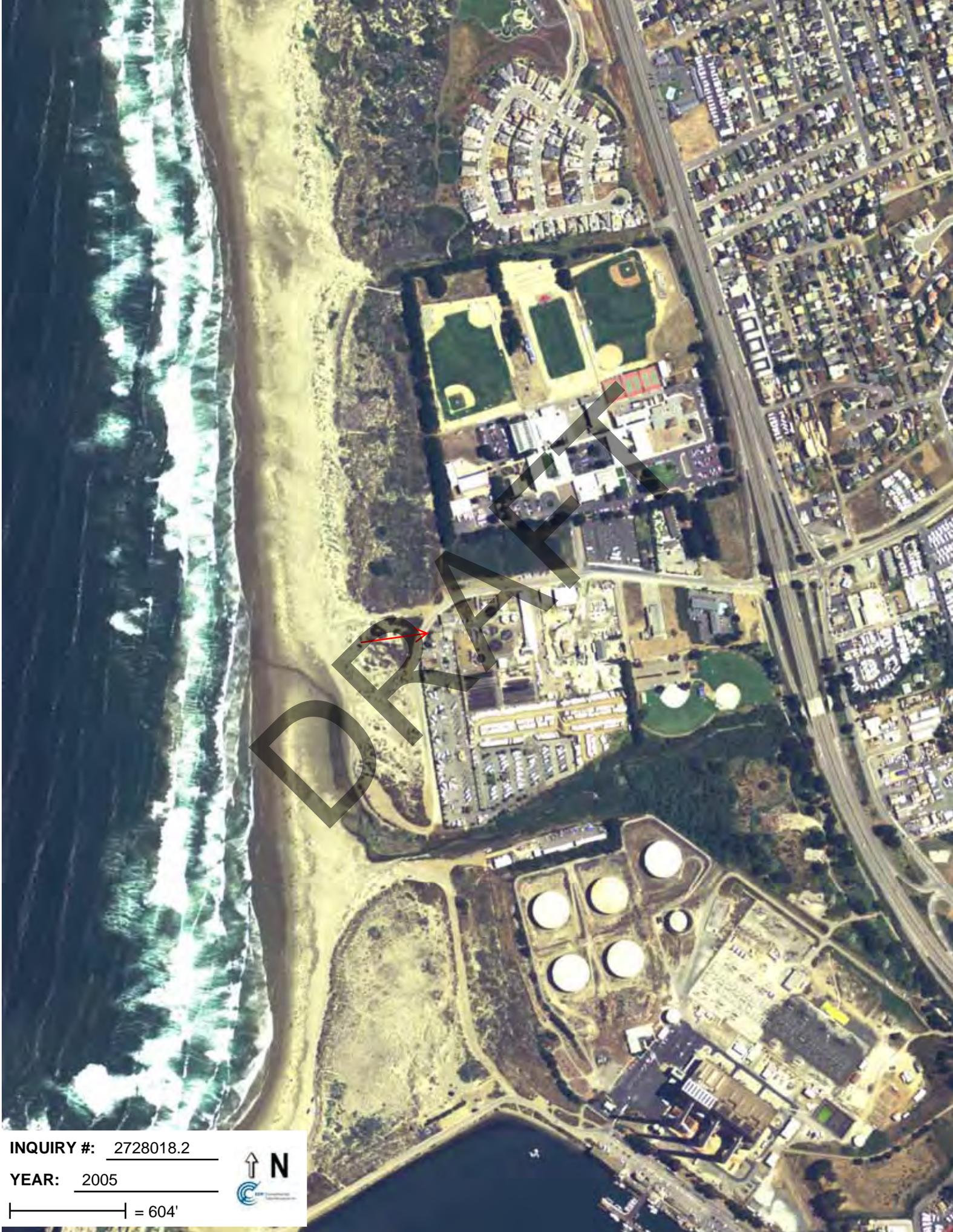


INQUIRY #: 2728018.2

YEAR: 2002

| = 666'





DRAFT

INQUIRY #: 2728018.2

YEAR: 2005

| = 604'



**Morro Bay WWTP**

160 Atascadero Road  
Morro Bay, CA 93442

Inquiry Number: 2728018.1  
March 25, 2010

**The EDR Historical Topographic Map Report**

DRAFT

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# Historical Topographic Map



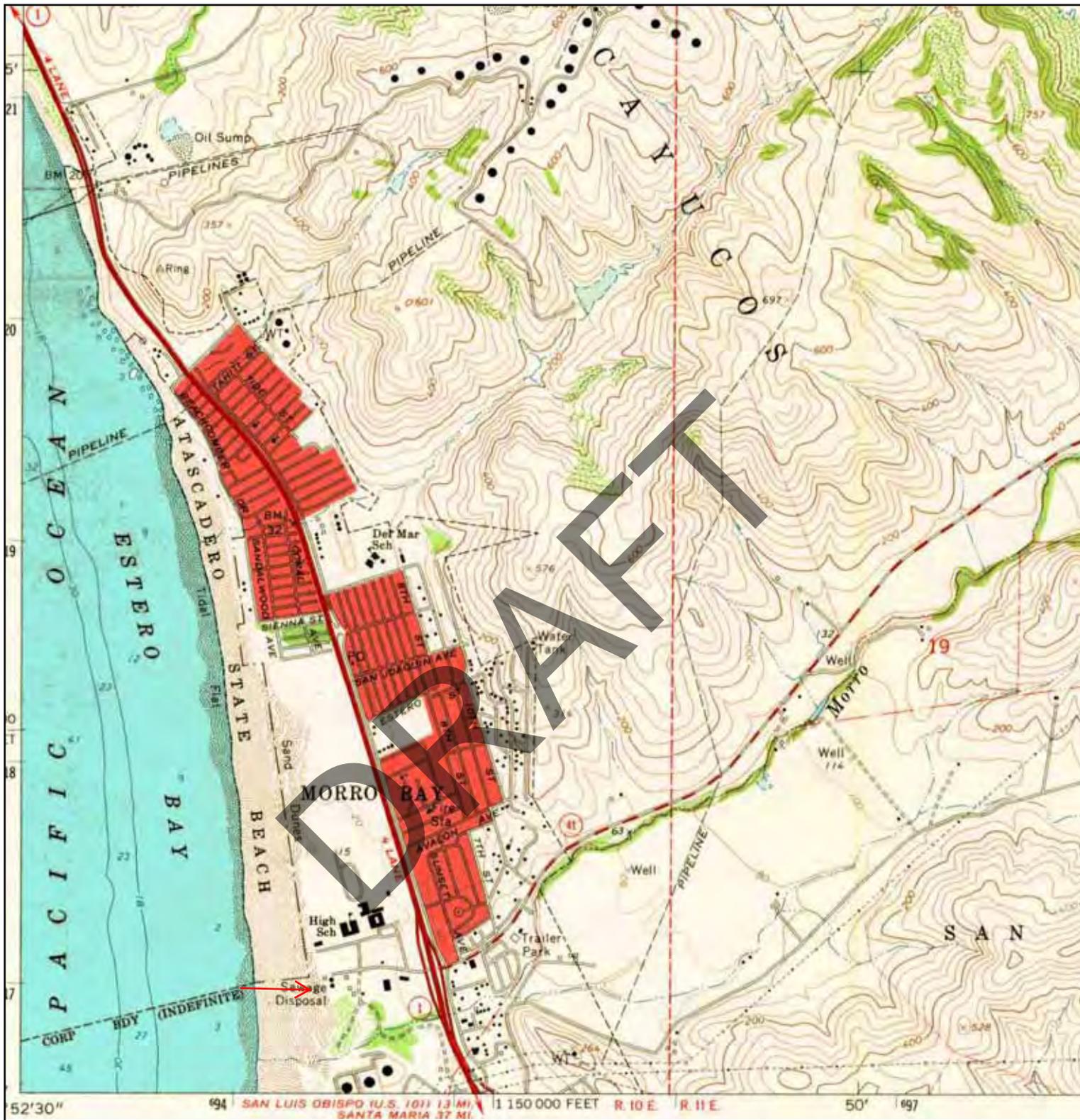
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	SERIES: 30 SCALE: 1:125000		

# Historical Topographic Map



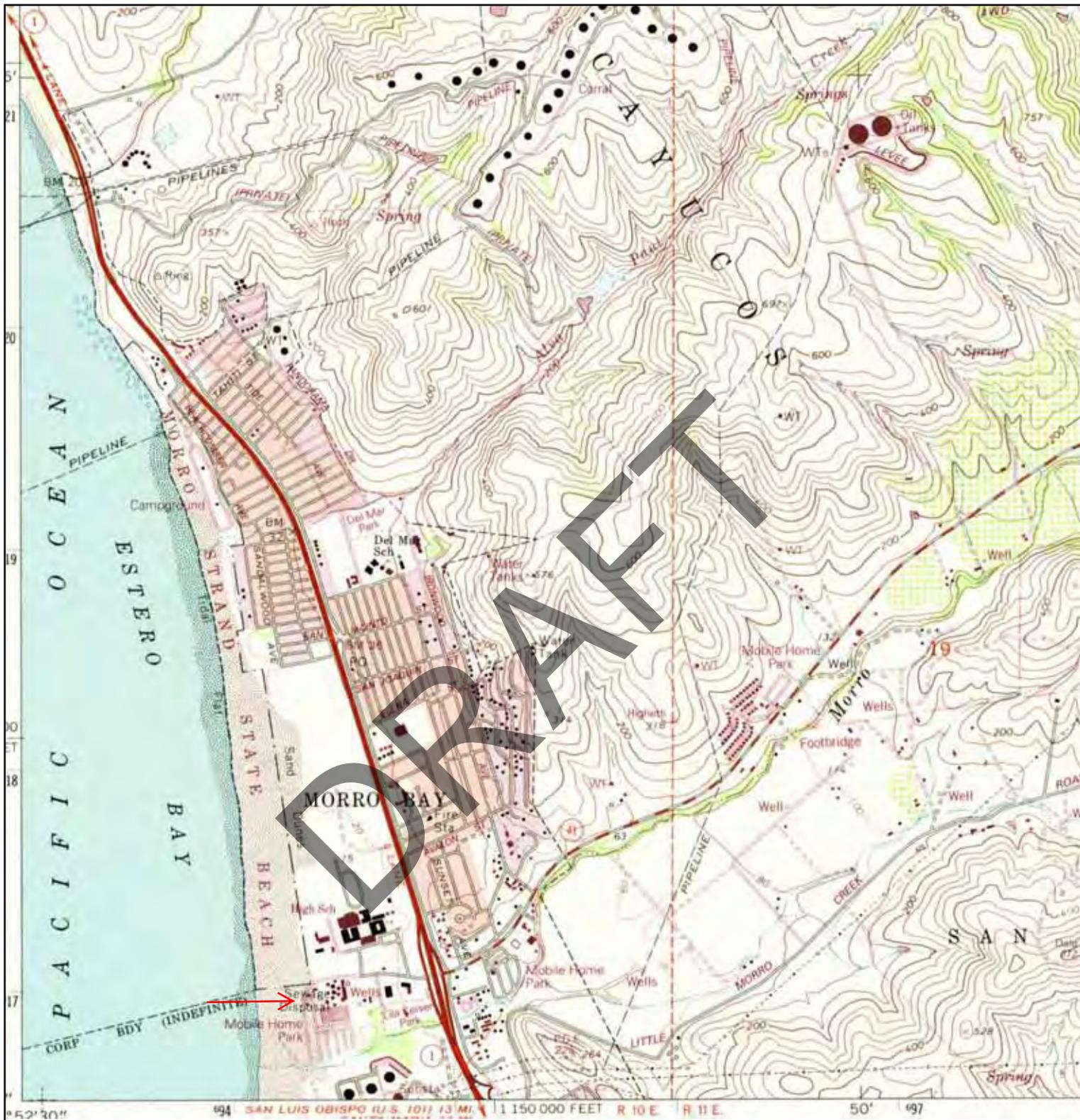
<p>N ↑</p>	<p>TARGET QUAD NAME: CAYUCOS MAP YEAR: 1951</p>	<p>SITE NAME: Morro Bay WWTW ADDRESS: 160 Atascadero Road Morro Bay, CA 93442 LAT/LONG: 35.3795 / 120.861</p>	<p>CLIENT: Fugro West, Inc. CONTACT: Chad Stoehr INQUIRY#: 2728018.1 RESEARCH DATE: 03/25/2010</p>
	<p>SERIES: 15 SCALE: 1:62500</p>		

# Historical Topographic Map



	TARGET QUAD NAME: MORRO BAY NORTH MAP YEAR: 1965	SITE NAME: Morro Bay WWTP ADDRESS: 160 Atascadero Road Morro Bay, CA 93442 LAT/LONG: 35.3795 / 120.861	CLIENT: Fugro West, Inc. CONTACT: Chad Stoehr INQUIRY#: 2728018.1 RESEARCH DATE: 03/25/2010
	SERIES: 7.5 SCALE: 1:24000		

# Historical Topographic Map



	TARGET QUAD	SITE NAME:	Morro Bay WWTP	CLIENT:	Fugro West, Inc.
	NAME: MORRO BAY NORTH	ADDRESS:	160 Atascadero Road	CONTACT:	Chad Stoehr
	MAP YEAR: 1993		Morro Bay, CA 93442	INQUIRY#:	2728018.1
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	SERIES: 7.5				
	SCALE: 1:24000				

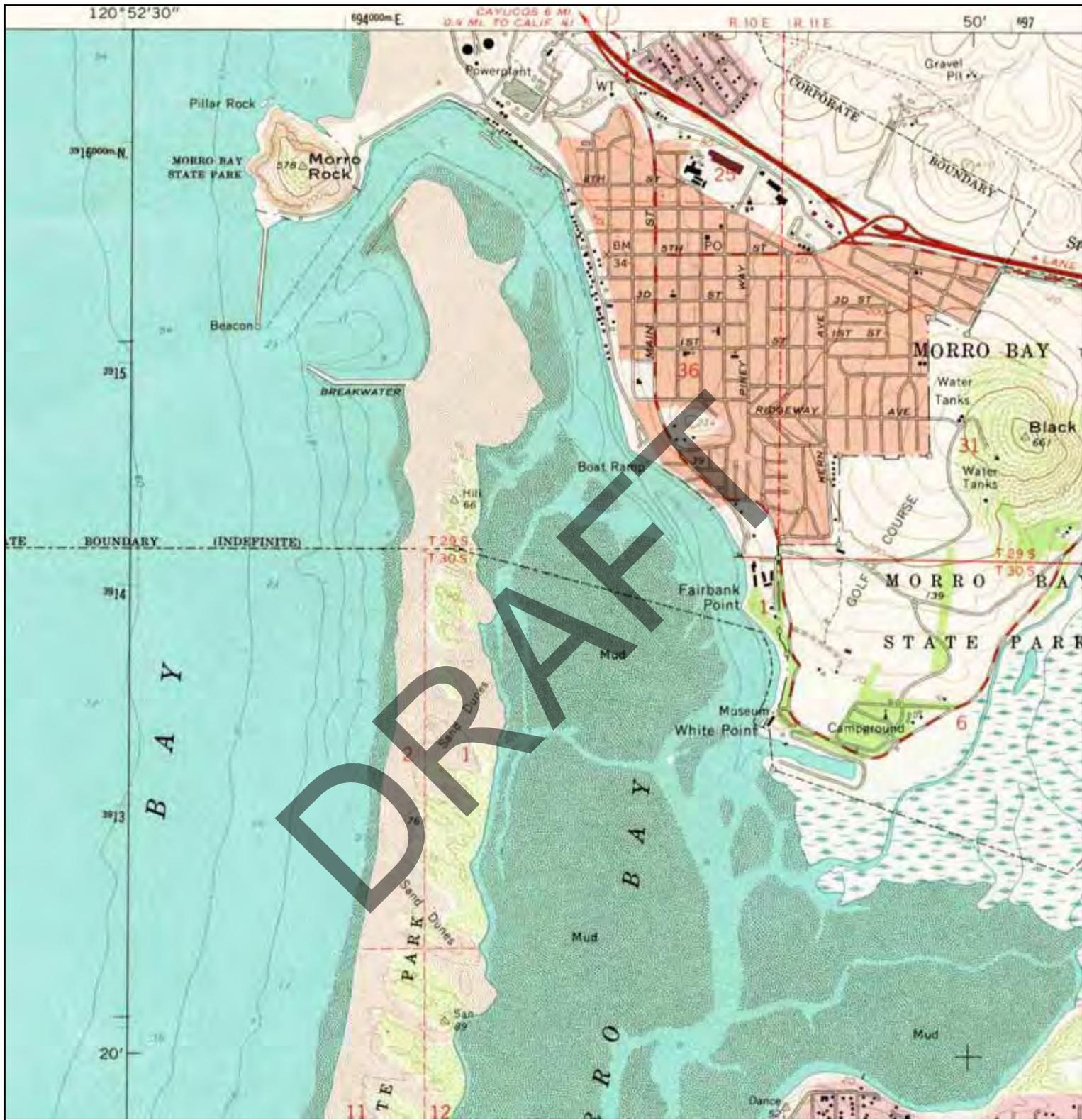
# Historical Topographic Map



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	SERIES: 7.5 SCALE: 1:24000		

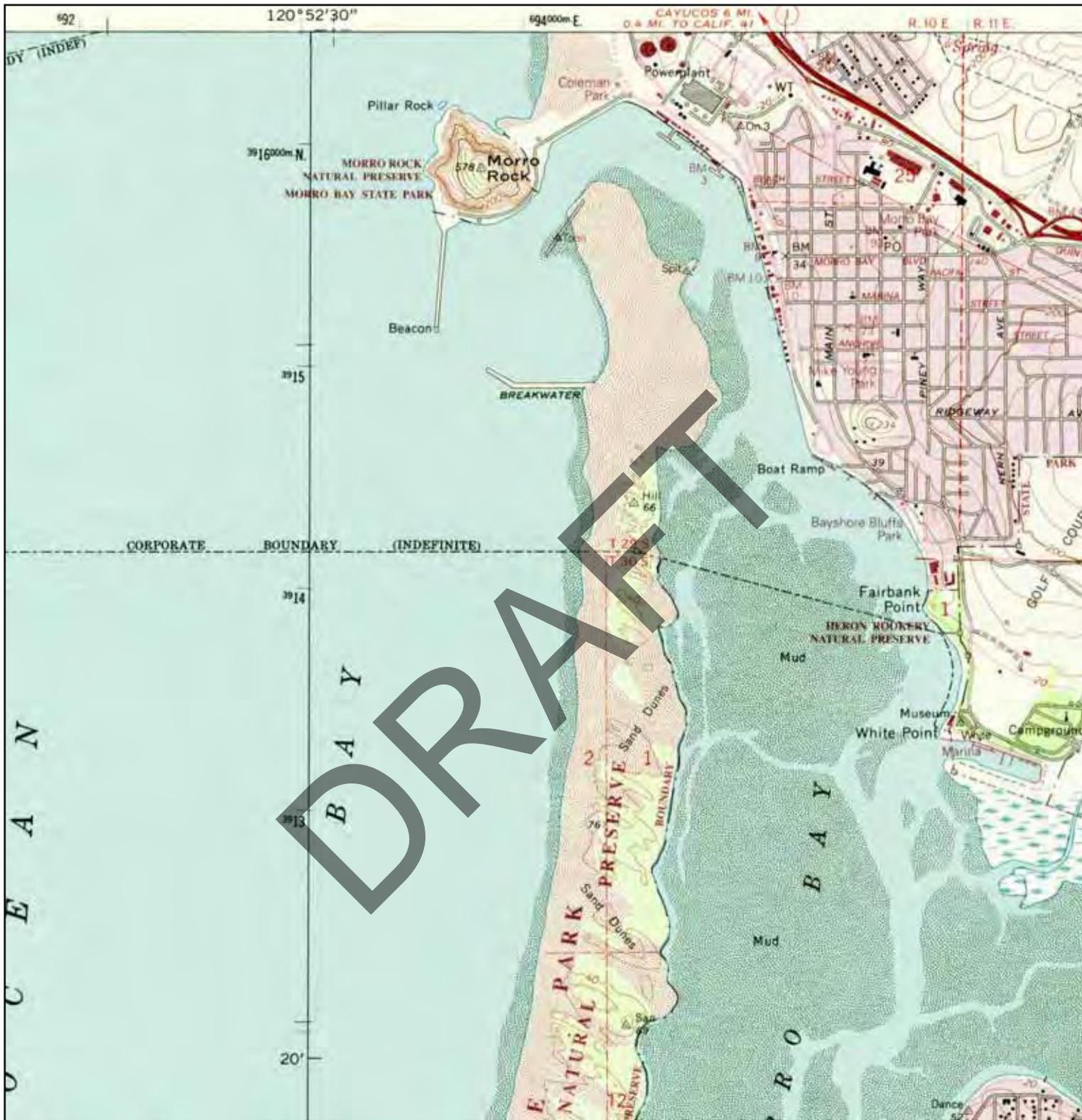


# Historical Topographic Map



<p>N ↑</p>	ADJOINING QUAD	SITE NAME:	Morro Bay WWTP	CLIENT:	Fugro West, Inc.	
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	MAP YEAR:	1978		Morro Bay, CA 93442	INQUIRY#:	2728018.1
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# Historical Topographic Map



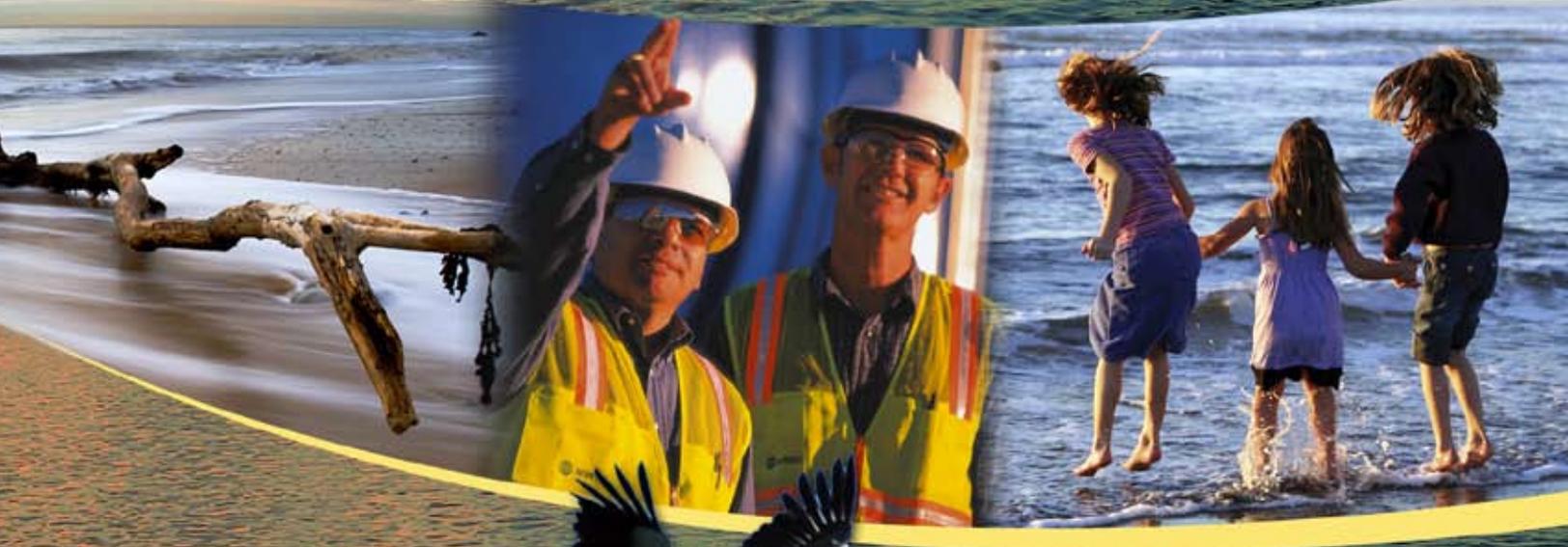
DRAFT

<p>N ↑</p>	ADJOINING QUAD	SITE NAME:	Morro Bay WWTP	CLIENT:	Fugro West, Inc.
	NAME: MORRO BAY SOUTH	ADDRESS:	160 Atascadero Road	CONTACT:	Chad Stoehr
	MAP YEAR: 1994		Morro Bay, CA 93442	INQUIRY#:	2728018.1
	REVISED FROM: 1965	LAT/LONG:	35.3795 / 120.861	RESEARCH DATE:	03/25/2010
	SERIES: 7.5				
	SCALE: 1:24000				



APPENDIX C

**TF/CCB/Title 22 Considerations TM**



# MEMORANDUM



**MWH**

**To:** Bruce Keogh  
Bill Callahan  
Dylan Wade

**Date:** June 16, 2010

**From:** Steve Hyland

**Client:** MBCSD

**Subject:** MBCSD WWTP Upgrade  
TF/CCB/Title 22 Considerations

**Reference:** 1008613.020101

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## Introduction

The current scope of work for the City of Morro Bay and Cayucos Sanitary District (MBCSD) Wastewater Treatment Plant (WWTP) Upgrade Project includes one Tertiary Filter (TF), one Chlorine Contact Basin (CCB) for effluent disinfection prior to discharge to the existing ocean outfall, one Chemical Station for sodium hypochlorite and sodium bisulfite, and associated gates, piping, and valves.

The design of these facilities is also intended to include provisions to accommodate the future installation of reclamation capability to meet California Title 22 requirements for “disinfected tertiary recycled water” for unrestricted use. Disinfected tertiary recycled water for unrestricted use is suitable for irrigation of food crops, parks and playgrounds, school yards, residential landscaping, and golf courses, i.e., “purple pipe” applications. Although the current scope of work includes provisions for the design of tertiary filtration, this scope does not include provisions for the design of Title 22 compliant facilities.

The objective of this Technical Memorandum (TM) is to present a conceptual level evaluation of the components and incremental construction costs to implement potential improvements to the proposed TF/CCB facilities. This evaluation examines different combinations of the number and sizes of TFs and CCBs that can be implemented to minimize operation and maintenance activities, improve disinfection efficiency, and position MBCSD for installation of Title 22 reclaimed water capability. Discussion and evaluation of these options are presented below for review and consideration by MBCSD.

## Background Information

**Initial Reclaimed Water Demand.** The initial phase of future reclaimed water facilities would be anticipated to be designed as a minimum for the following reclaimed water demands:

- Utility water for plant needs
- Irrigation of landscaping at the WWTP perimeter (fence line)
- Possible irrigation of the Morro Bay High School grounds
- Truck-fill station for off-site uses.

A preliminary estimate of the reclaimed water demand for the above uses would range from 100 to 500 gpm depending upon time of day.

Note that to achieve “disinfected tertiary recycled water” under Title 22 requirements, the plant effluent must be filtered with technology that has been pilot tested for approval by the California Department of Public Health. The tertiary filter technology discussed below has been approved for Title 22 applications. In addition, the filtered effluent must be disinfected to meet strict bacteriological standards. Where chlorine disinfection is used as proposed for this WWTP Upgrade Project, a modal contact time of at least 90 minutes in the CCB must be provided at peak flow to meet the Title 22 requirements for “disinfected tertiary recycled water”. This design peak flow is assumed to be two times the design average flow for Title 22 disinfection.

**Tertiary Filters.** The tertiary filter technology assumed for this evaluation is cloth media filtration as presented in the draft FMP and draft FMP - Amendment No. 1. Cloth filters consist of rotating disks covered with a pile fabric that filters suspended solids as the flow passes from the exterior face to the interior. The filtrate is carried away by the hollow center shaft that supports the disks. At periodic intervals the disks are rotated and backwashed to clean the cloth media.

The cloth filter units can be provided in 2 disk increments ranging from 2 disks to 12 disks per unit. The average flow capacity rating for cloth filters is based on a nominal hydraulic loading rate of 3 gpm/sf of disk surface or approximately 0.5 mgd per pair of disks. The peak flow capacity of the cloth filters is 6.0 gpm/sf or 1.0 mgd per pair of disks for a 3-hour duration as recommended by the manufacturer. For Title 22 applications, the cloth filters have been approved at the same peak hydraulic capacity of 6.0 gpm/sf. The 3-hour duration is established to preserve the expected cloth media life of 6 to 7 years before replacement. Note the current cost of cloth media replacement is approximately \$3000 per pair of disks (not including installation costs).

The cloth filters can be operated at higher flow rates based on a solids loading limitation of 3.25 lb total suspended solids/sf/day. For example, for an effluent quality of 30 mg/L TSS, the corresponding flow rate would be 1.4 mgd per pair of disks. At this loading the filter would be in continuous backwash.

The frequency and duration of backwash is the major factor that determines the cloth media life expectancy. So, extended operation of the cloth filters at the peak hydraulic and solids loading

rates is not desirable. For the purposes of this evaluation, the tertiary filters are assumed to operate at their design average flow capacity and their peaking capability is assumed to be adequate to handle the diurnal variations associated with daily flow that does not exceed the design average flow capacity.

For the purposes of this evaluation, costs for cloth filter units were developed based on pricing provided by the manufacturer (Aqua-Aerobics email dated June 1, 2010). A summary of the estimated construction costs for 2-Disk, 4-Disk, and 6-Disk units are presented in **Table A**.

**Table A – Cloth Filter Costs**

Description	2-Disk	4-Disk	6-Disk
Capacity (Average Flow)	0.5 mgd	1.0 mgd	1.5 mgd
Cloth Filter Cost	\$275,000	\$323,000	\$371,000
Cloth Filter Cost Installed	\$358,000	\$420,000	\$482,000
Associated Piping & Valves	\$54,000	\$63,000	\$72,000
Mechanical Subtotal	\$412,000	\$483,000	\$554,000
Structural	\$5,000	\$8,000	\$10,000
Architectural	\$8,000	\$13,000	\$16,000
Mechanical	\$412,000	\$483,000	\$554,000
HVAC	\$0	\$0	\$0
Electrical	\$40,000	\$40,000	\$40,000
Instrumentation	\$35,000	\$35,000	\$35,000
Subtotal	\$500,000	\$579,000	\$655,000
Multiplier (a)	1.393	1.393	1.393
<b>Estimated Construction Cost</b>	<b>\$700,000</b>	<b>\$810,000</b>	<b>\$910,000</b>

(a) Multiplier includes construction allowances for general conditions, bonds and insurance, mobilization and demobilization, overhead and profit, and contingency.

Note that the difference in estimated construction costs for the 2-disk, 4-disk, and 6-disk units is relatively small. Where multiple cloth filter units are under consideration, provision for the same size units is desirable for interchangeability of operation and maintenance. Consequently, for the purposes of this evaluation all cloth filter units were assumed to be 6-disk units.

### **Current Concept - Option A1 and Option A2**

Option A1 represents the current TF/CCB concept based on the draft Facility Master Plan (FMP) entitled “Wastewater Treatment Plant Facility Master Plan Report” dated September 2007 prepared by Carollo Engineers and the draft FMP – Amendment No. 1 entitled “Facility Master Plan Amendment No. 1” dated August 2009 prepared by Carollo Engineers. Refer to the flow schematic for Option A1 in Figure 1. Under the current scope of work the following facilities would be provided:

- Tertiary filtration rated for the average peak season dry weather flow (PSDWF) of 1.5 mgd. A cloth filter or equivalent is the current candidate for the tertiary filtration technology as previously discussed. One 6-disk cloth filter rated for 1.5 mgd average flow would be provided. Note that if a TF had been operated at a minimum of 1.5 mgd over the period of record from Y1995 to Y2009, over 96 percent of the annual effluent produced by the WWTP would have received tertiary filtration under this hypothetical operation.
- One CCB sized to provide a hydraulic retention time (HRT) of 60 minutes at the average PSDWF of 1.5 mgd and 16 minutes at the annual peak day flow (PDF) of 5.6 mgd. This would correspond to a minimum hydraulic basin volume of 63,000 gal. The preliminary basin geometry to provide a length to width ratio of 40:1 and depth to width ratio of 1:1 would be approximately 83 feet long by 23 feet wide. This basin geometry includes allowances for wall thicknesses and assumes a 3-pass configuration with channels that have a 6-foot width and 6-foot side water depth.
- Utility Water Pump Station would be provided to deliver treated effluent for ancillary plant uses such as spray water and seal water for mechanical equipment and pumps. The provision for utility water offsets the alternate use of potable water to provide these functions.
- Chemical Station would be provided with storage tanks, feed pumps, piping, valves, controls, and appurtenances to deliver sodium hypochlorite (bleach) and sodium bisulfite for disinfection and dechlorination, respectively. Note that the Chemical Station is assumed to be the same for all options.

Option A2 represents the second phase of the current concept of Option A1 with the addition of future Title 22 facilities. Under this scenario the default approach to provide future Title 22 facilities is the addition of a second TF and a second CCB that match the size of the TF and CCB provided in Option A1. Refer to the flow schematic of Option A2 in Figure 2. In addition, a Reclaimed Water Pump Station would be added in parallel to the Utility Water Pump Station for delivery to meet the initial reclaimed water demands previously described.

With the Option A2 facilities, the plant would operate two TF/CCB trains in parallel. One TF/CCB train would operate as under Option A1 for ocean discharge with capacity for an average flow of 1.5 mgd and a peak day flow of 5.6 mgd. The other TF/CCB train would operate to meet Title 22 requirements. The reclaimed water capacity of one TF/CCB train would be based on the 90-minute HRT in the CCB required for Title 22 disinfection. This corresponds to a peak flow rate of 1.0 mgd and an average flow rate of 0.5 mgd.

Note that the TF capacity needed for the Title 22 capacity of 0.5 mgd could be achieved with a 2-disk filter; but as previously discussed, the estimated construction cost difference of approximately \$200,000 is relatively small and is outweighed by the benefits of having equal size units for interchangeability.

The estimated construction costs for Option A1 and Option A2 are presented in **Table B**.

**Table B – Option A1 and Option A2 Estimated Construction Costs**

<b>Description</b>	<b>Amount</b>
Option A1	
Tertiary Filter	\$910,000
One-chamber CCB	\$428,000
UW Pump Station	\$399,000
Chemical Station	\$506,000
Subtotal	\$2,243,000
Option A2	
Tertiary Filter	\$910,000
One-chamber CCB	\$428,000
UW Pump Station	\$0
RW Pump Station	\$399,000
Chemical Station	\$50,000
Subtotal	\$1,737,000
<b>Option A Total</b>	<b>\$4,030,000</b>

### **Alternative Concept - Option B1 and B2**

Option B1 is a refinement of Option A1 that provides the same TF unit (6-disk cloth filter), Utility Water Pump Station, and Chemical Station, but provides a CCB with two chambers in lieu of one chamber to improve operation and maintenance at a relatively small increase in estimated construction cost. MBCSD and MWH staff discussed the difficulty of operating and maintaining a single chamber CCB at a coordination meeting conducted on April 26, 2010. Two CCB chambers are desirable so that one CCB chamber can be taken out of service for inspection and cleaning while the other chamber remains in service to provide disinfection. The use of a single chamber CCB is currently employed at the existing WWTP and this situation has created operation and maintenance difficulties in the past. For example, the existing CCB utilizes a chain and flight mechanism to sweep solids that accumulate on the floor to one end of the basin for disposal. The CCB has to be periodically taken out of service and drained to inspect and service the chain and flight mechanism. Plant effluent coliform violations have occurred in these instances.

A two-chamber CCB with an equivalent volume as the baseline CCB in Option A was initially evaluated. Refer to the flow schematic of Option B1 in Figure 3. The CCB was divided to provide two chambers with half the overall volume in each chamber. In order to provide comparable length to width and depth to width ratios, the preliminary basin geometry would be approximately 69 feet long by 38.5 feet wide. This basin geometry includes allowances for wall

thicknesses and assumes a 3-pass configuration in each chamber with channels that have a 5-foot width and 5-foot side water depth.

The major differences in the structural elements of the CCBs for Option A and Option B are summarized in **Table B**. The additional estimated construction cost to provide a two-chamber CCB with the same overall HRT as Option A is approximately \$180,000. A two-chamber CCB is recommended to be included in the final design.

**Table C – CCB**

Description	Unit	One-Chamber CCB	Two-Chamber CCB
Floor slab	sf	1910	2660
Hydraulic walls	lf	212	275
Divider Walls	lf	148	244

Upon further examination of the two-chamber CCB, the cost to increase the relatively shallow side water depth of 5 feet to 8 feet was evaluated. Although the depth to width ratio would deviate from the desired 1:1, increasing the depth does not alter the more critical length to width ratio. The increase in side water depth from 5.0 feet to 8.0 feet would increase the physical volume of each CCB chamber to 59,000 gal. If the disinfection effectiveness of the physical volume is assumed to be reduced to 90% because the depth to width ratio has changed from 1:1 to 1.6:1, then the resulting effective volume would be 53,000 gal in each CCB chamber for the desired modal contact time. The estimated construction cost to increase the side water depth from 5.0 feet to 8.0 feet is approximately \$60,000.

The net increase in estimated construction cost to provide a two-chamber CCB with a deeper side water depth is (\$180,000 + \$60,000 =) \$240,000 for Option B1 versus Option A1. The incremental cost to provide the greater flexibility afforded by two chambers and increasing the effective volume to improve disinfection capability (lower chemical cost) is relatively small compared to the overall construction cost of the TF/CCB facilities. Option B1 is recommended as a better value than Option A1.

Option B2 represents the second phase of Option B1 with the addition of Title 22 facilities. Refer to the flow schematic of Option B2 in Figure 4. However, Option B2 does not require the future construction of additional CCB volume. The increase in effective volume obtained by increasing the side water depth under Option B1 provides sufficient volume for both ocean discharge and Title 22 disinfection. Under Option B2 the future facilities would consist of a second TF and a Reclaimed Water Pump Station.

Analogous to the Option A2 scenario, with the Option B2 facilities the plant would operate two TF/CCB trains in parallel. One TF/CCB train would operate similar to Option A1 for ocean discharge but with reduced hydraulic capacity because of the smaller Option B effective volume of 53,000 gal per chamber versus the Option A volume of 63,000 gal. The 53,000 gal CCB chamber volume would provide an effective average flow capacity of 1.3 mgd and peak flow capacity of 4.7 mgd for ocean discharge.

The other TF/CCB train would operate to meet Title 22 requirements. The reclaimed water capacity of one TF/CCB train would be based on the 90-minute HRT in the CCB required for Title 22 disinfection. The effective volume of 53,000 gal in one chamber can provide 90 minutes of HRT at a peak flow rate of 0.8 mgd or an average flow rate of 0.4 mgd for Title 22 operation.

Under Option B the plant could operate one TF/CCB train for outfall discharge (average flow of 1.3 mgd and peak flow up to 4.7 mgd) and one TF/CCB train for Title 22 (average flow of 0.4 mgd and peak flow up to 0.8 mgd). The combined average flow capacity of the two TF/CCB trains of (1.3 mgd + 0.4 mgd =) 1.7 mgd would exceed the design PSDWF - Average of 1.5 mgd. The combined peak flow capacity of the two TF/CCB trains of (4.7 mgd + 0.8 mgd =) 5.5 mgd would effectively meet the design peak day flow of 5.6 mgd during wet weather events.

The estimated construction costs for Option B1 and Option B2 are presented in **Table D**. The estimated construction costs for Option A1 and Option A2 are included for comparison. Note that the overall cost of Option B is approximately \$200,000 lower than Option A.

**Table D – Options A1, A2, B1, and B2 Estimated Construction Costs**

Description	Amount	Description	Amount
Option A1		Option B1	
Tertiary Filter	\$910,000	Tertiary Filter	\$910,000
One-chamber CCB	\$428,000	Two-chamber CCB	\$668,000
UW Pump Station	\$399,000	UW Pump Station	\$399,000
Chemical Station	\$506,000	Chemical Station	\$506,000
Subtotal	\$2,240,000	Subtotal	\$2,480,000
Option A2		Option B2	
Tertiary Filter	\$910,000	Tertiary Filter	\$910,000
One-chamber CCB	\$428,000	CCB	\$0
UW Pump Station	\$0	UW Pump Station	\$0
RW Pump Station	\$399,000	RW Pump Station	\$399,000
Chemical Station	\$50,000	Chemical Station	\$50,000
Subtotal	\$1,790,000	Subtotal	\$1,360,000
<b>Option A Total</b>	<b>\$4,030,000</b>	<b>Option B Total</b>	<b>\$3,840,000</b>

## Summary

The estimated construction cost and flow capacities of each option evaluated in this TM are summarized in **Table E** for comparison.

**Table E – Comparison of Option A and Option B**

Description	Unit	Option A			Option B		
		A1	A2	Total	B1	B2	Total
Est. Construction Cost		\$2,240k	\$1,790k	\$4,030k	\$2,480k	\$1,360k	\$3,840k
Plant Capacity							
Average Flow							
Outfall	mgd	1.5	0.0	1.5	1.5 (b)	0.0	1.3
Title 22	mgd	<u>0.0</u>	<u>0.5</u>	<u>0.5</u>	<u>0.0</u>	<u>0.4</u>	<u>0.4</u>
Plant	mgd	1.5	0.5	2.0	1.5 (b)	0.4	1.7
Peak Flow							
Outfall	mgd	5.6	0.0	5.6	5.6 (b)	0.0	4.7
Title 22	mgd	<u>0.0</u>	<u>1.0</u>	<u>1.0</u>	<u>0.0</u>	<u>0.8</u>	<u>0.8</u>
Plant	mgd	5.6	1.0	6.6	5.6 (b)	0.8	5.5

A summary of the basis of design for Option A and Option B is presented in Table F at the end of the TM for reference.

In reviewing the two options presented in this TM, Option B is preferred based on the following considerations:

- Option A1 is the baseline configuration that represents the current scope of design.
- Option A2 represents the default approach to provide Title 22 reclaimed water capability in the future by adding a second TF and second CCB that are the same sized units as provided in Option A1.
- Option B would provide the immediate convenience and flexibility of two CCB chambers in lieu of one chamber and increase the side water depth from 5 feet to 8 feet for a relatively small investment of \$240,000.
- The increase the side water depth from 5 feet to 8 feet under Option B would provide an increase in disinfection volume that would increase disinfection efficiency (lower chemical cost) during the first phase of operation (Option B1). The increase in disinfection volume also simplifies and reduces the estimated construction cost to implement Title 22 capability in the future (Option B2).

- After installation of future Title 22 reclaimed water capability (Option A2 or Option B2), the overall plant capacity provided under Option B more closely matches the design parameters than Option A. Option A capacity would exceed the needed plant design criteria as indicated in Table F.

**Table F – Option A and Option B Plant Capacity Comparison**

<b>Description</b>	<b>Unit</b>	<b>Option A</b>	<b>Option B</b>	<b>Design Criteria</b>
PSDWF - Average	mgd	2.0	1.7	1.5
Peak Day Flow	mgd	6.6	5.5	5.6

Based on the considerations presented above, Option B is recommended for implementation for the MBCSD WWTP Upgrade Project.

Please contact Steve Hyland if you have any questions.

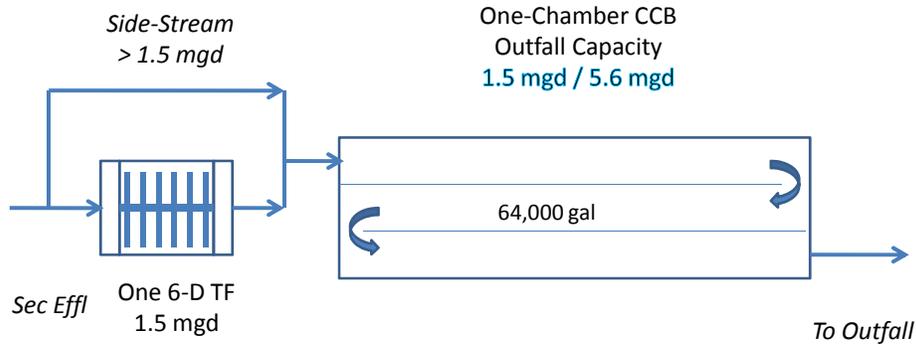
- c. Don Spiegel  
Roger Stephenson

**Table F – Basis of Design for Option A and Option B**

Description	Unit	Option A			Option B		
		A1	A2	Total	B1	B2	Total
Tertiary Filters							
No.	--	1	1	2	1	1	2
Size	Disks	6-D	6-D	6-D	6-D	6-D	6-D
Installed TF Cap.							
Average Flow	mgd	1.5	1.5	3.0	1.5	1.5	3.0
CCBs							
No. Chambers	--	1	1	2	2		2
Vol. / Chamber (a)	Gal	64,000	64,000	64,000	53,000		53,000
Total Volume (a)	gal	64,000	64,000	128,000	106,000		106,000
Side Water Depth	ft	6	6	6	8		8
Outfall Cap. per Chamber							
Average	mgd	1.5	0.0	1.5	1.3	0.0	1.3
Peak	mgd	5.6	0.0	5.6	4.7	0.0	4.7
Title 22 Cap. per Chamber							
Average	mgd	NA	0.5	0.5	NA	0.4	0.4
Peak	mgd	NA	1.0	1.0	NA	0.8	0.8
UW Pump Station							
	--	Yes		Yes	Yes		Yes
RW Pump Station							
	--		Yes	Yes		Yes	Yes
Chemical Station							
	--	Yes		Yes	Yes		Yes

- (a) Volumes somewhat larger than theoretical requirement due to rounding up of structural width and length dimensions. Effective volume for Option B listed.
- (b) Actual capacity can be higher with both CCB chambers in service, but values listed are plant design criteria. Disinfection expected to be more efficient (lower chemical costs) in this mode.

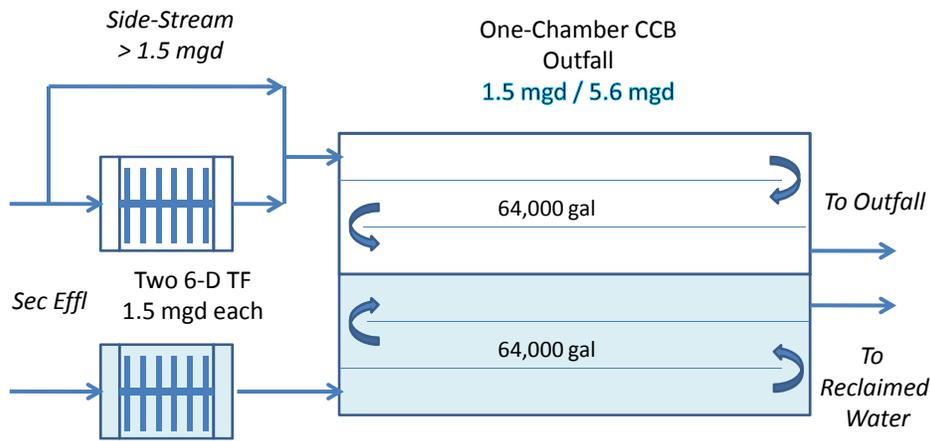
**Figure 1 – Option A1 Flow Schematic**



Notes:

1. With a hypothetical 1.5 mgd TF capacity, over 96% of total flow discharged from the WWTP over the period from Y1995 to Y2009 would have received tertiary filtration.
2. Utility Water Pump Station and Chemical Station not shown.

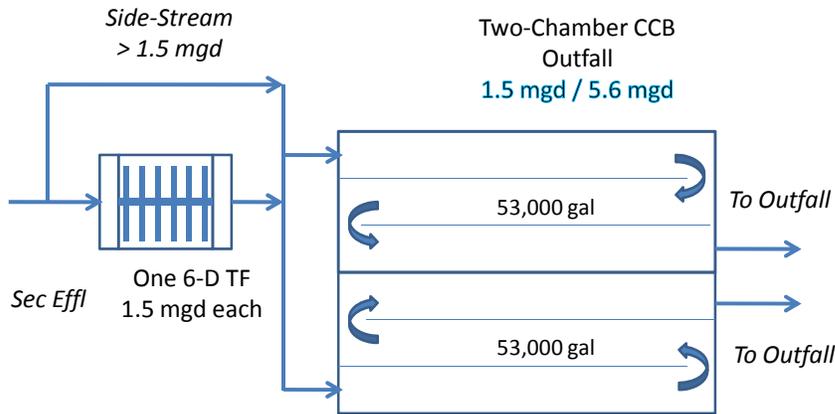
**Figure 2 – Option A2 Flow Schematic**



Notes:

1. Utility Water Pump Station, Chemical Station, & Reclaimed Water Pump Station not shown.

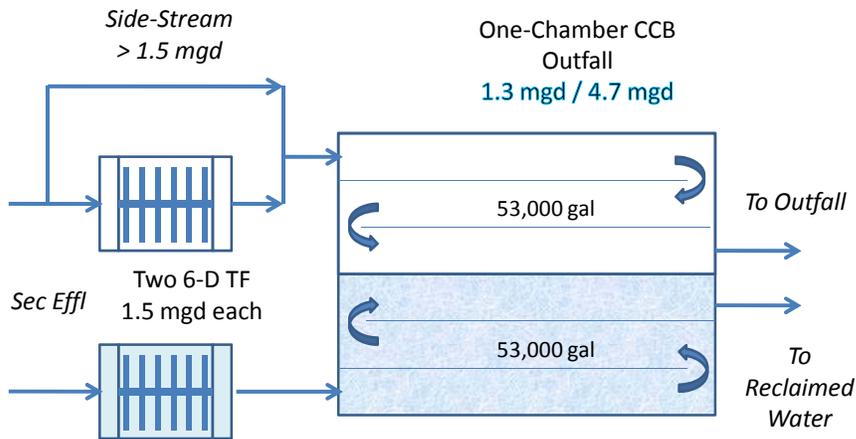
**Figure 3 – Option B1 Flow Schematic**



Notes:

1. Utility Water Pump Station & Chemical Station not shown.

**Figure 4 – Option B2 Flow Schematic**



Notes:

1. Utility Water Pump Station, Chemical Station, & Reclaimed Water Pump Station not shown.

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## STAFF REPORT

### **MORRO BAY-CAYUCOS J.P.A. WASTEWATER TREATMENT PLANT**

**To:** Honorable Mayor and City Council, City of Morro Bay  
Honorable President and Board of Directors, Cayucos Sanitary District

**From:** Bruce Keogh, Wastewater Division Manager

**Date:** July 1, 2010

***Subject:***

Status Report on Request for Proposal (RFP) for Project Management for the WWTP Upgrade Process

***Recommendation:***

This Department recommends that this report be received and that the Council and District Board schedule a special meeting to award a contract for PM services.

***Fiscal Impact:***

None

***Summary:***

This staff report is intended to provide an update on the Request for Proposal (RFP) for Project Management services for the WWTP upgrade process. This staff report updates the report from the June 10, JPA meeting.

***Background:***

At the May 13, 2010 JPA meeting the Council and District approved an RFP for Project Management services for the WWTP upgrade process. The RFP was public noticed on May 18 and closed on June 9. The public notice for the RFP was emailed to a list of consulting firms compiled by City and District staff and was also published in the Tribune. Four proposals were received from the following firms: Harris & Associates, Vanir, Dudek, and Dennis Delzeit teaming with the Wallace Group.

***Discussion:***

**Proposal Evaluation:**

The four proposals were reviewed by an evaluation committee composed of City and District staff. The evaluation committee unanimously selected two firms to interview, Harris & Associates and Dennis Delzeit teaming with the Wallace Group. Interviews with these two firms were held on June 30. The evaluation committee is working on a recommendation at this time and will work with the top firm to negotiate a contract to bring to the next JPA meeting for an award of contract.

Award of Contract:

Staff attempted to expedite the proposal evaluation and contract negotiation process with the goal of awarding the contract at this meeting. Due to scheduling constraints they were unable to accomplish that goal. Staff is recommending a special meeting for an award of contract in the interest of bringing the PM on-board as quickly as possible. If no special meeting is scheduled then staff would bring the recommendation for award of contract at the August 12 JPA meeting. Regardless of the meeting date, staff is planning on having the recommended PM give a presentation at that meeting and answer questions from the Council and Board prior to awarding the contract.

Staff's recommendation is based on the numerous critical project tasks that are currently on-going or will commence following the adoption of Amendment #2 to the Facility Master Plan (item B-1 on this agenda). Both potential PM candidates stressed the importance of the tight project time schedule during their interviews. In addition, the recent Council and Board direction to accept a Construction Design Report (CDR) from PERC for evaluation and assessment makes the need for a qualified PM even more critical.

If approved, the special meeting agenda could be limited to only the award of contract for the PM. One possible meeting date and time for a special meeting is the next JPA TAC meeting, July 15 between 1 and 3PM. That would involve postponing the July TAC meeting and having a JPA meeting in its place.

***Conclusion:***

Following the completion of the evaluation process, and the negotiation of a contract with the top firm, staff will bring a recommendation for award of contract for PM services at the next JPA meeting. Staff is recommending that a special meeting be held to expedite bringing a PM on board to manage the upgrade project.

## STAFF REPORT

**MORRO BAY-CAYUCOS J.P.A.  
WASTEWATER TREATMENT PLANT**

**To:** Honorable Mayor and City Council, City of Morro Bay  
Honorable President and Board of Directors, Cayucos Sanitary District

**From:** Bruce Keogh, Wastewater Division Manager

**Date:** July 1, 2010

***Subject:***

Discussion and Consideration to Send a Letter to the Regional Water Quality Control Board (RWQCB) and the USEPA Requesting a Reduction in Monitoring Frequency for Selected Parameters Contained in the Monitoring and Reporting Program of the NPDES Discharge Permit for the WWTP

***Recommendation:***

Staff recommends that following discussion and consideration of the draft letter to RWQCB and USEPA, the Council and District Board direct staff to send the letter and start the permit-modification process. This will allow the RWQCB and USEPA to begin to consider reducing the monitoring frequency of selected parameters in the NPDES discharge permit.

***Fiscal Impact:***

The recommended reductions in the effluent monitoring program could result in potential cost savings of up to \$70,000 over the next three years. There may be some additional time involved for both staff and Dr. Coats at Marine Research Specialists as this process moves forward. To date, approximately \$8,000 has been expended in development of the technical justification for the monitoring reduction.

***Summary:***

The topic of this staff report is the consideration and approval by the Council and District Board for a letter to the RWQCB and USEPA requesting a reduction in the monitoring frequency of 79 effluent parameters contained in the NPDES discharge permit. The request for reduction is based on a notation in the plant's NPDES permit that specifically allows for such a request. A reasonable potential analysis (RPA) conducted by Dr. Doug Coats of Marine Research Specialists provides the qualitative and quantitative justification for the proposed reductions. A copy of the letter and the RPA are attached to this staff report. It is important to note that this request is not intended to eliminate monitoring altogether, but rather to reduce the monitoring-frequency for selected parameters within the MBCSD effluent that are not anticipated to be at risk for ever exceeding the permit limits.

***Background:***

The treatment plant operates under NPDES Permit No CA0047881 issued by the RWQCB and the USEPA. The permit was renewed in March of 2009 and is valid for five years. Consistent with other NPDES discharge permits, the current permit contains a Monitoring and Reporting Program (MRP). The MRP for our WWTP includes monitoring of both effluent chemistry and receiving waters. Current and past NPDES permits have required intensive monitoring since the plant was upgraded in 1986. The MRP has been reviewed and modified during each permit renewal cycle. The modifications to the MRP have enhanced the ability of the MRP to detect any potential impacts from the discharge. The most important recommendations for improving the MRP have come from our consultant, Marine Research Specialists, and have been well-received by RWQCB and USEPA staff. Additional modifications have been mandated by revisions to the California Ocean Plan. A copy of the NPDES permit is available on the City web site, under Public Services, Wastewater Treatment Plant Operations. The MRP is included as Attachment E to that document.

***Discussion:***

**Monitoring & Reporting Program:**

The MRP outlines the parameters to be monitored and the frequency of the analysis. Some parameters such as pH, suspended solids, BOD, turbidity, total coliform, and total chlorine residual are monitored regularly by plant staff. However, effluent is also evaluated for the presence of over 160 chemical compounds. Most of these are evaluated on a semi-annual or annual basis, and require sophisticated chemical assays that are performed by outside contract laboratories. The costs to perform these analyses can be as high as several thousands of dollars per sample, depending upon the parameter to be tested and the complexity of the analysis required.

The State Water Board and the USEPA have specific guidelines for statistically evaluating historical data to determine how often effluent monitoring is necessary. They recognize that continued sampling is unnecessary when historical data demonstrate that there is no reasonable potential for a future exceedance of the permit limit on individual chemicals. The attached RPA, based on the extensive set of effluent-chemistry data collected over two decades, amply demonstrates that this is the case for MBCSD plant's effluent.

The letter to RWQCB and USEPA transmits the results of the RPA, which will allow them to modify the MBCSD permit and reduce the frequency of monitoring for 79 parameters that are currently tested on a semi-annual or annual basis. The letter is requesting that those 79 parameters be analyzed once in the five-year life of the NPDES discharge permit. Reducing the monitoring frequency for the 79 parameters to once-in-the-life of the permit will make the MBCSD monitoring frequency consistent with that of other small-volume dischargers.

**Basis for Reduction in Monitoring:**

The request for a monitoring-frequency reduction was prompted by an invitation contained within Footnote 7 on Page E-9 of the MBCSD NPDES discharge permit which states, "*After results are reported, the Discharger may request to the Regional Board and*

*USEPA that only those parameters detected during the first year of sampling may be analyzed during the remainder of the permit.”*

The quantitative and qualitative justification for reducing the monitoring frequency is contained in the attached RPA performed by Dr. Doug Coats of Marine Research Specialists. Significant effort was expended to establish the basis for monitoring frequency reduction by conducting statistical analyses of the large number of historical effluent measurements. The RPA was conducted per the specifications in Appendix VI of the California Ocean Plan, and contains a detailed discussion outlining the justifications for a reducing the monitoring frequency for 79 effluent parameters. The RPA amply demonstrates that analyzing for the presence of these 79 parameters once per permit cycle will remain adequately protective of the marine environment. Plant staff has provided a draft of the RPA to both RWQCB and USEPA staff, who concur that the technical justifications are both adequate and appropriate.

Regulatory Process:

RWQCB staff has indicated that the proposed reduction monitoring frequency would be considered a modification of the NPDES permit. As such, RWQCB staff has stated that they cannot modify the monitoring frequency administratively and that such a change would need to be considered and approved by both the Regional Board and USEPA. That process will take at least six months to complete, and will conclude with the request being heard at one of the regular Regional-Board meetings. The USEPA staff would also have to review and concur with the MBCSD request.

Cost Savings:

If RWQCB and USEPA approve all of the requested reductions in monitoring frequency, it could result in a potential cost savings of as much as \$70,000 over the remaining three years of monitoring within the current permit cycle.

***Conclusion:***

Staff recommends that, following discussion and consideration of the draft letter to RWQCB and USEPA, the Council and District Board direct staff to send the letter and start the permit-modification process. The RWQCB and USEPA will then be able to officially consider the request for a reduction in the monitoring frequency of selected parameters in the NPDES discharge permit.

July 9, 2010

Mr. Roger Briggs  
Executive Officer  
Central Coast Regional Water Quality Control Board (RWQCB)  
895 Aerovista Place, Suite 101  
San Luis Obispo, CA 93401

Ms. Alexis Strauss  
Director, Water Division  
Region IX, U.S. Environmental Protection Agency (USEPA)  
75 Hawthorne St. WTR-5  
San Francisco, CA 94105

Subject: Request for Reduction in Effluent Monitoring Frequency in NPDES Permit No. CA0047881 issued to the Morro Bay/Cayucos (MBCSD) Wastewater Treatment Plant

Dear Ms. Strauss and Mr. Briggs,

The MBCSD hereby requests that the USEPA and RWQCB reduce the frequency of effluent monitoring for 79 effluent parameters listed in the discharge permit issued to the MBCSD Wastewater Treatment Plant. The following specific modifications to NPDES Permit No. CA0047881 are requested:

- 1) Reduce semi-annual analysis for cyanide and the 10 metals monitored for the protection of aquatic life to an analysis once-in-the-life of the permit;
- 2) Reduce annual analysis for the six remaining parameters monitored for the protection of aquatic life to an analysis once-in-the-life of the permit;
- 3) Reduce annual analysis for the 62 parameters monitored for the protection of human health to an analysis once-in-the-life of the permit.

This request is in response to the invitation contained in Footnote 7 on page E-9 of the MBCSD discharge permit, which states, “*After results are reported, the Discharger may request to the Regional Board and USEPA that only those parameters detected during the first year of sampling may be analyzed during the remainder of the permit.*”

The quantitative and qualitative justification for reducing the monitoring frequency is contained in the attached Reasonable Potential Analysis (RPA) performed by Dr. Coats of Marine Research Specialists. The RPA was conducted in strict accordance with the

guidelines provided in Appendix VI of the 2005 California Ocean Plan, which specifies when effluent limitations are required in NPDES permits.

We look forward to working with USEPA and RWQCB staff on this matter and ask that this request be handled in an expeditious manner to avoid further unnecessary sampling and analysis in the current permit cycle.

If you have any questions, or require further information, please contact me at 772-6272,

Sincerely,

Bruce Keogh,  
Wastewater Division Manager

cc  
Ms. Andrea Leuker  
City Manager

Mr. Bill Callahan  
Cayucos Sanitary District

Mr. Rob Livick  
Public Services Director/ City Engineer

Dr. Douglas Coats  
Marine Research Specialists

Attachments:  
RPA prepared by Marine Research Specialists



# marine research specialists

3140 Telegraph Road, Suite A • Ventura, CA 93003 • (805) 644-1180

Bruce Keogh  
Wastewater Division Manager  
City of Morro Bay  
955 Shasta Avenue  
Morro Bay, CA 93442

7 December 2009

**Reference: Request for Reduction in the MBCSD WWTP<sup>1</sup> Effluent Monitoring Frequency and Correction to Heptachlor Units**

Dear Mr. Keogh:

This letter provides quantitative and qualitative justification for reducing the monitoring frequency of 79 effluent parameters listed in the MBCSD discharge permit.<sup>2</sup> Analysis of the long record of chemical assays of MBCSD effluent demonstrates that a reduction in analysis frequency to once per permit cycle will remain protective of the beneficial uses of the receiving waters. Specifically, justification for reductions is based on the outcome of Reasonable Potential Analyses (RPA) specified in Appendix VI of the California Ocean Plan (COP),<sup>3</sup> the standard monitoring frequencies identified in COP Appendix III, and best professional judgment (BPJ). The discharge permit grants the authority for reducing the sampling frequency to the staffs of the RWQCB and the USEPA.<sup>4</sup> Therefore, we recommend that you request the RWQCB and USEPA modify the permit as follows.

- 1) Reduce semi-annual analysis for cyanide and the 10 metals monitored for the protection of aquatic life to an analysis once-in-the-life of the permit;
- 2) Reduce annual analysis for the six remaining parameters monitored for the protection of aquatic life to an analysis once-in-the-life of the permit;
- 3) Reduce annual analysis for the 62 parameters monitored for the protection of human health to an analysis once-in-the-life of the permit; and
- 4) Acknowledge that the units for heptachlor and heptachlor epoxide limits specified in the permit should be ng/L rather than pg/L.

The lines of evidence that justify a reduction in the monitoring frequency for the effluent parameters are as follows.

- 1) The MBCSD discharge permit allows a request for a change in monitoring to once-in-the-life of the permit for those compounds that are undetected in the first year of monitoring. Seventy-three compounds were undetected in the July 2009 effluent samples.
- 2) Monitoring requirements for the six compounds detected in the July 2009 effluent sample should also be reduced because their concentrations were well below regulatory limits, they are all ubiquitous in the environment, and they were only detected because the chemical assays utilized were powerful enough to resolve these low background concentrations.

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<sup>1</sup> The City of Morro Bay and the Cayucos Sanitary District (MBCSD) are the joint owners of the wastewater treatment and disposal facility (WWTP).

<sup>2</sup> [Regional Water Quality Control Board \(RWQCB\) - Central Coast Region and the Environmental Protection Agency \(EPA\) – Region IX. 2009. Waste Discharge Requirements \(Order No. R3-2008-0065\) and National Pollutant Discharge Elimination System \(Permit No. CA0047881\) for the Morro Bay and Cayucos Wastewater Treatment Plant Discharges to the Pacific Ocean, Morro Bay, San Luis Obispo County. Effective 1 March 2009.](#)

<sup>3</sup> State Water Resources Control Board (SWRCB). 2005. Water Quality Control Plan, Ocean Waters of California, California Ocean Plan. California Environmental Protection Agency. Effective February 14, 2006.

<sup>4</sup> Footnote 7 on Page E-9 of the discharge permit issued to the MBCSD WWTP states: “*After results are reported, the Discharger may request to the Regional Board and USEPA that only those parameters detected during the first year of sampling be analyzed during the remainder of the permit.*”

- 3) The MBCSD discharge is one of the most intensively monitored discharges of its size. The standard monitoring procedures in the COP require other discharges near, or below 1 MGD, to monitor only once during the life of the permit. Additionally, if an RPA demonstrates no potential for exceedance of permit limits, standard monitoring frequencies generally do not apply at all.
- 4) RPA verifies that there is no potential for exceedance for 69 of the effluent compounds. Evaluation of the remaining ten compounds was inconclusive and/or complicated by the inclusion of potentially erroneous data.
- 5) The existing semiannual testing of effluent for chronic effects provides a highly sensitive, more all-inclusive measurement of potential impacts to marine organisms than regular testing of individual compounds can provide.
- 6) There is little environmental risk from the small volume of relatively clean wastewater discharged by the MBCSD. The discharge is located well offshore in an open ocean environment where effluent has been documented to disperse rapidly within just a few meters of the discharge. The MBCSD collection system does not draw from an industrialized area, and the treatment process routinely approaches or exceeds secondary standards, resulting in a high-quality effluent derived largely from domestic sources.

#### Undetected Compounds Qualify for Reductions in Monitoring Frequency

Seventy-three of the 79 parameters recommended for reduced monitoring had chemical concentrations too low to be quantified in the effluent samples collected in July 2009.<sup>5</sup> As a result, all 73 compounds automatically qualify for reduced sampling under the provisions of the discharge permit.<sup>4</sup> However, as described below, sampling reductions are also justified for the remaining six parameters, despite their quantifiable concentrations in the July 2009 effluent sample (Table 1).

The measured values for each of the six compounds detected in July 2009 were only slightly above the minimum reporting values, and all were well below permit limits. Because detection levels depend on laboratory performance standards, they lend little insight into the potential for environmental effects from a particular compound. Instead, comparisons between measured concentrations and thresholds of adverse effects (permit limits) are more appropriate for determining sampling frequency.

**Table 1.** Six Parameters Measured above Quantification Limits in the July 2009 Effluent Samples<sup>6</sup>

Chemical Compound or Parameter	Units	Reporting Level	Measured Value	Permit Limit
Copper	mg/L	0.1	0.011	0.14
Lead	mg/L	0.0005	0.0011	0.27
Zinc	mg/L	0.02	0.052	1.62
Bis(2-ethylhexyl) phthalate	µg/L	5.	9.2	469.
Dioxin	pg/L	— <sup>7</sup>	0.11	0.52
Radioactivity	α	pCi/L	—	0.201
	β	pCi/L	—	3.1

For example, the three metals (copper, lead, and zinc) and the organic compound (bis 2-ethylhexyl phthalate) have been detected at quantifiable levels in over half of the effluent samples collected during the last seventeen years. This is largely because the metals enter the wastewater collection system through erosion of natural mineral deposits along the central California coast, and are ubiquitous in the local

<sup>5</sup> [Marine Research Specialists. 2009. MBCSD Offshore Monitoring and Reporting Program, Annual and Semiannual Effluent Sampling, Chemical and Bioassay Analysis Results, July 2009.](#) 143pp. 1 September 2009

<sup>6</sup> Quantifiable concentrations exceed the minimum levels (MLs) identified in COP Appendix II, or for those parameters without MLs, the laboratory's practical quantification limit.

<sup>7</sup> ML not specified (see Footnote 8)

sedimentary environment. Similarly, bis(2-ethylhexyl) phthalate has become pervasive in the environment due to the massive scale on which it is produced, its mobility, and high vapor pressure. Regardless of their widespread presence, the concentrations all four compounds were more than an order of magnitude below levels deemed deleterious to marine organisms or humans, and, as described below, the long monitoring history unequivocally demonstrates that there is no reasonable potential for exceedance of the discharge permit limits for these compounds.

The two remaining effluent parameters detected in the July 2009 effluent sample, dioxin and radioactivity, are also ubiquitous in the environment, albeit at extremely low concentrations. Their detection was due to the exceedingly high resolution of the associated laboratory methods. The detection levels for these compounds are so low that the COP does not specify a minimum level (ML)<sup>8</sup> for either compound. Consequently, detection reporting was based on the PQLs<sup>9</sup> specified by the laboratories. Even though both radioactivity and dioxin concentrations were quantified in the July 2009 effluent sample, the measured levels were well below permit limits, where potential impacts to human health become a concern.

Annual sampling should not be required for any of these six detected parameters simply because laboratory methods are capable of discerning the low, background concentrations of these ubiquitous compounds.

### **Monitoring Frequency Exceeds Requirements Imposed on Similarly-Sized Dischargers**

The monitoring frequency specified in the current MBCSD discharge permit exceeds the monitoring requirements for other dischargers of similar volume. Reducing the monitoring frequency for 79 parameters to once-in-the-life of the permit will make the MBCSD monitoring program more consistent with other small-volume discharges of relatively benign effluent. Regardless of size, the COP's standard monitoring procedures only apply to individual pollutants when an RPA of the historical discharge data conclusively demonstrates a reasonable potential for exceeding a permit limit, or in the absence of sufficient historical data, when best professional judgment (BPJ) indicates there is a reasonable potential.

### **No Reasonable Potential for Exceeding COP Water-Quality Objectives**

RPA was performed on all 79 of the effluent compounds, and unequivocally demonstrates that no reasonable permit-exceedance potential exists for 69 of the 79 parameters.<sup>10</sup> For those compounds, the standard monitoring procedures do not apply, and the COP does not even require an effluent limit, much less monitoring at any time during the permit life.<sup>11</sup> Because effluent samples were analyzed for these compounds in July 2009,<sup>5</sup> the actual sampling frequency (once in the permit life) exceeds the COP monitoring requirement. The RPA was based on an extensive historical record of 2,882 measurements spanning seventeen years of MBCSD effluent monitoring. Consequently, the RPA conducted on these compounds was extraordinarily robust and reliable. Further analysis of effluent samples for these compounds during the current permit's life would be both unwarranted and expensive.

### **Semiannual Toxicity Testing is Protective without Additional Chemical Analyses**

RPA conducted on the first six of ten remaining compounds listed in Table 2 were inconclusive due to permit limits that were too low to be routinely resolved by available analytical techniques. Permit limits were below the MLs for these six compounds, although twelve or more of the actual reported detection

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<sup>8</sup> Minimum Levels (MLs) are the lowest concentrations that can be quantitatively measured by chemistry laboratories throughout California. They are specific to the analytical method, and are used to determine reporting thresholds on Discharge Monitoring Reports (DMRs). They are common to all California dischargers and are specified in Appendix II of the COP.

<sup>9</sup> Practical Quantification Limits (PQLs) are the analysis- and instrument-specific minimum concentration of a substance that can be routinely determined with a high degree of certainty (>99.9% confidence). They differ among laboratories and change over time.

<sup>10</sup> Listed with RPA Endpoint 2 in Table 3 of this letter.

<sup>11</sup> Bottom of COP Page 42: "Endpoint 2: An effluent limitation is not required for the pollutant [and]... effluent monitoring is not required for the pollutant...."

limits for 3,3-Dichlorobenzidine and PCB, were conclusively below the permit limit. This is only slightly below the fifteen conclusive non-detects required for exclusion of monitoring under the COP guidelines. All reported concentrations, measured in 26 to 43 separate effluent samples during the last seventeen years, were non-detects.

Based on the RPA outcome for these six compounds (Endpoint 3), the COP recommends inclusion of a permit limitation, but no chemical monitoring of the pollutant during the life of the permit if toxicity testing is conducted on an annual basis<sup>12</sup> in accordance with the standard monitoring procedures. The MBCSD discharge permit currently requires chronic toxicity bioassays on a semiannual basis, which is twice the standard monitoring frequency required for discharges of its size. Continued semiannual bioassay testing ensures adequate surveillance of pollutant levels within the MBCSD WWTP effluent, even with the recommended reduction in the monitoring frequency of individual compounds.

**Table 2.** Ten Effluent Parameters with Inconclusive RPAs<sup>13</sup>

Parameter	RPA Endpoint <sup>14</sup>	Non-Exceedances <sup>15</sup>	Units	Minimum Level <sup>8</sup>	Highest Measured	Permit Limit
<b>Fewer than 15 Conclusive Non-Exceedances</b>						
Benzidine	3	0	ng/L	5,000.	—	9.25
Chlordane	3	0	ng/L	100.	—	3.08
3,3-Dichlorobenzidine	3	13	µg/L	5.	—	1.09
Hexachlorobenzene	3	0	ng/L	1,000.	—	28.1
PCB	3	12	ng/L	500.	—	2.55
Toxaphene	3	2	ng/L	500.	—	28.1
<b>Too Few Observations</b>						
Tributyltin	3	1	µg/L	—	—	0.188
<b>Exceeded Limit</b>						
Radioactivity β	2 <sup>16</sup>	21	pCi/L	—	54.	50.
DDT	1	24	ng/L	50	51.	22.8
Dioxin	1	16	pg/L	—	0.563	0.52

### Tributyltin Monitoring already Acknowledged as Unnecessary

The tributyltin RPA was indeterminate due to the paucity of historical tributyltin measurements. As with the other six properties that yielded an inconclusive RPA (Endpoint 3), the COP does not require monitoring of this compound if toxicity testing is conducted at least annually. However, in contrast to the inconclusive RPAs found for the other six compounds, tributyltin's endpoint did not result solely from the inability to resolve concentrations as low as the permit limit in a large number of samples. Specifically, tributyltin analyses were only conducted on four effluent samples collected during the last seventeen years because routine monitoring for tributyltin was not a requirement under the two prior discharge permits. Although prior permits found that its occurrence within MBCSD effluent would be extremely unlikely, RWQCB Staff inadvertently<sup>17</sup> included a requirement for annual tributyltin analysis in the current permit.<sup>18</sup> As a result, an

<sup>12</sup> Top of COP Page 4: “Endpoint 3: ...Monitoring for the pollutant or whole effluent toxicity testing, consistent with the monitoring frequency in Appendix III, is required....”

<sup>13</sup> Listed with RPA Endpoints 1 or 3 in Table 3 of this letter.

<sup>14</sup> See Footnote 29 in Table 3

<sup>15</sup> A conclusive non-exceedance is either a measured concentration below the permit limit or a non-detect with a detection limit that is below the permit limit.

<sup>16</sup> The RPA program incorrectly identified Endpoint 2 for β radioactivity even though there was one exceedance of the drinking-water limit and Endpoint 1 is the correct outcome.

<sup>17</sup> Staff Response 18 on Page F-45 of the [Current MBCSD Discharge Permit](#) “proposed to remove the effluent tributyltin requirement.”

<sup>18</sup> Third parameter listed on Page E-10 in the Table of Effluent Monitoring Requirements for the Current MBCSD Discharge Permit

expensive and unnecessary organotin analysis was conducted on the July-2009 sample collected during this permit cycle. As expected, however, tributyltin was not detected in the effluent sample, even with a 0.07- $\mu\text{g/L}$  method detection limit that was well below the 0.188- $\mu\text{g/L}$  permit limit.

Despite the comparatively low number of tributyltin observations, the annual sampling frequency that is currently required in the permit should be reduced to the once-in-the-life frequency recommended for the other 78 parameters. The sampling-frequency reduction is based on: i) previous acknowledgement by RWQCB Staff that it is unnecessary, ii) an undetected concentration within the July 2008 sample that was conclusively below the permit limit, and iii) sampling that already satisfies the once-in-the-permit-life frequency recommended for the other 78 parameters.

### **Reduced Sampling Frequency is Protective of Beneficial Uses**

BPJ applied to a wide variety of information about the MBCSD discharge, beyond an RPA of historical effluent concentrations, demonstrates that the recommended monitoring-frequency reduction would be protective of beneficial uses.<sup>19</sup> This includes the remaining three<sup>20</sup> parameters that require application of BPJ to assess the need for continued sampling on an annual basis. Although each of these three cases is discussed below, BPJ applied to the general characteristics of the MBCSD discharge supports a reduction in sampling frequency to once-in-the-permit-life for all 79 parameters.

The MBCSD discharge poses a minimal threat to beneficial uses because it consists of a small volume of high-quality effluent that is discharged well offshore in an energetic open ocean environment where wastewater constituents are rapidly dispersed within 15 m of the discharge point. Despite the 301h-modification to the MBCSD's discharge permit, all of the MBCSD wastewater routinely receives secondary treatment. Even on those rare occasions when high flow rates necessitate blending with primary-treated wastewater, at least 1 MGD of the flow receives secondary treatment. As a result, effluent biochemical oxygen demand, suspended solids, and pH routinely approach or exceed the requirements normally applied to full-secondary facilities. As further testimony to the MBCSD's effluent quality, exceptions to permit limitations are extremely rare and minor, and almost always associated with unavoidable repairs to plant components, or uncommon and unforeseen upsets in the treatment process.

In addition to the high performance of the MBCSD WWTP, the general absence of pollutants within the wastewater stream is due to the lack of heavy industry within the collection area. Because the influent consists largely of wastewater from domestic sources, the introduction of most industrial pollutants, including the three described below, is highly unlikely.

Also, because of the depth of the MBCSD outfall, its location well offshore, and its rapid dilution of effluent to imperceptible levels, there are few paths of exposure for human encounters with the pollutants designated for reduced monitoring. Most of the pollutants are regulated for the protection of human health rather than aquatic organisms but the discharge is located far beyond the surfzone where human activities occur. There are no naturally occurring kelp beds or submerged rocky reefs near the discharge that would draw fishermen or recreational divers. Consequently, consistently low effluent concentrations of the other sixteen chemical contaminants, which are regulated for marine life protection, has been repeatedly confirmed by numerous marine bioassays conducted on the effluent.

### **Reduced Monitoring is Warranted for Three Parameters with Questionable Exceedances**

Out of the 2,882 effluent measurements included in this analysis, three isolated measurements slightly exceeded the effluent limits. These exceedance events were:

- 1) Radioactivity that was 4 pCi/L above the drinking-water standard of 50 pCi/L in January 1994;

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<sup>19</sup> Refer to the use of BPJ in Step 13 in the RPA-Procedures Appendix VI on COP Page 42

<sup>20</sup> Refer to Table 2 and the RPA results in Table 3 for  $\beta$  radioactivity, DDT, and dioxin.

- 2) A reported DDT concentration of 51 ng/L in the July 1998 sample that exceeded the 22.8 ng/L permit limit; and
- 3) A reported dioxin concentration that was 0.043 pg/L above the 0.52-pg/L effluent limit in the July 2002 sample.

In the absence of BPJ, the RPA procedures identify effluent monitoring in accordance with the COP standard monitoring procedures;<sup>21</sup> namely, annual monitoring for discharge volumes between 1 and 10 MGD, but monitoring once in the life of the permit for dischargers with volumes only 0.1 MGD below the 1.1 MGD flow rate from the MBCSD WWTP. However, as described below, the exceedances were isolated instances that were suspect and only slightly higher than the respective permit limits. Furthermore, BPJ not considered in the RPA suggests that recurrence of these events is unlikely. Specifically, the events were isolated in the middle of the seventeen-year-long record. Because the exceedances occurred only once for each compound, not repeatedly for a single compound, it is unlikely they represent a chronic pollutant within the effluent stream. Moreover, they do not represent a new contaminant source because the exceedances occurred more than eight years ago, and there have been numerous lower measurements in the interim. Lastly, there is no known input source for these compounds within the collection system that almost exclusively services domestic sources.

Because of uncertainty concerning laboratory error in these measurements, the marginal elevation above the effluent standard, and the conservative assumptions regarding MBCSD initial dilution rates, compliance with the receiving-water standards was likely to have occurred on all three occasions when permit exceedances were reported. Each of the three elevated measurements is discussed below in terms of their lack of potential for non-compliance in the remaining permit term.

**Radioactivity:** The slightly elevated gross- $\beta$  radioactivity of 54 pCi/L measured in the January 1994 effluent sample was abnormal. Radioactivity measurements recorded prior to 1995, including the January 1994 effluent measurement, tend to be of low resolution and questionable accuracy. The highest  $\beta$  radioactivity measured in the other 21 measurements was 21.15 pCi/L, less than half of the January 1994 measurement. The  $\alpha$ -radioactivity of the January 1994 measurement was also abnormally high (13 pCi/L) compared to the maximum of 4 pCi/L found in other effluent samples.  $\beta$ -particle activity arises from radioactive decay in both natural and man-made materials but  $\alpha$ -particle activity arises from natural mineral deposits that enter the collection system through erosion. Because of its natural origin, it would be highly unusual for  $\alpha$ -particle activity to triple in one effluent sample unless there was a concomitant increase in TSS. However, the TSS concentration on 26 January 1994, when the high radioactivity was measured, was nominal (25 mg/L).

It is also noteworthy that the standards specified for radioactivity are not derived in the same manner as for other chemical constituents. The maximum contaminant levels in discharged effluent, pursuant to the California Code of Regulations, Title 22, §64441 and §64443, are the same as those established for drinking water. Consequently, they do not account for 133-fold minimum dilution after discharge. The narrative standard in the Central Coast Basin Plan states that “*Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life; or result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal, or aquatic life.*” Regardless of the receiving water standard to be met, the abnormally high  $\beta$ -radioactivity measured in the January-1994 effluent sample is not expected to reoccur during the upcoming permit term given the consistently low radioactivity measured in effluent samples collected over the past decade and a half. Excluding the anomalous measurement from January 1994 in an RPA of  $\beta$  radioactivity yields Endpoint 2, wherein an effluent limit would not be required in the permit, much less any radionuclide monitoring during the permit term.

**DDT:** Detection of DDT (51 ng/L) in the July 1998 effluent sample was highly abnormal and probably due to laboratory error. Of the 42 effluent samples analyzed for DDT, this was the only time that any of its

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<sup>21</sup> Bottom of COP Page 42: “*Endpoint 1: An effluent limitation must be developed for the pollutant. Effluent monitoring for the pollutant, consistent with the monitoring frequency in Appendix III, is required.*”

congeners was detected. This isolated incidence of DDT detection coincided with a change in analysis procedure that reduced the reported PQL by an order of magnitude. Prior to July 1998, the analysis PQL (40 ng/L) was such that any detectable amount would automatically exceed the effluent limit of 22.8 ng/L.

In addition to the unusual coincidence of a detectable DDT concentration after a change in the analysis procedure, the DDT measurement in the July 1998 sample was suspect because:

- 1) The ratio of the primary and confirmation columns did not match, suggesting problems with laboratory instrumentation;
- 2) The measured concentration was only slightly above the sample PQL of 30 µg/L;
- 3) DDT congeners were not previously or subsequently detected in effluent;
- 4) DDT was not detected in the biosolids sample collected at the same time;
- 5) DDT has been banned in the United States since 1972 so there is no plausible new source for the contamination; and
- 6) DDT was not detected in a second, confirmatory effluent sample collected in September 1998.

Because the reported presence of detectable DDT concentrations in the July 1998 effluent sample was suspect, another effluent composite sample was collected in September 1998 to confirm the measurement. No congeners of DDT were detected in the second sample, which was analyzed at a very low PQL (5 ng/L). Since July 1998, no congeners of DDT have been detected in the 23 effluent samples that have continued to be analyzed at a very low PQL (5 ng/L), including the July 2009 sample. Consequently, it is highly probable that effluent discharged during the balance of the current permit term will continue to comply with the DDT standard. Without the anomalous measurement, the RPA of DDT yields Endpoint 2 with 24 conclusive non-exceedances of the permit limit. Consequently, an effluent limit would not be required in the permit, much less any kind of DDT monitoring.

**Dioxin:** As with radioactivity and DDT, the single dioxin exception in the last decade was abnormal and probably resulted from laboratory error. The dioxin concentration reported in the July-2002 effluent sample (0.563 pg/L) exceeded the permit limit (0.52 pg/L) by an extremely small concentration (0.047 pg/L). However, concentration differences as small as 0.047 parts-per-trillion are not reliably determined because protocols only require that instruments calibrate to within 20% when running standards. This introduces instrumental uncertainty that is much larger than the 8% difference between the measured concentration and the permitted limit.

The determination of extremely low dioxin concentrations is fraught with difficulty and tests are expensive to conduct (more than \$1000 per sample). The California State Water Resources Control Board acknowledges the difficulties associated with dioxin surveys and “...recognizes that there is a very limited number of laboratories equipped to perform these analyses at the very low levels of detection necessary to determine if these compounds are present at concentrations of potential health significance. A credible survey would be expensive.”<sup>22</sup>

Laboratory contamination at these extremely small concentrations adds uncertainty to the reported results. Initial analysis of the July-2002 effluent sample erroneously reported a much higher dioxin level (0.800 pg/L). This reported concentration was subsequently found to be due to laboratory contamination. The contamination was discovered during the concurrent analysis of a blank sample that found that the certified “pure” water used to dilute the effluent sample contained a comparatively high level of dioxin contamination. Subsequent use of an internal standard from a second manufacturer reduced the dioxin levels in the blank and resulted in the reported result.

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<sup>22</sup> State Water Resources Control Board (SWRCB). 1999. [California Ocean Plan 1999-2002 Triennial Review Workplan](#).

Even if dioxin were present within the effluent, the July-2002 measurement does not necessarily reflect a significant new source of dioxin. Dioxins are ubiquitous in the environment and do not easily break down into other compounds. Therefore, once produced, dioxins persist in the environment and are found almost everywhere. Only four of the 210 dioxin/furan congeners were found in the July-2002 effluent sample. These four congeners are the least toxic and most common of the dioxin congeners. The four dioxin/furan congeners found in the July-2002 sample are 100-to-1000-times less toxic than the TCDD congener. Additionally, this was the first instance of an exceedance of the dioxin limitation in the NPDES permit and does not portend lack of compliance with dioxin standards in the future. This has been confirmed by the seven samples collected since that time, including the July 2009 sample.

### Correction to Limits for Heptachlor and Heptachlor Epoxide

The 6.7-pg/L heptachlor limit and the 2.68-pg/L heptachlor epoxide limits listed in the MBCSD discharge permit<sup>23</sup> are incorrect, and three orders of magnitude too low due to an error in the units. Either the units should be ng/L, or the respective limits should be 6,700 pg/L and 2,680 pg/L. This error was transferred to the DMR forms and results in an unfairly stringent threshold for compliance testing that could inadvertently trigger mandatory penalties.

The error in the permit limit was pointed out previously in comments on the draft MBCSD discharge permit,<sup>24</sup> but was misinterpreted as a request for unit conversion.<sup>25</sup> Computation of the correct permit limits is determined from the mass-balance dilution (Equation 1).

$$C_e \equiv C_o + D(C_o - C_s) \quad \text{Equation 1}$$

where:  $C_e$  = the limiting concentration of a constituent in the effluent,  
 $C_o$  = the concentration of the constituent in the ocean after dilution by  $D$  (i.e., the COP objective), namely, the Table B limits for heptachlor (5E-5  $\mu\text{g/L}$ ) and heptachlor epoxide (2E-5  $\mu\text{g/L}$ ),  
 $D$  = the dilution expressed as the volumetric ratio of seawater mixed with effluent, which is 133 for the minimum initial dilution of the MBCSD outfall, and  
 $C_s$  = the background concentration of the constituent in ambient seawater, which is zero for both constituents.

Substitution for the heptachlor COP objective yields:

$$C_e = (5\text{E-}5\mu\text{g/L}) + 133 \times (5\text{E-}5\mu\text{g/L} - 0) = 670.0\text{E-}5\mu\text{g/L} * (1\text{E}+3\text{ng/L} / 1\mu\text{g/L}) = 670\text{E-}2\text{ng/L} = 6.7\text{ng/L}$$

The computation for concentration in pg/L is:

$$C_e = (5\text{E-}5\mu\text{g/L}) + 133 \times (5\text{E-}5\mu\text{g/L} - 0) = 670.0\text{E-}5\mu\text{g/L} * (1\text{E}+6\text{pg/L} / 1\mu\text{g/L}) = 670\text{E}1\text{pg/L} = 6,700\text{pg/L}$$

The correct computations for the epoxide congener are analogous.

These corrections to permit limits are an important component of any modification of the existing discharge permit.

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<sup>23</sup> Top of [Permit](#) Page 19.

<sup>24</sup> Middle of [Permit](#) Page F-49: Comment 32: "Correct the units on the Six-Month Median Effluent Limit for heptachlor and heptachlor epoxide to ng/L [Page 13, Section IV.C.4]. The NPDES Permit specifies heptachlor limiting concentrations that are associated with units of ng/L rather than the units of pg/L, which are incorrectly listed in the NPDES Permit."

<sup>25</sup> Middle of [Permit](#) Page F-49: "Staff Response 32: The heptachlor and heptachlor epoxide limits in the draft permit are correct and remain unchanged. Units of pg/L are more appropriate than units of ng/L, because ng/L requires an inordinate number of significant figures."

### **Summary**

Significant effort was expended to establish the basis for monitoring-frequency reduction by conducting statistical analyses of the large number of historical effluent measurements. In accordance with the procedures outlined in COP Appendix VI, the RPsCalc program was repeatedly applied, and the raw program output is attached to this letter. This includes sensitivity studies to assess how much the RPA results were influenced by anomalous measurements. While this was a necessary effort, most of the conclusions presented here can be derived from a qualitative inspection of the long historical record of effluent measurements. The record demonstrates that the vast majority of measurements were well below the most stringent receiving-water objectives outlined in the COP. On that basis alone, the potential for non-compliance can be considered low, and sampling frequency reduction for constituents analyzed on a semiannual and annual basis in the current NPDES discharge permit is well warranted. Given the historically high level of compliance, sampling once in the life of the permit is more than sufficient to demonstrate continued compliance with COP water-quality objectives.

Please contact the undersigned if you have questions regarding this report.

Sincerely,

Douglas A. Coats, Ph.D.  
Senior Oceanographer

Attachment: Output from RPsCalc V2.0 Program

**Table 3.** Results of a Reasonable Potential Analysis of the MBCSD WWTP Effluent

Analyte	Observations <sup>26</sup>						Permit <sup>27</sup>			COP <sup>28</sup>		End Point <sup>29</sup>	Basis <sup>30</sup>
	N	D	DNQ	ND	Censor	Concl	Units	Limit	UCB	Objective	UCB		
<b>Marine Life Protection</b>													
Arsenic	33	7	4	22	79%	33	mg/L	0.67	0.0043	8	3.01	2	Parametric
Cadmium	32	3	0	29	91%	32	mg/L	0.13	—	1	—	2	Non-Parametric
Chromium	33	11	4	18	67%	33	mg/L	0.27	0.0055	2	0.0412	2	Parametric
Copper	33	29	0	4	12%	33	mg/L	0.14	0.0784	3	2.47	2	Parametric
Lead	33	17	2	14	48%	33	mg/L	0.27	0.0064	2	0.0481	2	Parametric
Mercury	33	0	3	30	100%	33	µg/L	5.29	—	0.04	—	2	Non-Parametric
Nickel	33	0	8	25	100%	33	mg/L	0.67	—	5	—	2	Non-Parametric
Selenium	33	8	9	16	76%	33	mg/L	2.01	0.0059	15	0.0439	2	Parametric
Silver	33	1	0	32	97%	33	mg/L	0.07	—	0.7	—	2	Non-Parametric
Zinc	33	18	0	15	45%	33	mg/L	1.62	0.0779	20	8.49	2	Parametric
Cyanide	33	6	2	25	82%	33	mg/L	0.13	—	1	—	2	Non-Parametric
Non-Cl <sub>2</sub> Phenolics	44	8	2	34	82%	44	mg/L	4.02	—	30	—	2	Non-Parametric
Chlorinated Phenolics	44	0	0	44	100%	44	mg/L	0.13	—	1	—	2	Non-Parametric
Endosulfan	42	0	0	42	100%	31	µg/L	1.21	—	0.009	—	2	Non-Parametric
Endrin	31	0	0	31	100%	31	µg/L	0.27	—	0.002	—	2	Non-Parametric
HCH	42	3	0	39	93%	31	µg/L	0.54	—	0.004	—	2	Non-Parametric

<sup>26</sup> **N**=Number of samples                      **D**=Number of quantifiable concentrations                      **DNQ**=Detected above the ML, but not quantified above the PQL  
**ND**=Number of non-detects                      **Censor**=Percentage unquantifiable concentrations (Parametric RPA unwarranted if more than 80%)  
**Concl**=Number of conclusive non-exceedances of the discharge limit (Endpoint 2 if greater than 15 and no quantifiable concentrations above the limit)

<sup>27</sup> End-of-pipe concentrations specified in the NPDES discharge permit issued to the MBCSD:  
**Units**=Specified in the permit                      **Limit**=Lowest discharge limit (six-month median for marine-life protection, and monthly for all other constituents)  
**UCB**=95<sup>th</sup> percentile of the one-sided 95% upper confidence bound determined from a parametric RPA and to be compared with the permit limit

<sup>28</sup> End-of-mixing zone (ZID) concentrations (µg/L) after accounting for a 133-fold dilution and any background seawater concentrations:  
**Objective**=Lowest water-quality objective specified in Table B of the COP                      **UCB**=Determined from a parametric RPA of post-mixing concentrations

<sup>29</sup> Three endpoints determined from the RPA recommended in COP Appendix VI for establishing which Table B objectives require effluent limitations:  
**Endpoint 1**=Effluent limit and monitoring required (RPA demonstrates a reasonable potential for exceeding water-quality objective, or a quantifiable concentration exceeded the limit)  
**Endpoint 2**=Neither effluent limits nor monitoring required (RPA conclusively demonstrates no reasonable potential for exceeding water-quality objective)  
**Endpoint 3**=Effluent limit required and monitoring not required except for toxicity testing (RPA was inconclusive because quantification limits exceeded the permit limit)

<sup>30</sup> The basis for reducing the monitoring frequency:                      **Parametric**=Statistical hypothesis test performed on a sufficient number of quantifiable concentrations  
**Non-Parametric**=There were more than 15 conclusive non-exceedances and no quantifiable concentrations exceeding the limit  
**BPJ**=Best professional judgment applied because facility-specific monitoring data does not fully support an RPA

Analyte	Observations <sup>26</sup>						Permit <sup>27</sup>			COP <sup>28</sup>		End Point <sup>29</sup>	Basis <sup>30</sup>
	N	D	DNQ	ND	Censor	Concl	Units	Limit	UCB	Objective	UCB		
Radioactivity $\alpha$	22	19	2	1	14%	22	pCi/L	15	12.9	15	N/A <sup>31</sup>	2	Parametric
Radioactivity $\beta$	22	22	0	0	0%	21	pCi/L	50	37.0	50	N/A	2 <sup>32</sup>	BPJ
<b>Protection of Human Health – NonCarcinogens</b>													
Acrolein	25	0	0	–	100%	25	mg/L	29.5	—	220	—	2	Non-Parametric
Antimony	32	3	5	24	91%	32	mg/L	160.8	—	1,200	—	2	Non-Parametric
Bis(2-chloroethoxy) methane	43	0	0	43	100%	43	mg/L	0.59	—	4.4	—	2	Non-Parametric
Bis (2-chloro-1-methylethyl)	41	0	0	41	100%	41	mg/L	160.8	—	1,200	—	2	Non-Parametric
Chlorobenzene	33	0	0	33	100%	33	mg/L	76.4	—	570	—	2	Non-Parametric
Chromium III	33	11	4	18	67%	33	g/L	25.5	5.5E-06	190,000	0.0412	2	Parametric
Di-n-butyl phthalate	43	0	0	43	100%	43	mg/L	469	—	3,500	—	2	Non-Parametric
Dichlorobenzene	42	1	0	41	98%	42	mg/L	683	—	5,100	—	2	Non-Parametric
Diethyl phthalate	43	5	1	37	88%	43	mg/L	4420	—	33,000	—	2	Non-Parametric
Dimethyl phthalate	43	0	0	43	100%	43	g/L	109.9	—	820,000	—	2	Non-Parametric
2-Methyl-4,6-dinitrophenol	42	0	0	42	100%	42	mg/L	29.5	—	220	—	2	Non-Parametric
2,4-Dinitrophenol	44	0	0	44	100%	44	mg/L	0.54	—	4	—	2	Non-Parametric
Ethylbenzene	33	1	1	31	97%	33	mg/L	549	—	4,100	—	2	Non-Parametric
Fluoranthene	43	0	0	43	100%	43	mg/L	2	—	15	—	2	Non-Parametric
Hexachlorocyclopentadiene	42	0	0	42	100%	42	mg/L	7.8	—	58	—	2	Non-Parametric
Nitrobenzene	43	0	0	43	100%	43	mg/L	0.66	—	4.9	—	2	Non-Parametric
Thallium	32	0	2	30	100%	32	mg/L	0.27	—	2	—	2	Non-Parametric
Toluene	33	7	8	18	79%	33	g/L	11.4	9.28E-04	85,000	0.0069	2	Parametric
Tributyltin <sup>33</sup>	4	0	0	4	100%	1	µg/L	0.188	—	0.0014	—	3	BPJ
1,1,1-Trichloroethane	33	0	0	33	100%	33	g/L	72.4	—	540,000	—	2	Non-Parametric
<b>Protection of Human Health – Carcinogens</b>													
Acrylonitrile	25	0	0	25	100%	17	µg/L	13.4	—	0.1	—	2	Non-Parametric
Aldrin	31	0	0	31	100%	20	ng/L	2.95	—	0.000022	—	2	Non-Parametric
Benzene	33	1	0	32	97%	33	µg/L	791	—	5.9	—	2	Non-Parametric
Benzidine	42	0	0	42	100%	0	ng/L	9.25	—	0.000069	—	3	Non-Parametric/BPJ
Beryllium	32	0	0	32	100%	22	µg/L	4.42	—	0.033	—	2	Non-Parametric

<sup>31</sup> The drinking-water limits on radionuclides only apply to end-of-pipe concentrations

<sup>32</sup> The RCalc (Version 2.0) program incorrectly identified Endpoint 2 for  $\beta$  radioactivity even though there was one 54-pCi/L exceedance of the 50-pCi/L drinking-water limit, and thus, Endpoint 1 is the correct outcome. Without this isolated measurement from January 1994, the RPA yields a 37-pCi/L UCB, which is well below the permit limit.

<sup>33</sup> The current discharge permit inadvertently included annual monitoring for tributyltin even though the staff report acknowledged that monitoring is unnecessary, as has been the case in the past. Consequently, only four measurements of tributyltin were available for analysis in the historical database.

Analyte	Observations <sup>26</sup>						Permit <sup>27</sup>			COP <sup>28</sup>		End Point <sup>29</sup>	Basis <sup>30</sup>
	N	D	DNQ	ND	Censor	Concl	Units	Limit	UCB	Objective	UCB		
Bis (2-chloroethyl) ether	43	0	0	43	100%	34	µg/L	6.03	—	0.045	—	2	Non-Parametric
Bis(2-ethylhexyl) phthalate	43	28	2	13	35%	43	µg/L	469	20.1	3.5	0.150	2	Parametric
Carbon Tetrachloride	32	0	0	32	100%	32	µg/L	121	—	0.9	—	2	Non-Parametric
Chlordane	31	0	0	31	100%	0	ng/L	3.08	—	0.000023	—	3	Non-Parametric/BPJ
Dibromochloromethane	32	1	6	25	97%	32	µg/L	1152	—	8.6	—	2	Non-Parametric
Chloroform	32	18	1	13	44%	32	mg/L	17.4	0.0014	130	0.0105	2	Parametric
<b>DDT</b>	42	1	0	41	98%	24	ng/L	22.8	—	0.00017	—	1 <sup>34</sup>	BPJ
1,4-Dichlorobenzene	42	4	5	33	90%	42	mg/L	2.41	—	18	—	2	Non-Parametric
3,3-Dichlorobenzidine	43	0	0	43	100%	13	µg/L	1.09	—	0.0081	—	3	Non-Parametric/BPJ
1,2-Dichloroethane	33	0	0	33	100%	33	mg/L	3.75	—	28	—	2	Non-Parametric
1,1-Dichloroethene	33	0	0	33	100%	33	mg/L	0.12	—	0.9	—	2	Non-Parametric
Bromodichloromethane	33	1	1	31	97%	33	mg/L	0.83	—	6.2	—	2	Non-Parametric
Methylene chloride	32	1	3	28	97%	32	mg/L	60.3	—	450	—	2	Non-Parametric
1,3-Dichloropropene	33	0	0	33	100%	33	mg/L	1.19	—	8.9	—	2	Non-Parametric
Dieldrin	31	0	0	31	100%	22	ng/L	5.36	—	0.00004	—	2	Non-Parametric
2,4-Dinitrotoluene	43	0	0	43	100%	43	µg/L	348	—	2.6	—	2	Non-Parametric
1,2-Diphenylhydrazine	42	0	0	42	100%	41	µg/L	21.4	—	0.16	—	2	Non-Parametric
Halomethanes	33	4	5	24	88%	33	mg/L	17.4	—	130	—	2	Non-Parametric
Heptachlor	31	0	0	31	100%	23	ng/L <sup>35</sup>	6.7	—	0.00005	—	2	Non-Parametric
Heptachlor Epoxide	31	0	0	31	100%	20	ng/L <sup>35</sup>	2.68	—	0.00002	—	2	Non-Parametric
Hexachlorobenzene	42	0	0	42	100%	0	ng/L	28.1	—	0.00021	—	3	Non-Parametric/BPJ
Hexachlorobutadiene	43	0	0	43	100%	43	mg/L	1.88	—	14	—	2	Non-Parametric
Hexachloroethane	43	0	0	43	100%	43	µg/L	335	—	2.5	—	2	Non-Parametric
Isophorone	43	0	0	43	100%	43	mg/L	98	—	730	—	2	Non-Parametric
N-Nitrosodimethylamine	42	0	0	42	100%	42	µg/L	978	—	7.3	—	2	Non-Parametric
N-Nitrosodi-n-propylamine	43	0	0	43	100%	43	µg/L	50.9	—	0.38	—	2	Non-Parametric
N-Nitrosodiphenylamine	42	0	0	42	100%	42	µg/L	335	—	2.5	—	2	Non-Parametric
PAH	43	0	0	43	100%	20	µg/L	1.18	—	0.0088	—	2	Non-Parametric
PCB	31	0	0	31	100%	12	ng/L	2.55	—	0.000019	—	3	Non-Parametric/BPJ
<b>Dioxin</b>	18	13	0	5	28%	16	pg/L	0.52	—	3.9E-09	—	1 <sup>36</sup>	BPJ

<sup>34</sup> Except for a single questionable 51-ng/L measurement of a DDT congener in July 1998, which exceeded the 22.8-ng/L permit limit and indicated an Endpoint-1 outcome (monitoring required), DDT concentrations were undetectable in the remaining 41 effluent samples, with 24 conclusive non-exceedances of the permit limit, indicating an Endpoint-2 outcome (monitoring not required). See the text for further discussion.

<sup>35</sup> The concentration units of pg/L for the 6.7 and 2.68 limits on heptachlor and heptachlor epoxide are incorrect, and should be ng/L as shown here. See the text for further discussion.

Analyte	Observations <sup>26</sup>						Permit <sup>27</sup>			COP <sup>28</sup>		End Point <sup>29</sup>	Basis <sup>30</sup>
	N	D	DNQ	ND	Censor	Concl	Units	Limit	UCB	Objective	UCB		
1,1,2,2-Tetrachloroethane	33	0	0	33	100%	33	mg/L	0.31	—	2.3	—	2	Non-Parametric
Tetrachloroethene	33	2	0	31	94%	33	µg/L	268	—	2	—	2	Non-Parametric
Toxaphene	31	0	0	31	100%	2	ng/L	28.1	—	0.00021	—	3	Non-Parametric/BPJ
Trichloroethene	33	0	0	33	100%	33	mg/L	3.62	—	27	—	2	Non-Parametric
1,1,2-Trichloroethane	33	0	0	33	100%	33	mg/L	1.26	—	9.4	—	2	Non-Parametric
2,4,6-Trichlorophenol	44	0	0	44	100%	40	mg/L	0.039	—	0.29	—	2	Non-Parametric
Vinyl chloride	33	0	0	33	100%	33	mg/L	4.82	—	36	—	2	Non-Parametric

<sup>36</sup> As with DDT, a single questionable 0.563-ng/L measurement of a common congener of dioxin exceeded the 0.52-pg/L permit limit in a sample collected in July 2002. Its presence resulted in an Endpoint-1 outcome for the PRA (monitoring required). All of the remaining 17 measurements were below the permit limit. See the text for further discussion.