Samoa Pulp Mill Infrastructure Analysis

Redwood Marine Terminal II
Samoa, California

Prepared for:

County of Humboldt and
Humboldt Bay Harbor, Recreation, and Conservation District

Project Funding Provided by:

U.S. Department of Commerce 07-79-07177

SHN Engineers & Geologists

812 W. Wabash Ave.
Eureka, CA 95501-2138
707-441-8855

September 2017
015147.100

CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash • Eureka, CA 95501-2138 • 707-441-8855 • FAX: 707-441-8877 •shninfo@shn-engr.com

Reference: 015147.100

September 26, 2017

Ms. Paula Mushrush
Humboldt County Planning & Building Department
Housing Division
3015 H St.
Eureka, CA 95501

Subject: Samoa Pulp Mill Infrastructure Analysis, Redwood Marine Terminal II, Samoa, California

Dear Ms. Mushrush:

Development of this submittal focused on collecting initial information to help facilitate the implementation of the development of aquaculture at Redwood Marine Terminal II (RMT II), and disposal of centralized domestic treated effluent on the Samoa Peninsula. Both of these waste streams would use the existing ocean outfall at RMT II.

This document and its appendices provide a pathway to help facilitate economic development on the Samoa peninsula, and next steps will be for the lead agencies (Humboldt Bay Harbor, Recreation & Conservation District or Peninsula CSD) to carry out the permitting process.

Sincerely,

SHN Engineers & Geologists

Mike Foget, PE
Project Engineer

MKF/CRS:lms

Enclosure: Report

Reference: 015147.100

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September 2017

QA/QC:MKF ____

Executive Summary

The County and Humboldt Bay Harbor, Recreation & Conservation District (HBHRCD) have completed substantial work toward finding economical solutions to the under-used former Samoa Pulp mill facility on the Samoa peninsula, which is now referred to as the Redwood Marine Terminal II (RMT II). The work to date has included three grants:

- U.S. Environmental Protection Agency (EPA) Brownfields grant facilitated removal of 3 million gallons of caustic waste from the former pulp mill.
- Community Development Block Grant (CDBG) grant matching funds allowed the County and HBHRCD to scope out the project, which resulted in identifying wastewater as the barrier to long-term mill reuse.
- Coastal Commission grant matching funds identified under-used industrial property.

These studies identified existing wastewater infrastructure that could be reused if the cost is shared with other entities on the peninsula.

There are approximately 1,000 under-used industrial acres on the peninsula. In addition to the information in this report, there were several additional detailed studies prepared to facilitate reuse of this facility:

- Industrial Waterfront Preliminary Transportation Access Plan (LACO, 2013)
- Infrastructure Needs and Reuse Report (SHN, 2016)
- Management Plan for the Peninsula Community Services District (CSD) Formation (SHN, March 2017)
- Wetland Delineation (SHN, March 2017)

This report includes the following studies:

- Draft Report of Waste Discharge (ROWD) for the RMT II Aquaculture Project
- Draft ROWD Samoa Wastewater Treatment Facility Project
- RMT II Samoa Effluent Pipeline Preliminary Planning Overview
- Natural Resources Assessment, September 2017

This report summarizes the findings of those reports.

The next steps to be taken include:

1. Apply for aquaculture ROWD
2. Apply for Samoa Wastewater Treatment Plant ROWD
3. Study the longer, more complex portion of a wastewater collection and treatment system for the Fairhaven portion of the Samoa Peninsula.

Humboldt County, on behalf of the proposed Peninsula CSD recently was awarded a technical assistance grant from the California State Water Resources Control Board.

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Appendices

Abbreviations and Acronyms

pfpy	pounds of fish per year

APE	area of potential effects
CAAP	cold water concentrated aquatic animal production
CDBG	Community Development Block Grant
CEQA	California Environmental Quality Act
CSD	community services district
ELGs	effluent limit guidelines
EPA	U.S. Environmental Protection Agency
HBHRCD	Humboldt Bay Harbor, Recreation & Conservation District
LACO	LACO Associates, Inc.
LAFCo	Local Agency Formation Commission
MEIR	master environmental impact report
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
RMT II	Redwood Marine Terminal II
ROWD	report of waste discharge
RWQCB	North Coast Regional Water Quality Control Board
SHN	SHN Engineers & Geologists
SPG	Samoa Pacific Group, LLC
STMP	Samoa Town Master Plan
SWRCB	State Water Resources Control Board
WDRs	Waste Discharge Requirements
WWTF	wastewater treatment facility

1.0 Introduction

As part of the efforts to improve economic development on the Samoa Peninsula, the Humboldt County Planning & Building Department, Housing Division has been successful in securing grants to assist with the existing challenges encountered on the peninsula. This most recent effort was funded by the U.S. Department of Commerce (07-79-007177).

The County and Humboldt Bay Harbor, Recreation & Conservation District (HBHRCD) have completed substantial work toward finding economical solutions to the under-used former Samoa Pulp mill facility on the Samoa peninsula, which is now referred to as the Redwood Marine Terminal II (RMT II). The work to date has included three grants:

- U.S. Environmental Protection Agency (EPA) Brownfields grant facilitated removal of 3 million gallons of caustic waste from the former pulp mill.
- Community Development Block Grant (CDBG) grant matching funds allowed the County and HBHRCD to scope out the project, which resulted in identifying wastewater as the barrier to long-term mill reuse.
- Coastal Commission grant matching funds identified under-used industrial property.

These studies identified existing wastewater infrastructure that could be reused if the cost is shared with other entities on the peninsula.

In addition, the HBHRCD and Humboldt County recently secured additional grants, including:

- EPA Brownfields grant to facilitate removal of existing debris piles from RMT II
- State Water Resources Control Board (SWRCB) technical assistance grant to further study wastewater collection and treatment on the Samoa Peninsula

There are approximately 1,000 under-used industrial acres on the peninsula. In addition to the information in this report, there were several additional detailed studies prepared to facilitate reuse of this facility:

- Industrial Waterfront Preliminary Transportation Access Plan (LACO, 2013)
- Infrastructure Needs and Reuse Report (SHN, 2016)
- Management Plan for the Peninsula Community Services District (CSD) Formation (SHN, March 2017a)
- Wetland Delineation (SHN, March 2017b)

In 2016, SHN Engineers & Geologists (SHN) co-authored the infrastructure needs and reuse report that assessed the condition of the water and wastewater infrastructure at the RMT II facility. Water and wastewater infrastructure on the peninsula is a vital part of future improvements that will provide housing and economic growth to the nearby communities. The report identified several potential onsite and offsite alternatives that could potentially be used with the existing infrastructure at RMT II.

The HBHRCD is currently pursuing a plan that would combine three separately-permitted National Pollutant Discharge Elimination System (NPDES) waste streams through the ocean outfall at the Samoa Pulp Mill. The three proposed dischargers would include the Samoa wastewater treatment facility (WWTF) (WDID 1B85017RHUM), DG Fairhaven Power Facility (WDID 1B85026RHUM), and industrial users (proposed aquaculture) at RMT II (WDID 1B77005OHUM). The ocean outfall is currently only being used by DG Fairhaven; however, a February 2016 feasibility study conducted by SHN indicates that the ocean outfall at RMT II has the capacity for all three discharges.

Development of this current submittal focused on collecting initial information to help facilitate the implementation of the development of aquaculture at RMT II, and disposal of centralized domestic treated effluent on the Samoa Peninsula. Both of these waste streams would use the existing ocean outfall at RMT II; they are described in further detail below.

2.0 Aquaculture

The HBHRCD is pursuing the development of a multiple-use facility on the Samoa Peninsula at RMT II, including an industrial aquaculture park where individual lessees can occupy part or all of the facility and discharge industrial wastewater from cold water concentrated aquatic animal production (CAAP) facilities to the Pacific Ocean through the existing ocean outfall. Acquiring an NPDES permit for discharge of industrial aquaculture wastewater is one of the initial steps in developing this project and attracting aquaculture companies to the site. Establishing Waste Discharge Requirements (WDR)s for aquaculture wastewater discharged to the ocean outfall will have a direct impact on the design of new facilities for onsite aquaculture production. The level of wastewater treatment constructed for the CAAP facilities will depend on WDRs established by the North Coast Regional Water Quality Control Board (RWQCB).

Based on the available space, the HBHRCD is proposing to place in the former machine building at RMT II, an aquaculture facility capable of producing approximately 90,000 market weight fish per year; which is approximately 99,000 pounds of fish per year (pfpy). According to the U.S. Environmental Protection Agency (EPA) compliance guide for CAAP facility point source discharge permitting, annual production of greater than 20,000 pfpy requires an NPDES permit. However, effluent limit guidelines (ELGs) and best management practice plans are not automatically required unless annual production rates are equal to or greater than 100,000 pfpy.

To help facilitate the aquaculture project, SHN, on behalf of the HBHRCD, prepared a draft report of waste discharge (ROWD) and NPDES permit application for the aquaculture expansion project at the RMT II facility (Appendix A).

Appendix A includes the draft NPDES permit application for the RMT II aquaculture expansion project, which includes the RWQCB Form 200, EPA Consolidated Permit Program Form 1 and Form 2B, and a notice of intent (NOI) to discharge in accordance with RWQCB Order R1-2015-0009.

3.0 Samoa Wastewater Treatment Facility

Primarily, wastewater on the Samoa peninsula is treated by individual onsite septic systems, or as is the case in the Town of Samoa, two centralized onsite systems (SHN, March 2017a). Due to the combination of shallow groundwater and sandy soils prevalent throughout the peninsula, the onsite systems are limited in protecting groundwater quality, and in some cases, the septic systems are failing. Disposal of wastewater effluent is one of the primary restrictions to economic development on the peninsula.

The HBHRCD has analyzed the potential to reuse existing wastewater and other industrial infrastructure located at the RMT II site. Reuse of the existing infrastructure at RMT II can benefit communities on the Samoa Peninsula and Humboldt Bay through economic development and environmental health. Reuse of existing facilities limits the need for, and costs of, developing new facilities and provides a source of revenue for the HBHRCD. Disposal of treated effluent through the ocean outfall would also limit impacts to groundwater from existing and proposed onsite disposal activities.

The draft submittals developed for this effort address two elements that facilitate the delivery of treated effluent to the RMT II ocean outfall. The first element addresses permitting a new wastewater force main to transfer treated wastewater effluent from the proposed town of Samoa WWTF to the existing RMT II ocean outfall; the second element was to prepare a draft ROWD and NPDES permit application for treated domestic effluent from the town of Samoa.

3.1 CEQA and Special Studies for New Samoa Effluent Pipeline

The proposed ocean discharge location is through the ocean outfall located at RMT II, which is owned and operated by the HBHRCD. The HBHRCD has agreed to lease access to the ocean outfall to the town of Samoa for the discharge of treated municipal wastewater; however, there is no written lease agreement at this time. The proposed Samoa WWTF is an example of a project within the scope of the Samoa Town Master Plan (STMP) master environmental impact report (MEIR). However, the RMT II ocean outfall and piping connecting to the WWTF is not within the scope of the MEIR except to the extent that the northern portion of the pipe is within the physical area covered by the MEIR. Therefore the MEIR could possibly be used to support a portion of the analysis.

In terms of connected actions, California Environmental Quality Act (CEQA) does not allow piece-mealing; in other words, a project cannot be broken up into smaller pieces in order to make the impacts appear less. Although the Samoa WWTF is a necessary component of the proposed pipeline to connect to the ocean outfall, as a project, it can stand on its own without the pipeline. The WWTF is currently being permitted to dispose of wastewater through an onsite leachfield. Therefore, the pipeline is not necessary for the WWTF, and can be analyzed as a separate project.

However, the pipeline itself is not a viable project without the WWTF and the ocean outfall. It is recommended that the pipeline be permitted and analyzed under CEQA along with any necessary permits and analysis for the ocean outfall. The proposed alignment falls completely within previously developed industrial property, and is expected to receive either a negative declaration or mitigated negative declaration of significant impacts.

The initial effluent pipeline preliminary planning overview is included as Appendix B. Additional special studies conducted to support this effort included:

- **Wetland Delineation and Report***:* A wetland delineation was conducted and a full report was prepared for the pipeline area of potential effects (APE; SHN, March 2017b).
- **Natural Resources Assessment:** Background research for a natural resources assessment was conducted for the pipeline APE (September 2017; Appendix C).

3.2 Samoa Wastewater Discharge Permitting

The Samoa wastewater collection and treatment systems are currently owned and operated by the Samoa Pacific Group, LLC (SPG); however, SPG intends to transfer control and ownership of the systems to a publicly responsible party as soon as one can be formed. The Samoa Peninsula Fire Protection District submitted an application to the Local Agency Formation Commission (LAFCo) in April 2016 to form a community services district (CSD) that would include the Samoa wastewater collection and treatment systems, among other services. Once the Peninsula CSD is formed, the RWQCB will be notified of any transfer of ownership, operation, or control of the Samoa wastewater systems. The HBHRCD is aware of the CSD formation plans and intends to transfer the lease for access to the ocean outfall to the Peninsula CSD once it is formed.

To help facilitate the disposal of treated effluent on the Samoa Peninsula through the RMT II ocean outfall, SHN prepared a draft ROWD and NPDES permit application for the Samoa WWTF facility (Appendix D), which includes the RWQCB Form 200, EPA Consolidated Permit Program Form 1 and Form 2A. The draft ROWD includes a process diagram of the proposed WWTF is and a map of the proposed sewer collection system.

A detailed description of the proposed wastewater collection and treatment system improvements project is included in the project description and design calculations from the September 2015 ROWD submittal (fourth submittal) by California Engineering Company. Design calculations from the May 2015 ROWD submittal (second submittal) include design parameters from the proposed WWTF manufacturer, Orenco Systems, Inc.

A final master environmental impact report for construction of the WWTF and collection system in the town of Samoa, has been created by the Humboldt County Community Development Services Department and was approved by the Humboldt County Board of Supervisors on February 26, 2008 (State Clearinghouse Number 2003052054).

4.0 References

LACO, Associated, Inc. (December 5, 2013). *Samoa Industrial Waterfront, Preliminary Transportation Access Plan, Samoa Peninsula, Humboldt County, California*. Eureka, CA:LACO.

SHN Consulting Engineers & Geologists, Inc. (2016). *Infrastructure Needs and Reuse on the Samoa Peninsula, Redwood Marine Terminal II*. Eureka, CA:SHN.

---. (March 2017a). *Management Plan, Peninsula CSD Formation*. Eureka, CA:SHN.

---. (March 2017b). *Wetland Delineation, RMT II Samoa Effluent Pipeline, Samoa, California*. Eureka, CA:SHN.

Draft ROWD RMT II Aquaculture Project

A

Report of Waste Discharge

Redwood Marine Terminal II Aquaculture Project
Samoa, California

DRAFT

Prepared for:

Humboldt Bay Harbor, Recreation & Conservation District

Engineers & Geologists
812 W. Wabash Ave.
Eureka, CA 95501-2138
707-441-8855

March 2017
015147.100

SHN CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash • Eureka, CA 95501-2138 • 707-441-8855 • FAX: 707-441-8877 •shninfo@shn-engr.com

Reference: 015147.100

March 31, 2017

Mr. Justin McSmith
North Coast Regional Water Quality Control Board
5550 Skylane Boulevard, Suite A
Santa Rosa, CA 95403-1072

Subject: Report of Waste Discharge, Redwood Marine Terminal II Aquaculture Project, Samoa, California

Dear Mr. McSmith:

SHN Engineers & Geologists, on behalf of the Humboldt Bay Harbor, Recreation & Conservation District is submitting the following report of waste discharge (ROWD) and National Pollutant Discharge Elimination System (NPDES) permit applications for the Redwood Marine Terminal II proposed aquaculture expansion project.

The following forms are included herein as a part of the ROWD/NPDES permit application:

- Regional Water Quality Control Board Form 200: Application/ROWD General Information
- EPA Form 1: General Information
- EPA Form 2B: Concentrated Aquatic Animal Production Facility Information
- Notice of Intent to discharge in compliance with general order R1-2015-0009: Waste Discharge Requirements For Cold Water Concentrated Aquatic Animal Production Facility Discharges To Surface Waters

Please call me at 707-441-8855 if you have any comments or concerns.

Sincerely,

SHN Engineers & Geologists

Mike Foget, PE
Project Engineer

MKF/CRS:lms

Enclosure: Report of Waste Discharge
c. w/Encl.: Jack Crider, HBHRCD

DRAFT

Reference: 015147.100

Report of Waste Discharge

Redwood Marine Terminal II, Aquaculture Project
Samoa, California

Prepared for:

Humboldt Bay Harbor, Recreation & Conservation District

DRAFT

Prepared by:

Engineers & Geologists
812 W. Wabash Ave.
Eureka, CA 95501-2138
707-441-8855

March 2017

QA/QC: MKF ____

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Appendices

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List of Illustrations

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Abbreviations and Acronyms

°C	degrees Celsius
g	gram
gpd	gallons per day
hp	horsepower
kg	kilogram
kva	kilovolt amperes
lb	pounds
lb/d	pounds per day
lb/mo	pounds per month
lb/yr	pounds per year
mg/L	milligrams per liter
MGD	million gallons per day
ml/L	milliliters per liter
NTU	nephelometric turbidity units
pfpy	pounds of fish per year

CAAP	concentrated aquatic animal production
CDO	cease and desist order
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CSD	community services district
ELG	effluent limitation guidelines
EPA	U.S. Environmental Protection Agency
FDA	Federal Food and Drug Administration
Harbor District	Humboldt Bay Harbor, Recreation & Conservation District
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
RMT II	Redwood Marine Terminal II
ROWD	report of waste discharge
RWQCB	North Coast Regional Water Quality Control Board
SHN	SHN Engineers & Geologists
SWRCB	State Water Resources Control Board
TBD	to be determined
USGS	U.S. Geological Survey
WDR	Waste Discharge Requirements
WWTF	wastewater treatment facility

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1.0 Introduction

SHN Engineers & Geologists (SHN), on behalf of the Humboldt Bay Harbor, Recreation & Conservation District (Harbor District) is submitting the following report of waste discharge (ROWD) and National Pollutant Discharge Elimination System (NPDES) permit application for the aquaculture expansion project at the Redwood Marine Terminal II (RMT II) in Samoa, California. The Harbor District is applying for coverage under the North Coast Regional Water Quality Control Board (RWQCB) order number R1-2015-0009, general NPDES permit number CAG131015, Waste Discharge Requirements (WDR) for Cold Water Concentrated Aquatic Animal Production (CAAP) Facility Discharges to Surface Waters (Appendix A).

This NPDES permit application for the RMT II aquaculture expansion project includes the RWQCB Form 200 (Appendix B), U.S. Environmental Protection Agency (EPA) Consolidated Permit Program Form 1 (Appendix C) and Form 2B (Appendix D), and a notice of intent (NOI) to discharge in accordance with RWQCB Order R1-2015-0009 (Appendix E).

The Harbor District is proposing an aquaculture facility at RMT II capable of producing approximately 90,000 market weight fish per year; 99,208 pounds of fish per year (pfpy) at 1.102 pounds per market weight fish (CH2M, 2016). According to the EPA compliance guide for CAAP facility point source discharge permitting (EPA, 2006), annual production of greater than 20,000 pfpy requires an NPDES permit. However, effluent limit guidelines (ELGs) and best management practice plans are not automatically required unless annual production rates are equal to or greater than 100,000 pfpy (Appendix F).

The Harbor District is pursuing the development of a multiple use facility on the Samoa Peninsula at RMT II, including an industrial aquaculture park where individual lessees can occupy part or all of the facility and discharge industrial wastewater from CAAP facilities to the Pacific Ocean through the existing ocean outfall. Acquiring an NPDES permit for discharge of industrial aquaculture wastewater is one of the initial steps in developing this project and attracting aquaculture companies to the site. Establishing WDRs for aquaculture wastewater discharged to the ocean outfall will have a direct impact on the design of new facilities for onsite aquaculture production. The level of wastewater treatment constructed for the CAAP facilities will depend on WDRs established by the RWQCB. Data presented in this report are projected values from references and feasibility studies, and use conservative estimates where possible.

The following feasibility studies have been conducted to assess the potential for aquaculture expansion at RMT II:

- *Infrastructure Needs and Reuse on the Samoa Peninsula: Redwood Marine Terminal II.* SHN, CH2M, and Hemphill Water Engineering, February 2016 (Appendix G).
- *Aquaculture Waste Load Estimation: Redwood Marine Terminal II.* CH2M, February 2016 (Appendix G).
- *Diffuser Performance Assessment Report for the Redwood Marine Terminal II Ocean Outfall.* CH2M, February 2016 (Appendix G).
- *Preliminary Review of Existing Microfloc Treatment System.* Hemphill Water Engineering, January 2016 (Appendix G).

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- *Humboldt Bay Harbor Recreation and Conservation District Freshwater Aquaculture Site Evaluation.* Professional Aquaculture Services, September 2015 (Appendix H).
- *Aquaculture Facility Planning for Freshwater Tissue Pulp Mill.* Freshwater Institute, February 2013 (Appendix I).
- *Eco-Industrial Park Analysis.* Aqua-Terra & Associates, February 2013 (Appendix J).

2.0 Site Location

RMT II is located in Humboldt County, approximately one mile northwest of the City of Eureka, on a 72-acre parcel (Assessor's parcel number 401-112-021) at 1 TCF Drive in Section 20, Township 5 North, Range 1 West, Humboldt Base and Meridian (Figure 1). The site is approximately at latitude 40°48'16"N and longitude 124°11'39"W.

3.0 Site Description

RMT II is the site of a decommissioned kraft pulp mill that contains industrial resources that can be used for industrial aquaculture production including:

- A 1.5 mile-long, 36-inch diameter outfall pipe with an 800-foot long diffuser capable of achieving a dilution ratio of 115:1
- An aquaculture wastewater collection system, septic tank, and leach field with an 8,500 gallon per day (gpd) capacity
- An industrial water filtration system with a capacity of 30 million gallons per day (MGD)
- Two 1.5-million gallon clarifiers
- Fourteen 17,000-gallon water filters
- Four 150-horsepower (hp) pumps
- A 1,000-kilovolt amperes (kva) electrical substation

Currently, the one industrial aquaculture company operating onsite discharges approximately 2,400 gpd of wastewater to an onsite septic tank and leachfield (Figure 2). The existing leachfield has a capacity of approximately 8,500 gpd; any wastewater flows in excess of this amount resulting from new operations will need to be discharged through the ocean outfall.

4.0 Other Ocean Outfall Users

The Harbor District plans to own and operate the ocean outfall and lease access to onsite aquaculture companies as well as offsite users. Each potential offsite discharger using the ocean outfall will obtain an individual NPDES permit specific to their waste stream, and will meet approved RWQCB WDRs prior to co-mingling with other waste streams at RMT II. The following is a list of potential dischargers to the ocean outfall:

- Onsite aquaculture projects at RMT II
- DG Fairhaven power plant (current user)
- Town of Samoa wastewater treatment facility (WWTF)

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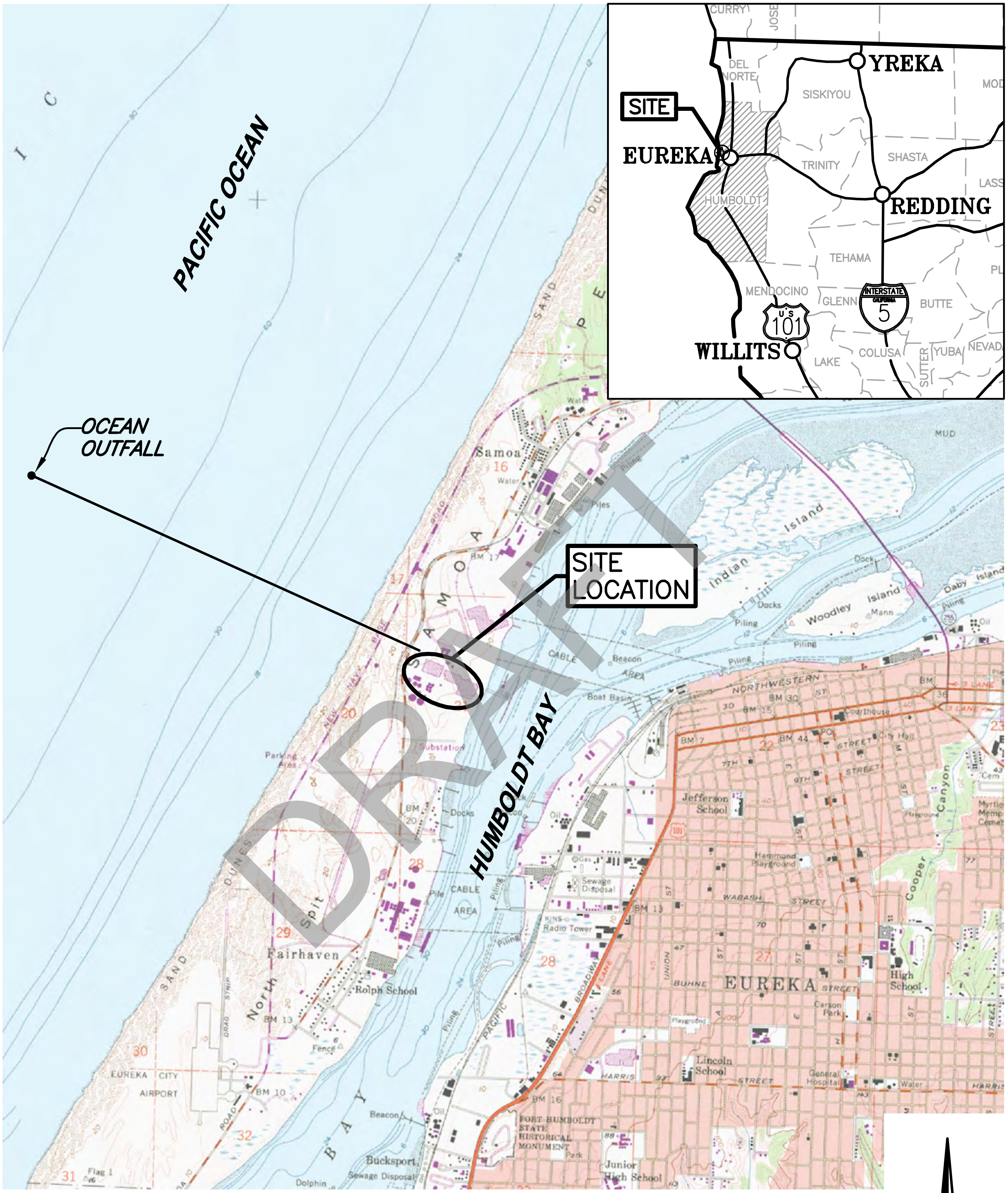

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SOURCE: EUREKA USGS
7.5 MINUTE QUADRANGLE

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1"=3,000'±

SHN
Consulting Engineers
& Geologists, Inc.

HBHRCD
Redwood Marine Terminal II
Samoa, California

Site Location Map

SHN 015147

March 2017

015147-SITE-LCTN

Figure 1

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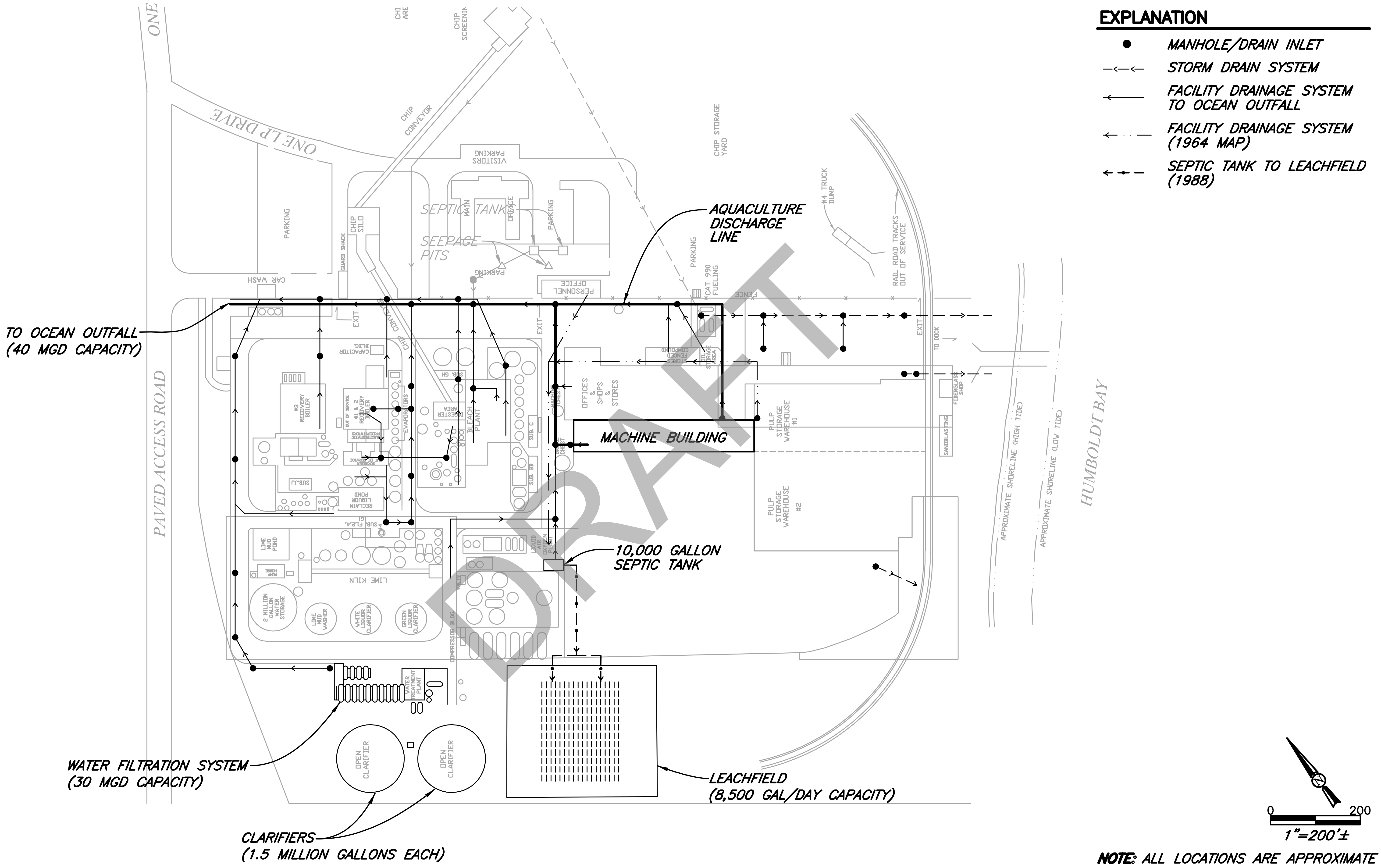

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NOTE: ALL LOCATIONS ARE APPROXIMATE

SOURCE: 1964 FACILITY DRAINAGE MAP FROM GEORGIA–PACIFIC CORPORATION "SEWERS, GENERAL ARRANGEMENT, UNDERGROUND PIPING"

SHN Consulting Engineers & Geologists, Inc.	HBHRCD Redwood Marine Terminal II Samoa, California	Aquaculture Discharge Line SHN 015147
March 2017	015147-AQACLTR-DISCRG-LINE-2	Figure 2

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- Community of Fairhaven wastewater system
- City of Eureka, Elk River WWTF

This section of the report briefly describes additional dischargers to the ocean outfall; proposed aquaculture projects at RMT II are discussed in more detail in the following sections.

DG Fairhaven. The Fairhaven biomass power plant is owned and operated by DG Fairhaven Power, LLC; it discharges to the RMT II ocean outfall under RWQCB Order R1-2012-0027 (NPDES permit CA0024571). An ROWD was submitted for the facility on June 30, 2016, to the RWQCB for renewal and update of the existing NPDES permit.

Samoa WWTF. The town of Samoa WWTF is owned and operated by the Samoa Pacific Group, LLC; the town discharges to land in accordance with RWQCB Orders R1-2001-62 and R1-2007-0026. An NPDES application is in-progress for changing the discharge location to the RMT II ocean outfall. The Town of Samoa is also in the permitting phase to replace the sewer collection system and the WWTF. The new Samoa WWTF and sewer collection system are intended to be passed into the control of a community services district (CSD) once formed (the Peninsula CSD formation is currently in-progress), and improvements made to the collection system and WWTF.

Fairhaven Wastewater System. The community of Fairhaven is served by individual septic systems; however, there is the potential for the community to connect with a regional collection and treatment system managed by the Peninsula CSD (formation in-progress) including the Town of Samoa. These plans are still conceptual; funding for implementation is currently being researched.

Eureka WWTF. The City of Eureka, Elk River WWTF is owned and operated by the City of Eureka; it discharges to Humboldt Bay under RWQCB Order R1-2016-0001 (NPDES permit CA0024449). The Eureka WWTF discharge recently changed from the Pacific Ocean to the more restrictive standards for Humboldt Bay. As a part of the new permit, Eureka received a cease and desist order (CDO) allowing until 2030 to comply with the California Enclosed Bays and Estuaries Policy. The City of Eureka is exploring the feasibility of different alternatives to meet the new discharge requirements, including pumping effluent to the ocean outfall at RMT II. It should be noted that Eureka is required by the CDO to submit a plan identifying alternatives to comply with the Enclosed Bays and Estuaries Policy by July 2020, but is not required to complete construction of the approved alternative until July 2030.

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5.0 Ocean Outfall and Diffuser

The ocean outfall and diffuser were determined to have a capacity of 40 MGD, according to a recent hydraulic modeling study, which will provide sufficient hydraulic capacity for all proposed discharges to the outfall described above (CH2M, 2016a). The Fairhaven Power Facility currently discharges approximately 170,000 gpd (SHN, CH2M, and Hemphill Water Engineering, 2016): the Samoa WWTF is proposing to discharge approximately 45,000 gpd; the community of Fairhaven has fewer homes than the Town of Samoa (it will likely discharge less than 45,000 gpd); and the City of Eureka WWTF discharges up to 30 MGD during peak wet weather flow events (peak day average flow; SHN, 2017). A minimum of 9 MGD additional capacity would exist in the ocean outfall given Eureka's peak wet weather discharge, which occurs approximately 1 day per year. At the present time, only the DG Fairhaven power facility discharges to the ocean outfall, leaving more than 39 MGD discharge capacity available for additional users, including onsite aquaculture projects. The City of Eureka would use a significant amount of the outfall diffuser capacity; however, the level of development of that project is preliminary at this time.

Inspection, cleaning, and minor repair of the ocean outfall diffuser were completed in 2014, 2015, and 2016 by MM Diving Inc. (2016 inspection report included in Appendix K). All exposed joints and flanges have been inspected, zincs added, and the diffuser has been cleared to allow flow.

The ocean outfall diffuser is capable of achieving a minimum probable initial dilution of 115:1 according to the previous NPDES permit (RWQCB Order R1-2010-0033). Dilution is achieved by spreading the discharge flow out over the 800-foot long diffuser that discharges through a series of 144, 2.4-inch diameter port holes (CH2M, 2016a; Appendix G).

6.0 Preliminary Aquaculture Design Parameters

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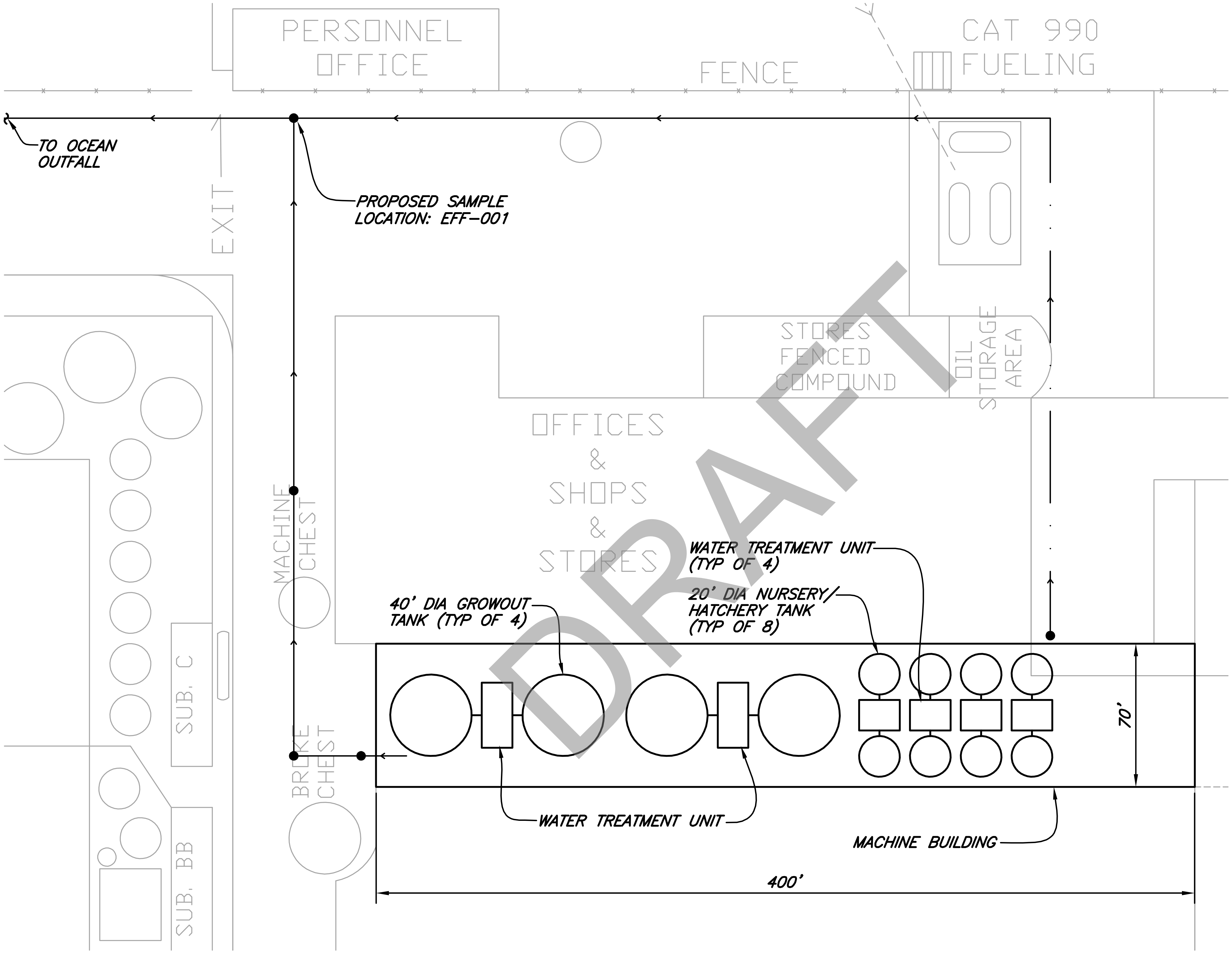
The Harbor District plans to obtain an NPDES permit for aquaculture activities at RMT II, and lease access to the ocean outfall through the discharge permit to one or more aquaculture companies. The exact type or types of aquaculture systems that will be used by potential aquaculture companies is unknown. However, through feasibility studies, discussions with aquaculture industry leaders, an evaluation of site constraints, and consideration of regulatory constraints, a theoretical initial project layout has been developed. The following discussion is intended to provide a logical framework for developing the proposed project.

Proposed Layout. Two aquaculture system flow regimes are being considered: once-through and recirculating. A once-through system would pass source water directly through the aquaculture tanks once prior to discharge. A recirculating system would recirculate approximately 90% of the water in the system, discharging only 10% of the total volume of the tanks per day. Both types of systems will work with the proposed layout; however, discharge systems designed for specific aquaculture companies that elect to locate to RMT II may vary significantly from this example. The proposed layout is only to serve as an example to characterize projected design flows, waste loads, and production rates.

The approximately 400-foot long and 70-foot wide Machine Building is proposed to house the aquaculture operations (Figure 3). The Machine Building can potentially house four, 40-foot diameter grow-out tanks with a water treatment unit for every two tanks (Figure 3). The proposed layout also includes eight, 20-foot diameter hatchery tanks with one water treatment unit for every two tanks. The nursery tanks support the grow-out tanks and do not result in direct fish production. The number and type of treatment tanks for each grow-out and nursery tank will depend upon fish species, WDRs, the amount of pre-treatment required based on source water quality (freshwater or saltwater), and the type of system used (once-through or recirculating).

Additional effluent treatment units are not shown in the layout, because the type of waste treatment will be developed based on WDRs from the RWQCB, as well as the type of effluent generated, which will vary depending on the type of system used (once-through or recirculating).

Proposed Production Capacity. The 40-foot diameter, 4-foot deep grow-out tanks can reportedly produce approximately 20,000 to 50,000 pfpy each, depending on species, size, and desired production density (Vaught, 2017). New systems typically do not operate at maximum capacity right away because of site-specific operational, water treatment, and fish health issues.



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EXPLANATION

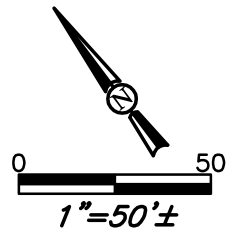
● MANHOLE/DRAIN INLET

← FACILITY DRAINAGE SYSTEM TO OCEAN OUTFALL

←·–·– FACILITY DRAINAGE SYSTEM (1964 MAP)

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. SYSTEM DESIGN AND LAYOUT IS NOT FINAL. ALL EQUIPMENT AND LOCATIONS ARE FOR EXAMPLE PURPOSES ONLY.



SOURCE: 1964 FACILITY DRAINAGE MAP FROM GEORGIA-PACIFIC CORPORATION "SEWERS, GENERAL ARRANGEMENT, UNDERGROUND PIPING"

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Example Aquaculture System Layout

SHN 015147

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Figure 3

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Redundancy is also needed for cleaning and repairing tanks and equipment such that not all tanks may be operational all of the time. This creates a maximum annual production range of approximately 80,000 to 200,000 pfpy. Due to initial startup conditions and efficiency losses, annual production capacity is proposed to be less than 100,000 pfpy.

A maximum production capacity of approximately 800,000 pfpy was estimated (CH2M, 2016; Appendix G) based on the maximum hydraulic discharge capacity of the ocean outfall and diffuser structure (CH2M, 2016a; Appendix G). This level of production is considered the maximum theoretical production level possible at RMT II at this time, and is not necessarily feasible considering economic constraints of source water supply and treatment, available area for production tanks and support equipment, or regulatory discharge requirements. A proposed initial build-out capacity of less than 100,000 pfpy is proposed during the initial NPDES permit term of 5 years. Based on a market weight of 1.1 pounds (lb)/fish (0.5 kilograms [kg/fish), a projected production rate of 90,000 fish per year will result in 99,208 pfpy.

Proposed Feed Rates. CH2M (2016; Appendix G) estimated feed rates as a percentage of fish body mass. Feed rates increase with water temperature; feed rates were presented using three water temperatures: 10 degrees Celsius (˚C), 15 ˚C, and 20 ˚C. Based on an annual production rate of 90,000 market weight fish, monthly feed rate estimates ranged from 14,534 pounds per month (lb/mo) at 15 ˚C to 19,601 lb/mo at 20 ˚C. Based on these estimates, a maximum monthly feed rate is expected to be approximately 20,000 lb.

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Proposed Wastewater Discharge Volumes. Recirculating aquaculture systems discharge a portion of the total volume of the tanks each day. An example recirculation system has a discharge-to-recirculation ratio of 1:10 (that is, 10% of the total volume will be discharged as waste each day). At a daily 10% discharge rate, the typical combined discharge from the four grow-out tanks and the eight nursery tanks will be up to 21,000 gpd (Table 1). Periodic draining and cleaning of tanks and treatment units may result in increased short-term flow rates; however, the flow rates presented here represent the projected long-term average waste discharge rates.

Table 1
Recirculating System Preliminary Waste Flow Calculation Parameters
Redwood Marine Terminal II Aquaculture Project Report of Waste Discharge

Parameter	Grow-Out Tanks	Nursery Tanks	Units
Tank Diameter	40	20	feet
Tank Area	1,257	314	square feet
Tank Depth	4	4	feet
Tank Volume	5,027/37,599	1,257/9,400	cubic feet/gallons
Number of Tanks	4	6	--
Total Volume	150,394	56,398	gallons
Discharge : Recirculation Ratio	10%	10%	--
Discharge	**15,039**	**5,640**	**gallons per day**

Previous feasibility studies have suggested that the cost of treating freshwater for aquaculture use may be prohibitively expensive at RMT II (Professional Aquaculture Services, 2015; Appendix H; Aqua-Terra & Associates, 2013; Appendix I). The February 2016 aquaculture waste load estimation by CH2M indicated that a once-through saltwater system is preferable at RMT II because of the high cost of treating freshwater at RMT II. Once-through aquaculture systems discharge at the same flow rate that water enters the system; therefore the volume of the tanks has less of an impact on discharge rate than do recirculating systems. However, a higher discharge flow rate is generated. Flow rate projections from CH2M (2016; Appendix G) indicate that at an annual production rate of 90,000 market weight fish (0.5 kg) per year, a daily flow rate of approximately 5 MGD is expected. With periodic tank cleaning cycles, daily equipment cleaning, and potential fish processing for shipping, this flow rate may be a low estimate of possible effluent discharge rates from the aquaculture facility.

Based on the two possible designs presented above, the flow-through system results in the greatest potential discharge volume at 5 MGD compared with the recirculating system at 0.02 MGD. The recirculating system may be more feasible for a freshwater system because of the high cost of acquiring freshwater at the site and pre-treatment of source water. The flow-through system may be more feasible for a saltwater system requiring less pre-treatment than freshwater sources.

Proposed Fish Species. Many potential species of fish can be raised at the RMT II site because of the potential to use freshwater and/or saltwater. The specific species selected for production will depend upon the economic feasibility determined by aquaculture companies that choose to locate to the site. Species may include bivalves (such as, oysters, clams, and mussels), or finfish (such as, steelhead, sablefish, salmon, sturgeon, and trout). (This is not intended to be an exhaustive list of potential species produced at RMT II.)

The February 2016 aquaculture waste load estimation for RMT II selected finfish as opposed to bivalves for estimating waste loads from aquaculture activities, because finfish produce a higher waste load than bivalves (CH2M, 2016; Appendix G). Bivalves are fed with algae cultured from existing stocks in source waters and consume trace nutrients and sunlight; finfish are fed with externally sourced feed stocks. Furthermore, because of the projected high cost of treating freshwater, a predominantly saltwater fish species was preferred. Steelhead, an anadromous fish species that can be raised in mostly seawater, was selected based on conversations with California Department of Fish and Wildlife and local oyster mariculture specialists.

Proposed Waste Discharge. The 2016 aquaculture waste load estimation study (CH2M, 2016; Appendix G) considered solid and dissolved waste products separately, with further analysis on each category for nitrogen and phosphorus wastes, and (subsequently) ammonium-nitrogen waste. Waste loads reportedly increase with water temperature and fish weight; all fish were assumed to reach a full production weight of 500 grams (g), and the water temperature was assumed to be 15 ˚C. Waste load estimates account for the life cycle of the fish in production from 5 g to 500 g over a 30-week period, and have been converted into annual and daily waste loads in pounds per year (lb/yr) and pounds per day (lb/d) in Table 2.

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Table 2
Flow-Through Steelhead Production Waste Load Estimates[1]
Redwood Marine Terminal II Aquaculture Project Report of Waste Discharge

Parameter	Annual Production (lb/yr)[2]	Daily Production (lb/d)[3]
Steelhead Production	**99,208[4]**	**271.8**
Total Solid Waste	30,404	83.3
Solid Nitrogen Waste	1,347	3.7
Solid Phosphorus Waste	556	1.5
Dissolved Nitrogen Waste	4,183	11.5
Ammonium-Nitrogen Waste	3,348	9.2
Dissolved Phosphorus Waste	332	0.9
Total Nitrogen Waste	5,532	15.2
Total Phosphorus Waste	886	2.4

1. Steelhead production and waste load estimates from CH2M (February 2016). *Aquaculture Waste Load Estimation: Redwood Marine Terminal II.*
2. lb/yr: pounds per year
3. lb/d: pounds per day
4. Based on annual steelhead production of 90,000 market-weight fish per year at 500 grams per fish.

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Proposed Phasing. During the startup phase for aquaculture projects at RMT II, a production level of 99,208 pfpy is proposed. This level of production generates wastewater flow rates well below the hydraulic capacity of the ocean outfall and diffuser (40 MGD), and reduces costly monitoring and testing associated with ELGs (production below 100,000 pfpy does not automatically require ELGs). The startup phase is expected to last the duration of the initial NPDES permit term (assumed to be 5 years). During this period, construction, operation, and marketing logistics can be developed, and production levels can be assessed, to determine if a higher level of production will be feasible. If increased production levels are desired, a second phase NPDES permit application/ROWD will reflect the need for increased production, including how the project will meet the requirements for complying with ELGs.

Proposed Project Updates. Because the aquaculture facility information provided in this ROWD is only an example, it is proposed that a requirement of the NPDES permit be that the following information is submitted to the RWQCB upon lease of the facility to an aquaculture company and that all plans are approved by the RWQCB before construction and ultimate discharge to the ocean outfall:

- An updated Form 200 including:
    - The new facility operator contact information
    - Operational process description and flow diagram including design flows
    - Effluent characterization including a complete list of chemicals or drugs to be applied with quantity and frequency of use
- An updated Form 2B including:
    - Description and details of source water and pre-treatment technologies to be used
    - Fish species to be grown, including harvestable weights and feed weights

- An updated NOI including:
    - Type of system: flow-through or recirculating
    - Number and type of rearing units
    - Number and type of treatment units
    - Projected operating schedule
    - Fish species to be grown, including a 5-year projected production schedule
    - Source water flow rates (minimum and maximum), as well as period of use
    - Method of pre-treatment of source water (if applicable)
    - Description of wastewater discharge source, frequency, duration, and volume
    - Effluent priority pollutant test results (if available)
    - Chemical and/or drug chronic toxicity test information
    - Verification of receiving water quality objectives (impaired water body listing, Ocean Plan objectives)
    - Feed type, maximum monthly feed rate, month of maximum feeding, and annual average feed rate
    - Proposed drug and chemical use, maximum daily amount used, method of application, and location of application

7.0 Report of Waste Discharge: RWQCB Form 200

An ROWD (Form 200) is included as Appendix B to address the discharges from the proposed aquaculture project at RMT II to the existing Pacific Ocean outfall (WDID No. 1B77005OHUM).

Part IV of Form 200 identifies the reason for filing, which includes "New Discharge or Facility" and "Waste Discharge Requirements Update or NPDES Permit Reissuance." The proposed project has not been approved or constructed; therefore, the reason for filing is identified as a "New Discharge or Facility," even though the site has an existing discharge point with a previously approved NPDES permit. The previous NPDES permit has lapsed and was issued for a pulp mill; therefore, a new NPDES permit must be issued.

Part V of Form 200 identifies the compliance pathway with respect to the California Environmental Quality Act (CEQA). The proposed aquaculture project has not been determined to be exempt from CEQA requirements at this time. Proposed construction is expected to take place in previously developed areas of RMT II, using existing buildings and infrastructure where possible, and within the boundaries of the property owned by the Harbor District.

8.0 General Information: EPA Form 1

An EPA Form 1 is included in Appendix C, and contains general information about the facility, owner, and operator.

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9.0 Supplemental Information: EPA Form 2B

An EPA Form 2B is included in Appendix D and contains information relating to concentrated animal feeding operations and aquatic animal production facilities. Form 2B contains three parts:

- Part I contains general information.
- Part II contains information relating to concentrated animal feeding operation characteristics.
- Part III contains information relating to concentrated aquatic animal production facility characteristics.

Parts I and III are included in this application, including information on the proposed aquaculture expansion project at RMT II.

Part III.A.2 summarizes discharge flow rates from the proposed facility. The discharge described above for a flow-through system of 5.0 MGD is listed as the maximum daily, maximum 30-day, and long-term average flow rate for the proposed system. This flow rate is a preliminary estimate and represents the higher of the two estimated design flows for the two types of aquaculture systems considered here. This information will be updated when a specific system design is developed. This discharge rate is well below the 40-MGD discharge capacity of the outfall.

Part III.C.2 lists the four water sources for the RMT II facility. Economic feasibility studies indicate that pre-treatment of freshwater (groundwater and Mad River water) may be economically infeasible; however, because the preliminary feasibility status of the project, all potential sources are listed. (More specific water source information is presented in Section VII; see below.)

Part III.D describes the fish species, total yearly harvestable weight, and maximum weight present at any one time. Water sources for RMT II are considered cold water sources, so no warm water fish species are proposed to be reared at the site. Steelhead was used as the example finfish species for estimation of harvestable weights and feed weights for the proposed project (CH2M, 2016; Appendix G). However, many species may feasibly be grown at RMT II, because of the supply of both freshwater and saltwater. Total yearly harvestable weight of fish is assumed to represent a conservative estimate of production, not to be exceeded by any potential project scenario. The maximum amount of fish present in the system at any one time includes the assumption that fish are introduced to the system at a weight of 5 g and grown to a market weight of 500 g over a 30-week period, and that this growth occurs linearly (that is, equal mass growth each day by each fish). Based on this scenario, an estimated 30,000 lbs of fish will be present in the system at any one time (This includes all fish, not just market weight fish.) Of the total amount of fish present in the system each day, approximately 272 pfpd are estimated to be of market weight.

Part III.E describes the maximum monthly amount of feed used, and identifies the month of maximum feeding. Based on the waste load estimation study for RMT II aquaculture by CH2M (2016; Appendix G), an estimated 20,000 lb/mo of feed may be distributed. This represents the most conservative scenario presented by the study using steelhead feeding rates at 20 ˚C (feed rates were higher at higher temperatures). It is unclear at this time whether feed rates will vary monthly, or whether production schedules will change the amount of feed distributed in the system.

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10.0 Supplemental Information: NOI

The NOI is included as Appendix E and includes supplemental information for CAAP facilities as defined by 40 Code of Federal Regulations (CFR) §122.24. Information presented in the NOI relating to operation, production, water treatment, waste discharge, feed use, and chemical and drug use are estimated values based on feasibility studies.

Section VI includes operations and production information. The type of system proposed uses containment tanks in either a flow-through or recirculating system. The type of system developed will depend upon the fish species and source water that the potential aquaculture company chooses to use. Based on the proposed site for the aquaculture system (the Machine Building), an estimated four, 40-foot diameter grow-out tanks, and eight, 20-foot diameter nursery tanks may be constructed. The actual size, number, and layout of rearing tanks will be determined by the potential aquaculture company, as well as the number and type of treatment units. The species of fish reported in the NOI is steelhead trout (*Onchorhynchus mykiss*). This species was selected for estimation of conservative waste loads at the facility (CH2M, 2016; Appendix G), because steelhead are anadromous finfish that generate higher waste loads than bivalves (such as, oysters or clams), and because they can be reared in mostly seawater (which is reportedly more economically feasible because reduced pre-treatment requirements than freshwater). Based on an annual production rate of 90,000 market weight steelhead, the annual gross production weight is estimated to be 99,208 pfpy (market weight fish are assumed to be 500 g each). This section also includes a process diagram of the proposed example facility design in Figure 4.

Section VII includes information about water sources used for the aquaculture project. The RMT II site has access to an industrial supply of untreated freshwater from the Mad River, and could (potentially) use seawater from either Humboldt Bay or the Pacific Ocean. Studies have indicated that the use of freshwater may be prohibitively expensive because of the cost of pre-treatment; however, infrastructure is already in place for delivery of freshwater to the site. Seawater drawn from Humboldt Bay or the Pacific Ocean will require construction of a new intake structure. Seawater from the Pacific Ocean may be pumped in through an internal pipe located inside the outfall pipe, in which case, the outfall pipe would serve as intake and discharge. The intake would have to be located away from the outfall diffuser to eliminate the direct intake of discharged effluent, requiring construction of a new intake structure. Seawater drawn from Humboldt Bay will also require construction of a new intake structure possibly located on or near the RMT II dock.

The exact minimum and maximum source water flow rates are unknown at this time and are to be determined (TBD). The maximum flow is listed as 40 MGD, because that is the hydraulic capacity of the ocean outfall and diffuser. The once-through aquaculture system is projected to require more source water than the recirculating system; however, the source water for each type of system may be different. Based on the high cost of pre-treatment of freshwater, recirculating systems that reduce the amount of source water needed may be more feasible. Less pre-treatment of seawater may reduce the cost of using this source making a once-through system more feasible. The once-through system is estimated to use approximately 5 MGD based on the 2016 waste load estimation study conducted by CH2M (Appendix G).

The level and method of source water treatment is unknown at this time. The type of pre-treatment required will depend on the source water, fish species, and cost determined by the potential aquaculture company. Pre-treatment methods, design, operation, and residual waste handling and

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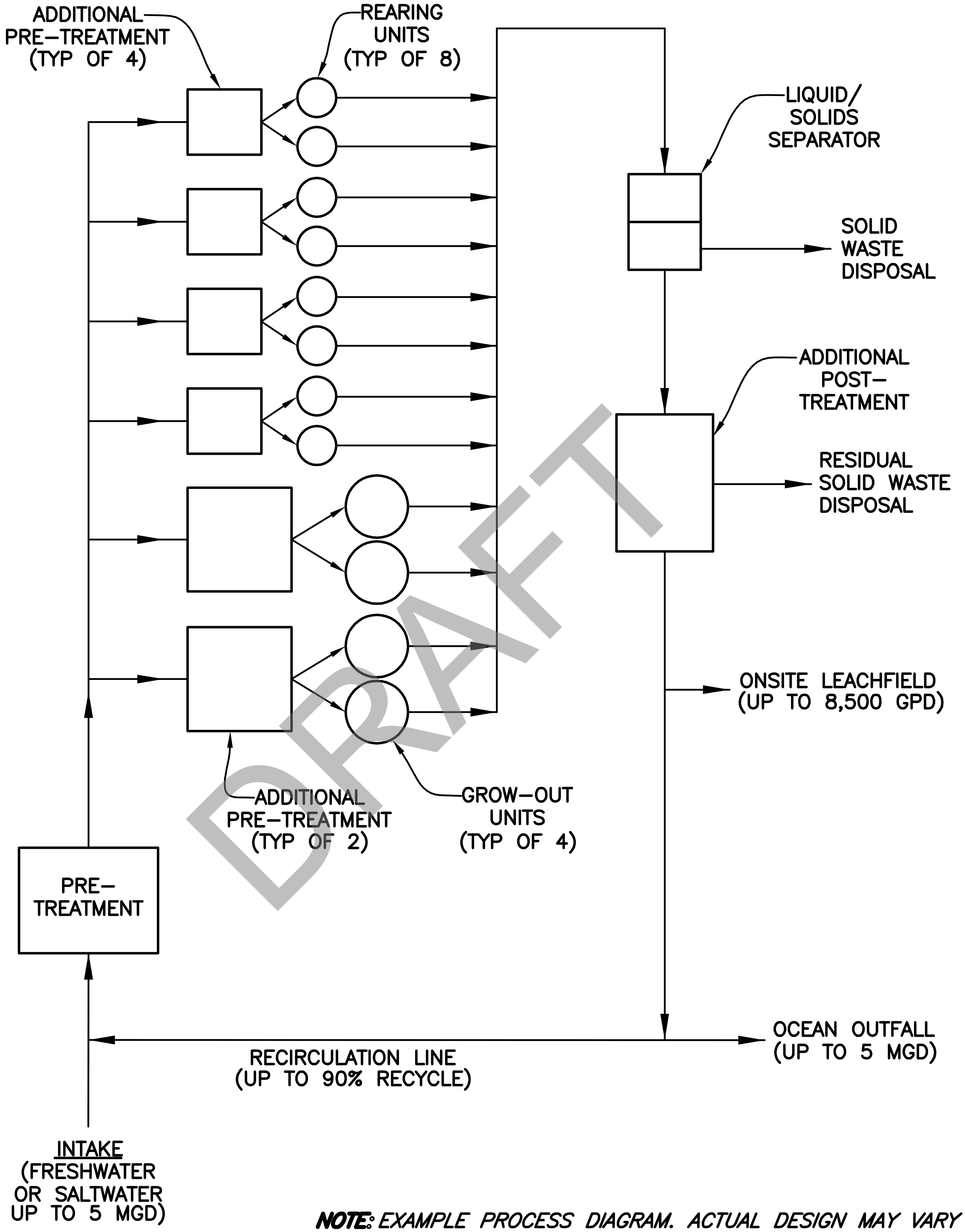

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NOTE: *EXAMPLE PROCESS DIAGRAM. ACTUAL DESIGN MAY VARY BASED ON AQUACULTURE COMPANY PREFERENCES*

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Aquaculture Process Diagram

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Figure 4

\\Eureka\Projects\2015\015147-redwood-marine-terminal-II\100-NPDES-permit\Dwgs , SAVED: 3/24/2017 4:32 PM CSWANSON, PLOTTED: 3/31/2017 9:24 AM, CHRIS D. NEWELL disposal will be included in an updated NOI submitted to the RWQCB once an aquaculture company is enlisted to use the site.

Section VIII includes information about wastewater characterization. Wastewater treatment processes for proposed facility are unknown at this time and will be influenced by such factors as source water quality, pre-treatment processes, fish species and production density (how many fish are being grown in each tank), what is added to the water for production (including chemicals, drugs, and feed), and RWQCB WDRs. Treatment processes will ultimately be designed to meet the discharge criteria established by the RWQCB.

The current onsite aquaculture user discharges approximately 2,400 gpd to the existing septic system leaving an additional 6,100 gpd capacity for additional aquaculture users; however, this amount of flow is insignificant compared to the potential discharge flows of approximately 5 MGD. Therefore, proposed wastewater discharge will occur though the ocean outfall continuously. The outfall and diffuser capacity of 40 MGD is listed here as the maximum volume of discharge possible from aquaculture activities, assuming no other discharge(s) to the outfall occurs.

Section VIII also provides a means to attach effluent water quality test results for priority pollutants identified by the California Toxics Rule and chemical- or drug-related chronic toxicity test information. However, effluent monitoring results for priority pollutants and chemical or drug test results are not available at this time, because the proposed aquaculture system may include any of the approved aquaculture drugs listed in Appendix L.

Section IX includes information about receiving water characterization, including water quality objectives established by Table 3-1 of the Basin Plan (RWQCB, 2011). Table 3-1 of the Basin Plan identifies the Water Quality Control Plan: Ocean Waters of California (hereafter Ocean Plan; SWRCB, 2015) as applicable to all North Coast Region coastal waters. The 2015 Ocean Plan includes water quality objectives for bacterial, physical, chemical, and biological characteristics, in addition to objectives for radioactivity (listed in Table 1 of the Ocean Plan). These objectives may be incorporated into an effluent limitation by the RWQCB if there is a reasonable potential for effluent from the facility to cause or contribute to an exceedance of the water quality objectives listed in Table 1 of the Ocean Plan. Upon further development of aquaculture facility design and operation, sufficient information about potential water treatment methods, and feed, and chemical and drug contents and use will be provided to the RWQCB to make an assessment of the potential for impacts to ocean waters in accordance with the Ocean Plan.

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The Ocean Plan also includes narrative and numerical effluent limitations. Narrative effluent limitations specify in “Part III.A.2: General Requirements for Management of Waste Discharge to the Ocean”:

a. Waste management systems that discharge to the ocean must be designed and operated in a manner that will maintain the indigenous marine life and a healthy and diverse marine community.
b. Waste discharged to the ocean must be essentially free of:
    i. Material that is floatable or will become floatable upon discharge
    ii. Settleable material or substances that may form sediments that will degrade benthic communities or other aquatic life
    iii. Substances that will accumulate to toxic levels in marine waters, sediments, or biota

    iv. Substances that significantly decrease the natural light to benthic communities and other marine life
    v. Materials that result in aesthetically undesirable discoloration of the ocean surface
  c. Waste effluents shall be discharged in a manner that provides sufficient initial dilution to minimize the concentrations of substances not removed in the treatment.
  d. Location of waste discharges must be determined after a detailed assessment of the oceanographic characteristics and current patterns to ensure that:
    i. Pathogenic organisms and viruses are not present in areas where shellfish are harvested for human consumption or in areas used for swimming or other body-contact sports.
    ii. Natural water quality conditions are not altered in areas designated as being of special biological significance or areas that existing marine laboratories use as a source of seawater.
    iii. Maximum protection is provided to the marine environment.
  e. Waste that contains pathogenic organisms or viruses should be discharged a sufficient distance from shell fishing and water-contact sports areas to maintain applicable bacterial standards without disinfection. Where conditions are such that an adequate distance cannot be attained, reliable disinfection in conjunction with a reasonable separation of the discharge point from the area of use must be provided. Disinfection procedures that do not increase effluent toxicity and that constitute the least environmental and human hazard should be used.

Numerical effluent limitations are listed in Table 2 of the Ocean Plan (SWRCB, 2015; shown below in Table 3); numerical effluent limitations specify limits on grease and oil, suspended solids, settleable solids, turbidity, and pH. Based on the narrative limitation described above that all effluent be essentially free of floatable or settleable material, and the numerical limitation for grease and settleable solids, it can be expected that a liquids-solids separator will be required to maintain compliance with these effluent limitations by removing uneaten feed and other floatable or settleable material, including fish scales or oil and grease.

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Table 3
California Ocean Plan Effluent Limitations[1]
Redwood Marine Terminal II Aquaculture Project Report of Waste Discharge

Parameter	Units	Monthly Average (30-day)	Weekly Average (7-day)	Instantaneous Maximum
Grease and Oil	mg/L[2]	25	40	75
Suspended Solids	See below[3]			
Settleable Solids	ml/L[4]	1.0	1.5	3.0
Turbidity	NTU[5]	75	100	225
pH	Units	Within limit of 6.0 to 9.0 at all times		

1. Table 2 Effluent Limitations; California Ocean Plan (2015)
2. mg/L: milligrams per liter
3. Suspended Solids: Dischargers shall, as a 30-day average, remove 75% of suspended solids from the influent stream before discharging wastewaters to the ocean, except that the effluent limitation to be met shall not be lower than 60 mg/L. Regional Boards may recommend that the State Water Board (Chapter III Section J), with the concurrence of the Environmental Protection Agency, adjust the 60 mg/L lower effluent concentration limit, to suit the environmental and effluent characteristics of the discharge. As a further consideration in making such recommendation for adjustment, Regional Water Boards should evaluate effects on existing and potential water reclamation projects. If the lower effluent concentration limit is adjusted, the discharger shall remove 75% of suspended solids from the influent stream at any time the influent concentration exceeds four times such adjusted effluent limit.
4. ml/L: milliliters per liter
5. NTU: nephelometric turbidity units

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Effluent limitations specify that 75% of the suspended solids in the influent must be removed prior to discharge, with the exception of establishing a minimum concentration of 60 milligrams per liter (mg/L). If the minimum concentration were to be lowered by the RWQCB to below 60 mg/L, then an additional limitation would be specified wherein if the influent is greater than 4 times the numerical limit, 75% of the suspended solids must be removed prior to discharge. Based on an estimated solid waste load of 83.3 lb/d (from an annual production of 90,000 market weight fish) and an effluent flow of 5 MGD (from the once-through system), the projected suspended solids concentration would be 2.0 mg/L. Taking into account the minimum probable initial dilution factor of 115:1 for the outfall diffuser, the effluent suspended solids concentration would be approximately 0.02 mg/L, well below the ocean plan limit of 60 mg/L. At the solid waste discharge of 83.3 lb/d and a daily discharge of only 20,000 gpd (from the recirculating system), the projected suspended solids concentration would be approximately 480 mg/L. Applying the minimum probable initial dilution factor of 115:1 for the outfall diffuser, an initial effluent concentration of less than 5 mg/L may be expected, well below the ocean plan effluent limitation of 60 mg/L. Additional solids removal may be accomplished using two existing clarifiers at RMT II. The existing clarifiers were originally used for freshwater pre-treatment for kraft pulp production and sediment removed in the clarifiers was discharged to the ocean outfall. If the clarifiers are deemed necessary for aquaculture wastewater treatment, they will need to be retrofitted to facilitate solids handling and disposal, and a solids disposal plan will need to be developed, because wastewater sludge discharge is prohibited by the Ocean Plan.

Turbidity values will require additional analysis dependent upon specific system design parameters, feed type and quantity, and approval of a dilution factor. Effluent pH values are expected to be within a range acceptable for aquatic habitat because of the fact that effluent will be from an aquatic system (that is, if fish can survive and be grown in the discharge water, it should be of an acceptable pH for discharge to another aquatic habitat). Additional verification of turbidity and pH discharge compliance will be necessary prior to and after design and construction of a new aquaculture facility at RMT II.

Section X includes information about feed use. A maximum monthly feed rate of approximately 20,000 lb/mo is expected, as described above in the paragraph on "Proposed Feed Rates," in section 4.0. At this time, the month of maximum use and the average feed rate is yet TBD. Once a specific species and water source have been identified, and a system design has been developed, more detail about feed use will be submitted to the RWQCB with an updated NOI.

Section XI includes information about aquaculture drugs and chemicals. The specific types and amounts of chemicals or drugs used in the system are TBD based upon species, source water, and system design. Additional information about drug and chemical use will be submitted to the RWQCB for approval with an updated NOI once more specific information on a proposed system is available. Federal Food and Drug Administration (FDA)-approved aquaculture drugs are listed in Appendix L, including references to relevant health and safety information.

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RWQCB General Order R1-2015-0009

CALIFORNIA
Water Boards

Edmund G. Brown Jr.
Governor

Matthew Rodriquez
Secretary for
Environmental Protection

North Coast Regional Water Quality Control Board

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
NORTH COAST REGION

ORDER NO. R1-2015-0009
GENERAL NPDES NO. CAG131015

WASTE DISCHARGE REQUIREMENTS FOR COLD WATER CONCENTRATED AQUATIC ANIMAL PRODUCTION FACILITY DISCHARGES TO SURFACE WATERS

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The following Permittees are subject to waste discharge requirements (WDRs) set forth in this General Order upon authorization by a Notice of Applicability (NOA) from the California Regional Water Quality Control Board, North Coast Region (Regional Water Board) Executive Officer:

Table 1. Permittee Information

Permittees	This General Order applies to individuals, public agencies, private businesses, and other legal entities (hereafter Permittees) that operate a cold water Concentrated Aquatic Animal Production (CAAP) Facility, as defined in of 40 Code of Federal Regulations section 122.24, and that discharge to water bodies within the North Coast Region. To be eligible for coverage under this General Order, a hatchery, fish farm, or other facility must contain, grow, or hold cold water fish species or other cold water aquatic animals in ponds, raceways, or other similar structures. Facilities covered by this General Order discharge at least 30 calendar days per year, produce at least 20,000 pounds harvest weight of aquatic animals per year, and feed at least 5,000 pounds of food during the calendar month of maximum feeding. Facilities that do not meet the above criteria may also be designated a cold water CAAP facility upon a determination that the facility is a significant contributor of pollution to waters of the United States.

Table 2. Discharge Description

Effluent Description	Receiving Water
Discharges from flow-through or recirculating fish ladders, spawning houses, production ponds, off-line settling ponds/lagoons, excess flows (diverted but not needed in operations), or other processes associated with the CAAP facility operations.	Surface Waters within the North Coast Region

Table 3. Administrative Information

This General Order was adopted on:	**November 19, 2015**
This General Order shall become effective on:	**February 1, 2016**
This General Order shall expire on:	**January 31, 2021**
The U.S. Environmental Protection Agency (U.S. EPA) and the California Regional Water Quality Control Board, North Coast Region have classified these discharges as follows:	**Minor**

Those Permittees who are covered under this General Order at the time of expiration will continue to be covered until coverage becomes effective under a reissued General Order. Only those CAAP facilities authorized to discharge under the expiring General Order and who submit a Notice of Intent (NOI) at least 180 days prior to the expiration date of this General Order (by August 4, 2020) will remain authorized to discharge under the administratively continued permit conditions.

IT IS HEREBY ORDERED, that in order to meet the provisions contained in division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder, the Permittee shall comply with the requirements in this General Order.

I, Matthias St. John, Executive Officer, do hereby certify that this General Order with all attachments is a full, true, and correct copy of the General Order adopted by the California Regional Water Quality Control Board, North Coast Region, on November 19, 2015.

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Matthias St. John, Executive Officer

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I. FACILITY INFORMATION

A. Eligible Facilities

This General Order applies to individuals, public agencies, private businesses, and other legal entities (hereafter Permittees) that operate cold water Concentrated Aquatic Animal Production (CAAP) Facilities (hereafter CAAP facilities). A cold water CAAP facility as defined in 40 Code of Federal Regulations (40 C.F.R.) section 122.24 is a fish hatchery, fish farm, or other facility which contains, grows, or holds cold water fish species or other cold water aquatic animals including, but not limited to, the *Salmonidae* family of fish (e.g., trout and salmon) in ponds, raceways, or other similar structures. The CAAP facilities that must be authorized by this General Order discharge at least 30 calendar days per year, produce at least 20,000 pounds harvest weight (9,090 kilograms) of aquatic animals per year, and feed at least 5,000 pounds (2,272 kilograms) of food during the calendar month of maximum feeding. A facility that does not meet the above criteria may also be designated a CAAP facility upon a determination that the facility is a significant contributor of pollution to waters of the United States. CAAP facilities not meeting the above criteria or designated as a significant contributor are not considered to be a point source and are not required to obtain a National Pollutant Discharge Elimination (NPDES) permit; however, enrollment under this General Order would be allowed.

B. Authorized Discharges

1. This General Order covers discharges to surface waters from CAAP facilities in the North Coast Region.
2. CAAP facilities authorized by this General Order, must demonstrate that the discharge meets the following criteria:
    - **a.** Except those constituents for which compliance with water quality-based effluent limitations is required in section V of this General Order, pollutant concentrations in the discharge do not cause, have a reasonable potential to cause, or contribute to an excursion above any applicable federal water quality criterion established by the U. S. Environmental Protection Agency (U.S. EPA) pursuant to the Clean Water Act (CWA) section 303, or any water quality objective adopted by the Regional Water Quality Control Board, North Coast Region (Regional Water Board) or State Water Resources Control Board (State Water Board), including prohibitions of discharge for the receiving waters.
    - **b.** The discharge does not cause acute or chronic toxicity in the receiving water.
3. Authorized discharges are subject to all the requirements and provisions set forth in this General Order.
4. This General Order does not authorize the discharge of any waste streams, including spills and other unintentional or non-routine discharge of pollutants, that are not part of the normal operations of CAAP facilities as described in the Permittee's Notice of Intent (NOI), or any pollutants that are not ordinarily present in such waste streams.

II. NOTIFICATION REQUIREMENTS

A. General Order Application

Existing CAAP facilities that have submitted a Report of Waste Discharge (ROWD) for renewal of their existing individual NPDES permit, and the ROWD has been deemed complete by the Regional Water Board, shall retain coverage under the administratively continued permit conditions in their existing individual NPDES permits for a period of 120 days following the effective date of this General Order. Existing Permittees who wish to continue the discharge under this General Order are required to submit a complete Notice of Intent (NOI) within 60 days

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following the effective date of this General Order. If an existing Permittee does not submit a complete NOI in accordance with this section, authorization to discharge will automatically be terminated 120 days following the effective date of this General Order and the discharge shall be prohibited thereafter.

A new CAAP facility must submit an NOI and the first annual filing fee at least 180 days prior to initiation of a new discharge. A CAAP facility that is a "new source," as defined in 40 C.F.R. sections 122.2 and 122.29, will be required to comply with the California Environmental Quality Act (CEQA) and U.S. EPA's new source performance standards. A "new source" is defined as a facility that produces 100,000 pounds or more of harvest weight (45,359 kilograms) of aquatic animals per year in flow-through or recirculating systems that are constructed after September 22, 2004. A facility is a "new source" if 1) the facility is constructed at a site where no other facility is located, 2) the facility totally replaces the process or production equipment that causes the discharge of pollutants at the existing facility, or 3) the facility process is substantially independent of an existing facility at the same site. New sources will not automatically be covered under this General Order and may be required to submit an application for an individual NPDES permit.

B. General Order Coverage

Upon review of the completed NOI, the Executive Officer shall determine the applicability of this General Order to the CAAP facility discharge(s). If the CAAP facility is deemed eligible for coverage, the Executive Officer shall issue a Notice of Applicability (NOA). The NOA shall assign an individual general permit number notifying the CAAP facility that the discharge is authorized under the terms and conditions of this General Order. The NOA may specify additional site-specific monitoring and reporting requirements. A new discharge (new source) for which coverage under this General Order is being sought shall not commence until after receiving the written NOA or until the Regional Water Board has issued an individual NPDES permit for the discharge.

This General Order does not automatically apply to discharges from CAAP facilities whose maximum weight of fish during a year is less than 20,000 pounds or whose maximum monthly feeding is less than 5,000 pounds. Such facilities are required to submit an NOI. The Executive Officer may determine that such a facility is a significant contributor of pollutants and require coverage under this General Order.

The Regional Water Board may require any CAAP facility requesting coverage under this General Order to apply for and obtain an individual NPDES permit in accordance with 40 C.F.R. section 122.28(b)(3)(i). Circumstances where an individual NPDES permit may be required include, but are not limited to, where the CAAP facility is not in compliance or is not expected to be in compliance with the terms and conditions of this General Order, or where a total maximum daily load (TMDL) has been completed for a water body or a segment of a water body approved after the effective date of this General Order. CAAP facilities that discharge to a water body with an approved TMDL, or a water body listed on the State's CWA section 303(d) list, will be evaluated on a case-by-case basis for coverage under this General Order or coverage under an individual permit (see section IV.D of the Fact Sheet (Attachment F) for more information).

In accordance with 40 C.F.R. section 122.28(b)(3)(iii), any Permittee may request to be excluded from coverage under a general NPDES permit by applying for an individual NPDES permit. This request must provide justification supporting the request for an individual NPDES permit and reasons why coverage under this General Order is not appropriate. Upon receipt of the request and application, the Executive Officer shall determine if an individual NPDES permit should be issued.

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C. Termination of Coverage

Upon receiving the NOA, the CAAP facility is subject to the terms and conditions of this General Order and is responsible for submitting monitoring reports and the annual fee associated with this General Order until a written request for official termination of coverage is approved by the Executive Officer. If the Regional Water Board issues an individual NPDES permit or Waste Discharge Requirements (WDRs) with more specific requirements to a CAAP facility, the applicability of this General Order is automatically terminated on the effective date of the individual permit.

D. Permit Expiration

This General Order will expire 5 years after its effective date, as specified on the cover page of this General Order. In accordance with 40 C.F.R. section 122.6, if the permit is not reissued by the expiration date, the conditions of this General Order will continue in force and effect until a new General Order is issued. Only those CAAP facilities authorized to discharge under the expiring General Order and who submit a NOI at least 180 days prior to the expiration date of this General Order will remain authorized to discharge under the administratively continued permit conditions.

III. FINDINGS

The California Regional Water Quality Control Board, North Coast Region (Regional Water Board), finds:

A. Legal Authorities. This General Order serves as WDRs pursuant to article 4, chapter 4, division 7 of the Water Code (commencing with section 13260).This General Order is also issued pursuant to section 402 of the federal CWA and implementing regulations adopted by the U.S. EPA and chapter 5.5, division 7 of the Water Code (commencing with section 13370). It shall serve as an NPDES permit for point source discharges from CAAP facilities to surface waters.

40 C.F.R. section 122.28 authorizes the U.S. EPA and approved states to issue general permits to regulate a point source category, if the sources:

1. Involve the same or substantially similar types of operations;
2. Discharge the same type of waste;
3. Require the same type of effluent limitations or operating conditions;
4. Require similar monitoring; and
5. Are more appropriately regulated under a general permit rather than individual permits.

On September 22, 1989, U.S. EPA granted the State of California, through the State Water Board and Regional Water Boards, the authority to issue general NPDES permits pursuant to 40 C.F.R. parts 122 and 123.

B. Background and Rationale for Requirements. The Regional Water Board developed the requirements in this General Order based on readily available information for similar discharges, through monitoring and reporting programs contained in individual NPDES permits for existing CAAP facilities, and other available information. The Fact Sheet (Attachment F), which contains background information and rationale for the requirements in this General Order, is hereby incorporated into and constitutes Findings for this General Order. Attachments A through E and G are also incorporated into this General Order.

C. Provisions and Requirements Implementing State Law. The provisions/requirements in subsection X.C.6.a. are included to implement state law only. These provisions/requirements are not required or authorized under the federal CWA.

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D. Notification of Interested Parties. The Regional Water Board has notified the interested agencies and persons of its intent to prescribe WDRs for the discharges and has provided them with an opportunity to submit their written comments and recommendations. Details of the notification are provided in the Fact Sheet.

E. Consideration of Public Comment. The Regional Water Board, in a public meeting, heard and considered all comments pertaining to the discharges. Details of the Public Hearing are provided in the Fact Sheet.

IV. DISCHARGE PROHIBITIONS

A. The discharge of any waste not disclosed by the Permittee or not within the reasonable contemplation of the Regional Water Board is prohibited.

B. Creation of pollution, contamination, or nuisance, as defined by Water Code section 13050, is prohibited.

C. The discharge of waste to land that is not under the control of the Permittee is prohibited, except as authorized under section X.C.6.a. of this General Order (Solids Disposal and Handling Requirements).

D. The discharge of waste at any point not described in the NOA or authorized by permit issued by the State Water Board or another Regional Water Board Order is prohibited.

E. The discharge of any radiological, chemical, or biological warfare agent into waters of the state is prohibited under Water Code section 13375.

F. The discharge of waste resulting from cleaning activities is prohibited.

G. The discharge of detectable levels of chemicals used for the treatment and control of disease, other than salt (NaCl), is prohibited[1].

V. EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

During the effective period of this General Order, the Permittee is authorized to discharge pollutants from the discharge point(s) specified in the NOA within the limits and subject to the conditions set forth in this General Order. This General Order authorizes the discharge of only those pollutants resulting from facility processes, waste streams, and operations that have been clearly identified in the NOA.

A. Effluent Limitations

1. Final Effluent Limitations

a. Total Suspended Solids (TSS) and Settleable Solids. The Permittee shall maintain compliance with the following effluent limitations at each discharge point, with compliance measured at Monitoring Location EFF-001 (EFF-002, etc. if there is more than one discharge point) as specified in the NOA:

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[1] This provision on treatment waste, is intended to prevent discharge of chemicals at levels that would cause toxicity, exceed water quality objectives, or otherwise impair beneficial uses.

Table 4. Effluent Limitations

Parameter	Units	Effluent Limitations			
		Average Monthly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Total Suspended Solids[1]	mg/L	8	15	---	---
Settleable Solids[1]	ml/L	0.1	0.2	---	---

Table Notes:

1. For all Permittees, except the Mad River Fish Hatchery, this limitation represents an allowable incremental increase above that concentration present in the influent water. The concentration of constituents in the influent shall be subtracted from the final effluent concentration for the purpose of applying this effluent limitation. For the Mad River Hatchery, this limitation applies to the total concentration in the effluent.

b. **pH.** The Permittee shall maintain compliance with the following effluent limitations for the respective receiving water at each discharge point, with compliance measured at Monitoring Location EFF-001 (EFF-002, etc. if there is more than one discharge point) as specified in the NOA:

i. **Trinity River.** The pH of discharges to the Trinity River shall not be depressed below 7.0 nor raised above 8.5. When the pH of the influent exceeds 8.5 at Monitoring Location INF-001 (INF-002, etc. if there is more than one discharge point) as specified in the NOA, the pH of discharges shall not exceed the pH of the influent. In no case shall effluent pH exceed 9.0.

ii. **Mad River and Russian River.** The pH of discharges to the Mad River and Russian River shall not be depressed below 6.5 nor raised above 8.5. When the pH of the influent exceeds 8.5 at Monitoring Location INF-001 (INF-002, etc. if there is more than one discharge point) as specified in the NOA, the pH of discharges shall not exceed the pH of the influent. In no case shall effluent pH exceed 9.0.

iii. **All Other Receiving Waters.** The pH of discharges to all other water bodies shall conform to those limits listed in Table 3-1 of the Basin Plan (see Attachment G). For waters not listed in Table 3-1 and where pH objectives are not prescribed, the pH shall not be depressed below 6.5 nor raised above 8.5. When the pH of the influent exceeds 8.5 at Monitoring Location INF-001 (INF-002, etc. if there is more than one discharge point) as specified in the NOA, the pH of discharges shall not exceed the pH of the influent. In no case shall effluent pH exceed 9.0.

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VI. OTHER DISCHARGE SPECIFICATIONS – NOT APPLICABLE

VII. LAND DISCHARGE SPECIFICATIONS – NOT APPLICABLE

This Permit does not authorize discharges to land.

VIII. RECYCLING SPECIFICATIONS – NOT APPLICABLE

This Permit does not authorize use or application of recycled water.

IX. RECEIVING WATER LIMITATIONS

A. Surface Water Limitations

Receiving water limitations are based on water quality objectives contained in the Basin Plan and are part of this General Order. However, a receiving water condition not in conformance with the limitation is not necessarily a violation of this General Order. Compliance with receiving water limitations shall be measured at monitoring locations described in the NOA. The Regional Water Board may require an investigation to determine cause and culpability prior to asserting a violation has occurred.

1. Unless more stringent water quality objectives for dissolved oxygen are established for a specific receiving water by Table 3-1 of the Basin Plan, authorized discharges shall not cause the dissolved oxygen concentration of receiving water to be depressed below 7.0 mg/L at any time nor below 9.0 mg/L during critical spawning and egg incubation periods. In the event that the receiving waters have background dissolved oxygen concentrations that are below these levels, discharges shall not depress dissolved oxygen concentrations below existing levels.

2. Authorized discharges shall not cause or substantially contribute to exceedances of water quality objectives for specific waters of the North Coast Region that are established in Table 3-1 of the Basin Plan for specific conductance, total dissolved solids, hardness and boron.

3. Unless more stringent water quality objectives for pH are established for specific receiving waters by Table 3-1 of the Basin Plan, authorized discharges shall not cause the pH of receiving waters to be depressed below 6.5 nor raised above 8.5. Within this range, a discharge shall not cause the pH of the receiving waters to be changed at any time more than 0.5 units from that which occurs naturally.

4. Authorized discharges shall not cause the turbidity of receiving waters to be increased more than 20 percent above naturally occurring background levels.

5. Authorized discharges shall not cause receiving waters to contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

6. Authorized discharges shall not cause receiving waters to contain floating materials, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.

7. Authorized discharges shall not cause receiving waters to contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance, or that adversely affect beneficial uses.

8. Authorized discharges shall not cause coloration of receiving waters that causes nuisance or adversely affects beneficial uses.

9. Authorized discharges shall not cause receiving waters to contain substances in concentrations that result in deposition of material that causes nuisance or adversely affect beneficial uses.

10. Authorized discharges shall not cause receiving waters to contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affects beneficial uses.

11. Authorized discharges shall not cause receiving waters to contain toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in humans, plants, animals, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods, as specified by the Regional Water Board.

12. Authorized discharges shall not cause alteration of natural temperature of receiving waters unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses. At no time or place shall discharges cause an increase of the receiving water by more than 5°F above natural receiving water temperature.

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13. Authorized discharges shall not cause an individual pesticide or combination of pesticides to be present in concentrations that adversely affect beneficial uses. Authorized discharges shall not cause bioaccumulation of pesticide concentrations in bottom sediments or aquatic life.

14. Authorized discharges shall not cause receiving waters to contain concentrations of pesticides in excess of the limiting concentrations set forth in Table 3-2 of the Basin Plan or in excess of more stringent Maximum Contaminant Levels (MCLs) established for these pollutants in Cal. Code Regs., tit. 22, division 4, chapter 15, articles 4 and 5.5.

15. Authorized discharges shall not cause receiving waters to contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise affect beneficial uses.

16. Authorized discharges shall not cause a violation of any applicable water quality standard for receiving waters adopted by the Regional Water Board or the State Water Board, as required by the federal Clean Water Act and regulations adopted thereunder. If more stringent applicable water quality standards are promulgated or approved pursuant to section 303 of the Clean Water Act, or amendments thereto, the Regional Water Board will revise and modify this General Order in accordance with such more stringent standards.

17. Authorized discharges shall not cause concentrations of chemical constituents to occur in excess of limits specified in Table 3-2 of the Basin Plan or in excess of more stringent MCLs established for these pollutants in Cal. Code Regs., tit. 22, division 4, chapter 15, articles 4 and 5.5 or in concentrations that adversely affect the agricultural supply beneficial use.

18. Authorized discharges shall not cause receiving waters to contain radionuclides in concentrations which are deleterious to human, plant, animal or aquatic life, nor which result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal or indigenous aquatic life.

B. Groundwater Limitations – Not Applicable

X. PROVISIONS

A. Standard Provisions

1. **Federal Standard Provisions.** The Permittee shall comply with all Standard Provisions included in Attachment D.

2. **Regional Water Board Standard Provisions.** The Permittee shall comply with the following provisions. In the event that there is any conflict, duplication, or overlap between provisions specified by this General Order, the more stringent provision shall apply:

a. Failure to comply with provisions or requirements of this General Order, or violation of other applicable laws or regulations governing discharges from this Facility, may subject the Permittee to administrative or civil liabilities, criminal penalties, and/or other enforcement remedies to ensure compliance. Additionally, certain violations may subject the Permittee to civil or criminal enforcement from appropriate local, state, or federal law enforcement entities.

b. In the event the Permittee does not comply or will be unable to comply for any reason, with any prohibition, interim or final effluent limitation, land discharge specification, reclamation specification, other specification, or receiving water limitation or provision of this General Order that may result in a significant threat to human health or the environment, such as inundation of treatment components, breach of pond containment, recycled water main break or equivalent release, irrigation runoff, etc.,

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that results in a discharge to a drainage channel or a surface water, the Permittee shall notify Regional Water Board staff within 24 hours of having knowledge of such noncompliance. Spill notification and reporting shall be conducted in accordance with section V.E. of Attachment D and X.E. of the Monitoring and Reporting Program.

B. Monitoring and Reporting Program (MRP) Requirements

The Permittee shall comply with the MRP, and future revisions thereto, in Attachment E.

C. Special Provisions

1. Reopener Provisions

a. **Standard Revisions.** If applicable water quality standards are promulgated or approved pursuant to section 303 of the CWA, or amendments thereto, the Regional Water Board may reopen this General Order and make modifications in accordance with such revised standards.

b. **Reasonable Potential.** This General Order may be reopened for modification to include an effluent limitation, if monitoring establishes that the discharge causes, or has the reasonable potential to cause or contribute to, an excursion above a water quality criterion or objective applicable to the receiving water.

c. **303(d)-Listed Pollutants.** If a Total Maximum Daily Load (TMDL) is adopted and is applicable to a discharge(s) authorized by this General order, this General Order may be reopened to incorporate the requirements of the TMDL. TMDLs for bacteria, nitrogen, phosphorus, dissolved oxygen, sediment, and temperature are currently applicable and/or under development for various watersheds within the North Coast Region. Point source waste load allocations (WLAs) have been assigned to the Mad River Fish Hatchery in accordance with the applicable TMDLs. Accordingly, this General Order implements those WLAs. The Permittees shall refer to Chapter 4 of the Basin Plan to determine whether there are any applicable TMDLs for the receiving water. In addition, the Regional Water Board may include additional provisions necessary for Permittees to comply with applicable TMDLs and/or consider revising this General Order to make it consistent with any Regional Water Board decisions arising from various petitions for re-hearing and litigation concerning the SIP, 303(d) list, and TMDL program.

d. **Water Effects Ratios (WERs) and Metal Translators.** A default WER of 1.0 has been used in this General Order for calculating CTR criteria for applicable priority pollutant inorganic constituents. In addition, default dissolved-to-total metal translators have been used to convert water quality objectives from dissolved to total recoverable. If the Permittee performs studies to determine site-specific WERs and/or site-specific dissolved-to-total metal translators and submits a report that demonstrates that WER or translator studies were performed in accordance with U.S. EPA or other approved guidance, this General Order may be reopened to modify the effluent limitations for the applicable constituents.

2. Special Studies, Technical Reports and Additional Monitoring Requirements

a. **New Chemical and Aquaculture Drug Use Reporting.** Based on information provided by the existing CAAP facilities in the North Coast Region, chemicals and aquaculture drugs used for the treatment and control of disease include oxytetracycline, penicillin G, florfenicol, amoxicillin trihydrate, erythromycin, Romet, formalin, PVP iodine, hydrogen peroxide, potassium permanganate, sodium chloride, acetic acid, chloramine-T, SLICE, and ivermectin. Chemicals and aquaculture drugs used for anesthesia include MS-222, sodium bicarbonate, carbon dioxide, and Aqui-S. Other

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chemicals and aquaculture drugs can only be authorized if the Permittee submits a written request to the Executive Officer to use a new drug or chemical. The request for new chemical usage shall contain the following:

i. The common name(s) and active ingredient(s) of the drug or chemical proposed for use and discharge;

ii. The purpose for the proposed use of the drug or chemical (i.e., list the specific disease for treatment and specific species for treatment);

iii. The amount proposed for use and the resulting calculated concentration in the discharge;

iv. The duration and frequency of the proposed use;

v. Material Safety Data Sheets (MSDS) and available information; and

vi. Any related Investigational New Animal Drug (INAD), New Animal Drug Application (NADA) information, extra-label use requirements, and/or veterinarian prescriptions.

The Permittee shall also submit chronic toxicity test information on any new chemical or drug applied in solution for immersive treatment in accordance with methods specified in the U.S. EPA *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms* (EPA-821-R-02-014) using *Ceriodaphnia dubia* and apply the Test of Significant Toxicity (TST) described in *National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document* (EPA 833-R10-003, 2010). The submission may include previous, valid chronic toxicity test results. Upon review of the written request for new chemical usage, the Executive Officer shall determine the suitability of the chemical(s) for use under this General Order. If the chemical(s) is deemed eligible for coverage, the Executive Officer shall issue an amendment to the Notice of Applicability (NOA).

3. Best Management Practices and Pollution Prevention

a. Pollutant Minimization Program (PMP)

i. The Permittee shall, as required by the Executive Officer, develop and conduct a PMP as further described below when there is evidence (e.g., sample results reported as detected, but not quantified (DNQ) when the effluent limitation is less than the method detection limit (MDL), sample results from analytical methods more sensitive than those methods required by this General Order, presence of whole effluent toxicity, health advisories for fish consumption, results of benthic or aquatic organism tissue sampling) that a priority pollutant or contaminant of emerging concern (CEC) is present in the effluent above an effluent limitation and either:

(a) A sample result is reported as DNQ and the effluent limitation is less than the RL; or

(b) A sample result is reported as ND and the effluent limitation is less than the MDL, using definitions described in Attachment A and reporting protocols described in MRP section X.B.4.

ii. The PMP shall include, but not be limited to, the following actions and submittals acceptable to the Regional Water Board:

(a) An annual review and semi-annual monitoring of potential sources of the reportable priority pollutant(s), which may include fish tissue monitoring and other bio-uptake sampling;

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- **(b)** Quarterly monitoring for the reportable priority pollutant(s) in the influent to the wastewater treatment system;
- **(c)** Submittal of a control strategy designed to proceed toward the goal of maintaining concentrations of the reportable priority pollutant(s) in the effluent at or below the effluent limitation;
- **(d)** Implementation of appropriate cost-effective control measures for the reportable priority pollutant(s), consistent with the control strategy; and
- **(e)** An annual status report that shall be submitted as part of the Annual Facility Report due July 1st to the Regional Water Board and shall include:
    - **(1)** All PMP monitoring results for the previous year;
    - **(2)** A list of potential sources of the reportable priority pollutant(s);
    - **(3)** A summary of all actions undertaken pursuant to the control strategy; and
    - **(4)** A description of actions to be taken in the following year.

b. Best Management Practices (BMP) Plan

Each Permittee must submit **within 90 days of the issuance of the NOA** authorizing coverage under this General Order a site-specific BMP Plan developed and implemented as required by 40 C.F.R. part 451, subpart A. An existing BMP plan may be modified for use under this section. The Permittee shall develop and implement the BMP Plan to prevent or minimize the generation and discharge of wastes and pollutants to waters of the United States and waters of the State and ensure disposal or land application of wastes is in compliance with applicable solid waste disposal regulations. The Permittee shall review the BMP Plan annually and must amend the BMP Plan whenever there is a change in the facility or in the operation of the facility which materially increases the generation of pollutants or their release or potential release to surface waters.

The BMP Plan must include, at a minimum, the following BMPs:

i. Chemical and Solids Controls

- **(a)** Feed management and feeding strategies must minimize the discharge of unconsumed food.
- **(b)** Raceways and ponds must be cleaned at such frequency and in such a manner to prevent the discharge of accumulated solids discharged to waters of the United States.
- **(c)** Fish grading, harvesting and other activities within raceways or ponds must be conducted in such a manner to minimize the discharge of accumulated solids.
- **(d)** Fish mortalities must be removed and properly disposed of on a regular basis to prevent discharge to waters of the United States, except in cases where the discharge to surface waters is determined to benefit the aquatic environment. Procedures must be identified and implemented to collect, store, and dispose of fish and other solid wastes.
- **(e)** A description of practices used to minimize use of drugs and chemicals to the extent feasible.

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(f) All drugs and pesticides must be used in accordance with applicable label directions (Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) or Federal Food and Drug Administration (FDA)), except under the following conditions, both of which must be reported in writing to the Executive Officer

(1) Participation in Investigational New Animal Drug (INAD) studies, using established protocols; or

(2) Extra-label drug use, as prescribed by a veterinarian.

ii. Materials Storage

(a) Ensure proper storage of drugs, chemicals, and feed in a manner designed to prevent spills that may result in the unauthorized discharge of drugs, pesticides or feed to land or waters of the United States.

(b) Implement procedures for properly containing, cleaning, and disposing of any spilled material.

iii. Structural Maintenance

(a) Inspect the production system and the wastewater treatment system on a routine basis in order to identify and promptly repair any damage.

(b) Conduct regular maintenance of the production system and the wastewater treatment system in order to ensure that they are properly functioning.

iv. Recordkeeping

(a) In order to calculate representative feed conversion ratios, maintain records for aquatic animal rearing units documenting the feed amounts and estimates of the numbers and weight of aquatic animals.

(b) Keep records documenting the frequency of cleaning, inspections, maintenance and repairs.

v. Training

(a) Train all facility personnel in spill prevention and how to respond in the event of a spill in order to ensure the proper clean-up and disposal of spilled material adequately.

(b) Train personnel on the proper operation and cleaning of production and wastewater treatment systems including training in feeding procedures and proper use of equipment. The Permittee shall ensure that its operations staff are familiar with the BMP Plan and have been adequately trained in the specific procedures it requires.

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c. Chemical Controls, Verification Monitoring and Reporting Plan

Within 1 year of the issuance of the NOA authorizing coverage under this General Order, each Permittee must submit for Executive Officer concurrence a site-specific Chemical Controls, Monitoring and Reporting Plan (Reduction and Verification MRP) in order to minimize the need for disease control chemicals and characterize effluent associated with disease control activities.[2] The Reduction and Verification MRP must include, at a minimum, (1) an evaluation of controls and alternatives for the reduction of chemical usage at each facility, (2) a plan to collect and analyze site specific effluent for whole effluent toxicity, (3) a plan to collect, analyze, and compare to water quality objectives concentrations of antibiotics and other treatments used for the prevention of disease in site specific effluent, and (4) a schedule for implementation.

Each Permittee shall implement a site-specific Reduction and Verification MRP in accordance with the implementation schedule approved by the Executive Officer.

4. Construction, Operation and Maintenance Specifications

a. This General Order (Attachment D, Standard Provision I.D) requires that the Permittee at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the Permittee to achieve compliance with this General Order. Proper operation and maintenance includes adequate laboratory quality control and appropriate quality assurance procedures.

b. The Permittee shall maintain an updated Operation and Maintenance (O&M) Manual for the Facility. The Permittee shall update the O&M Manual, as necessary, to conform to changes in operation and maintenance of the Facility. The O&M Manual shall be readily available to operating personnel onsite and for review by state or federal inspectors. The O&M Manual[3] shall include the following:

i. Description of the Facility's organizational structure showing the number of employees, duties and qualifications and plant attendance schedules (daily, weekends and holidays, part-time, etc.). The description should include documentation that the personnel are knowledgeable and qualified to operate the treatment Facility so as to achieve the required level of treatment at all times.

ii. Detailed description of safe and effective operation and maintenance of treatment processes, process control instrumentation and equipment.

iii. Description of laboratory and quality assurance procedures.

iv. Process and equipment inspection and maintenance schedules.

v. Description of safeguards to assure that, should there be reduction, loss, or failure of electric power, the Permittee will be able to comply with requirements of this General Order.

vi. Description of preventive (fail-safe) and contingency (response and cleanup) plans for controlling accidental discharges, and for minimizing the effect of such events. These plans shall identify the possible sources (such as loading and storage areas, power outage, waste treatment unit failure, process equipment

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[2] Reference to disease control chemicals also includes any chemicals used in the facility for cleaning, and other treatment purposes.

[3] If a facility's existing operations and/ or best management practices (BMP) manual meets all of the requirements contained in Special Provision X.C.4.b.i-vi, it shall satisfy this provision.

failure, tank and piping failure) of accidental discharges, untreated or partially treated waste bypass, and polluted drainage.

5. Special Provisions for Municipal Facilities (POTWs Only) – Not Applicable

6. Other Special Provisions

a. Solids Disposal

i. The application to land of collected screenings and other solids, including fish carcasses is not covered or authorized by this Order. Collected screenings and other solids, including fish carcasses shall be disposed of in a manner consistent with Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste , as set forth in Cal. Code Regs., tit 27, division 2, subdivision 1, § 20005, et seq.

ii. A report describing solids handling, disposal method, and final disposition of solids and/or fish carcasses shall be submitted to the Regional Water Board within 90 days of the issuance of the NOA authorizing coverage under this General Order. The report may be submitted in conjunction with the Permittee's BMP Plan.

iii. All aquaculture drugs and chemicals not discharged in accordance with the provisions of this General Order shall be disposed of in an environmentally safe manner, according to label guidelines, MSDS guidelines, and the Permittee's BMP Plan. Any other form of disposal requires approval from the Executive Officer.

7. Compliance Schedules – Not Applicable

This Order does not establish interim effluent limitations or schedules of compliance for final numeric effluent limitations.

XI. COMPLIANCE DETERMINATION

Compliance with the effluent limitations contained in section V of this General Order will be determined as specified below.

A. General

Compliance with effluent limitations for priority pollutants shall be determined using sample reporting protocols defined in the MRP of this General Order. For purposes of reporting and administrative enforcement by the Regional and State Water Boards, the Permittee shall be deemed out of compliance with effluent limitations if the concentration of the priority pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the reporting level (RL).

B. Multiple Sample Data

When determining compliance with an average monthly effluent limitation for priority pollutants, and more than one sample result is available, the Permittee shall compute the arithmetic mean unless the data set contains one or more reported determinations of "Detected, but Not Quantified" (DNQ) or "Not Detected" (ND). In those cases, the Permittee shall compute the median in place of the arithmetic mean in accordance with the following procedure.

1. The data set shall be ranked from low to high, ranking the reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.
2. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or

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both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

C. Average Monthly Effluent Limitation (AMEL)

If the average (or when applicable, the median determined by subsection B above for multiple sample data) of daily discharges over a calendar month exceeds the AMEL for a given parameter, this will represent a single violation, though the Permittee will be considered out of compliance for each day of that month for that parameter (e.g., resulting in 31 days of non-compliance in a 31-day month). If only a single sample is taken during the calendar month and the analytical result for that sample exceeds the AMEL, the Permittee will be considered out of compliance for that calendar month. The Permittee will only be considered out of compliance for days when the discharge occurs.

D. Maximum Daily Effluent Limitation (MDEL)

If a daily discharge (or when applicable, the median determined by subsection B, above, for multiple sample data of a daily discharge) exceeds the MDEL for a given parameter, the Permittee will be considered out of compliance for that parameter for that 1 day only within the reporting period.

E. Instantaneous Minimum Effluent Limitation

If the analytical result of a single grab sample is lower than the instantaneous minimum effluent limitation for a parameter, the Permittee will be considered out of compliance for that parameter for that single sample. Non-compliance for each sample will be considered separately (e.g., the results of two grab samples taken within a calendar day that both are lower than the instantaneous minimum effluent limitation would result in two instances of non-compliance with the instantaneous minimum effluent limitation).

If the Permittee monitors pH continuously, pursuant to 40 C.F.R. section 401.17, the Permittee shall be in compliance with the pH limitation specified herein provided that both of the following conditions are satisfied: (1) the total time during which the pH values are outside the required range of pH values shall not exceed 7 hours and 26 minutes in any calendar month; and (2) no individual excursion from the range of pH values shall exceed 60 minutes.

F. Instantaneous Maximum Effluent Limitation

If the analytical result of a single grab sample is higher than the instantaneous maximum effluent limitation for a parameter, the Permittee will be considered out of compliance for that parameter for that single sample. Non-compliance for each sample will be considered separately (e.g., the results of two grab samples taken within a calendar day that both exceed the instantaneous maximum effluent limitation would result in two instances of non-compliance with the instantaneous maximum effluent limitation).

If the Permittee monitors pH continuously, pursuant to 40 C.F.R. section 401.17, the Permittee shall be in compliance with the pH limitation specified herein provided that both of the following conditions are satisfied: (1) the total time during which the pH values are outside the required range of pH values shall not exceed 7 hours and 26 minutes in any calendar month; and (2) no individual excursion from the range of pH values shall exceed 60 minutes.

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ATTACHMENT A – DEFINITIONS

Aquaculture Facility: a hatchery, fish farm, or other facility that contains, grows, or holds fish for later harvest (or process) and for sale or release.

Arithmetic Mean (μ): also called the average, is the sum of measured values divided by the number of samples. For ambient water concentrations, the arithmetic mean is calculated as follows:

Arithmetic mean = $\mu = \Sigma x / n$ where: Σx is the sum of the measured ambient water concentrations, and n is the number of samples.

Average Monthly Effluent Limitation (AMEL): the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Effluent Limitation (AWEL): the highest allowable average of daily discharges over a calendar week (Sunday through Saturday), calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Best Management Practices (BMPs): mean schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of surface waters. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, and solids or waste disposal.

Bioaccumulative Pollutants: substances taken up by an organism from its surrounding medium through gill membranes, epithelial tissue, or from food and subsequently concentrated and retained in the body of the organism.

Carcinogenic Pollutants: substances that are known to cause cancer in living organisms.

Coefficient of Variation (CV): a measure of the data variability and is calculated as the estimated standard deviation divided by the arithmetic mean of the observed values.

Cold Water Species: means cold water aquatic animals including, but not limited to, the *Salmonidae* family of fish (e.g., trout and salmon).

Concentrated Aquatic Animal Production (CAAP) Facility: means point sources subject to the National Pollutant Discharge Elimination System (NPDES) permit program including those upland facilities that discharge for at least 30 days per year and contain, grow, or hold cold water fish species or other cold water aquatic animals except in facilities which produce less than 9,000 harvest weight kilograms (approximately 20,000 pounds) of aquatic animals per year and facilities which feed less than 2,275 kilograms (approximately 5,000 pounds) of food during the calendar month of maximum feeding.

Daily Discharge: Daily Discharge is defined as either: (1) the total mass of the constituent discharged over the calendar day (12:00 am through 11:59 pm) or any 24-hour period that reasonably represents a calendar day for purposes of sampling (as specified in the permit), for a constituent with limitations expressed in units of mass; or (2) the unweighted arithmetic mean measurement of the constituent over the day for a constituent with limitations expressed in other units of measurement (e.g., concentration).

The daily discharge may be determined by the analytical results of a composite sample taken over the course of one day (a calendar day or other 24-hour period defined as a day) or by the arithmetic mean of analytical results from one or more grab samples taken over the course of the day.

For composite sampling, if 1 day is defined as a 24-hour period other than a calendar day, the analytical result for the 24-hour period will be considered as the result for the calendar day in which the 24-hour period ends.

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Detected, but Not Quantified (DNQ): sample results less than the RL, but greater than or equal to the laboratory's MDL.

Dilution Credit: the amount of dilution granted to a discharge in the calculation of a water quality-based effluent limitation, based on the allowance of a specified mixing zone. It is calculated from the dilution ratio or determined through conducting a mixing zone study or modeling of the discharge and receiving water.

Effective Concentration (EC): a point estimate of the toxicant concentration that would cause an adverse effect on a quantal, "all or nothing," response (such as death, immobilization, or serious incapacitation) in a given percent of the test organisms. If the effect is death or immobility, the term lethal concentration (LC) may be used. EC values may be calculated using point estimation techniques such as probit, logit, and Spearman-Karber. EC25 is the concentration of toxicant (in percent effluent) that causes a response in 25 percent of the test organisms.

Effluent Concentration Allowance (ECA): a value derived from the water quality criterion/objective, dilution credit, and ambient background concentration that is used, in conjunction with the coefficient of variation for the effluent monitoring data, to calculate a long-term average (LTA) discharge concentration. The ECA has the same meaning as waste load allocation (WLA) as used in U.S. EPA guidance (Technical Support Document For Water Quality-based Toxics Control, March 1991, second printing, EPA/505/2-90-001).

Enclosed Bays: indentations along the coast that enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between the headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. Enclosed bays include, but are not limited to, Humboldt Bay, Bodega Harbor, Tomales Bay, Drake's Estero, San Francisco Bay, Morro Bay, Los Angeles-Long Beach Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay. Enclosed bays do not include inland surface waters or ocean waters.

Estimated Chemical Concentration: the estimated chemical concentration that results from the confirmed detection of the substance by the analytical method below the ML value.

Estuaries: waters, including coastal lagoons, located at the mouths of streams that serve as areas of mixing for fresh and ocean waters. Coastal lagoons and mouths of streams that are temporarily separated from the ocean by sandbars shall be considered estuaries. Estuarine waters shall be considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of fresh water and seawater. Estuarine waters included, but are not limited to, the Sacramento-San Joaquin Delta, as defined in Water Code section 12220, Suisun Bay, Carquinez Strait downstream to the Carquinez Bridge, and appropriate areas of the Smith, Mad, Eel, Noyo, Russian, Klamath, San Diego, and Otay rivers. Estuaries do not include inland surface waters or ocean waters.

Extralabel Drug Use: means a drug approved under the Federal Food, Drug, and Cosmetic Act that is not used in accordance with the approved label directions (see 21 C.F.R. part 530).

FDA: means the Federal Food and Drug Administration.

FIFRA: means the Federal Insecticide, Fungicide, and Rodenticide Act.

Inhibition Concentration (IC): the IC25 is typically calculated as a percentage of effluent. It is the level at which the organisms exhibit 25 percent reduction in biological measurement such as reproduction or growth. It is calculated statistically and used in chronic toxicity testing.

Inland Surface Waters: all surface waters of the State that do not include the ocean, enclosed bays, or estuaries.

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Instantaneous Maximum Effluent Limitation: the highest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous maximum limitation).

Instantaneous Minimum Effluent Limitation: the lowest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous minimum limitation).

Investigational New Animal Drug (INAD): means a drug for which there is a valid exemption in effect under section 512(j) of the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. 360(j), to conduct experiments.

Lowest Observed Effect Concentration (LOEC): the lowest concentration of an effluent or toxicant that results in adverse effects on the test organism (i.e., where the values for the observed endpoints are statistically different from the control).

Maximum Daily Effluent Limitation (MDEL): the highest allowable daily discharge of a pollutant, over a calendar day (or 24-hour period). For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the arithmetic mean measurement of the pollutant over the day.

Median: the middle measurement in a set of data. The median of a set of data is found by first arranging the measurements in order of magnitude (either increasing or decreasing order). If the number of measurements (n) is odd, then the median = $X_{(n+1)/2}$. If n is even, then the median = $(X_{n/2} + X_{(n/2)+1})/2$ (i.e., the midpoint between the $n/2$ and $n/2+1$).

Method Detection Limit (MDL): the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, as defined in 40 C.F.R., Part 136, Attachment B, revised as of July 3, 1999.

Minimum Level (ML): the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed.

Mixing Zone: a limited volume of receiving water that is allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall water body.

Not Detected (ND): those sample results less than the laboratory's MDL.

Notice of Applicability (NOA): means a written notification issued by the NPDES permitting authority authorizing discharge under the terms and conditions of a general order.

Notice of Intent (NOI): means a written application submitted to the NPDES permitting authority seeking authorization to discharge under a general order.

Off-line Settling Basin: means a constructed retention basin that receives wastewater from cleaning of aquaculture facility rearing/holding units, or quiescent zones, or both, for the retention and treatment of wastewater through settling of solids.

Persistent Pollutants: substances for which degradation or decomposition in the environment is nonexistent or very slow.

Pollutant Minimization Program (PMP): waste minimization and pollution prevention actions that include, but are not limited to, product substitution, waste stream recycling, alternative waste management methods, and education of the public and businesses. The goal of the PMP shall be to reduce all potential sources of a priority pollutant(s) through pollutant minimization (control) strategies, including pollution prevention measures as appropriate, to maintain the effluent concentration at or below the water quality-

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based effluent limitation. Pollution prevention measures may be particularly appropriate for persistent bioaccumulative priority pollutants where there is evidence that beneficial uses are being impacted. The Regional Water Board may consider cost effectiveness when establishing the requirements of a PMP. The completion and implementation of a Pollution Prevention Plan, if required pursuant to Water Code section 13263.3(d), shall be considered to fulfill the PMP requirements.

Pollution Prevention: any action that causes a net reduction in the use or generation of a hazardous substance or other pollutant that is discharged into water and includes, but is not limited to, input change, operational improvement, production process change, and product reformulation (as defined in Water Code section 13263.3). Pollution prevention does not include actions that merely shift a pollutant in wastewater from one environmental medium to another environmental medium, unless clear environmental benefits of such an approach are identified to the satisfaction of the State or Regional Water Board.

Production: means the amount of fish grown and fed in a given period of time for harvest, processing, or release.

Publicly Owned Treatment Works (POTW): a treatment works as defined in section 212 of the Clean Water Act (CWA), which is owned by a State or municipality as defined by section 502(4) of the CWA. [Section 502(4) of the CWA defines a municipality as a city, town, borough, county, parish, district, association, or other public body created by or pursuant to State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes). This definition includes any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes and other conveyances only if they convey wastewater to a POTW Treatment Plant. The term also means the municipality as defined in section 502(4) of the Clean Water Act, which has jurisdiction over the Indirect Discharges to and the discharges from such a treatment works.

Reporting Level (RL): the ML (and its associated analytical method) used for reporting and compliance determination. The MLs included in this General Order correspond to approved analytical methods for reporting a sample result that are selected by the Regional Water Board either from Appendix 4 of the SIP in accordance with section 2.4.2 of the SIP or established in accordance with section 2.4.3 of the SIP. The ML is based on the proper application of method-based analytical procedures for sample preparation and the absence of any matrix interferences. Other factors may be applied to the ML depending on the specific sample preparation steps employed. For example, the treatment typically applied in cases where there are matrix-effects is to dilute the sample or sample aliquot by a factor of ten. In such cases, this additional factor must be applied to the ML in the computation of the RL.

Satellite Collection System: the portion, if any, of a sanitary sewer system owned or operated by a different public agency than the agency that owns and operates the wastewater treatment facility that a sanitary sewer system is tributary to.

Solids: means sand, silt, or other debris collected from facility intake or source waters and accumulated waste material from aquaculture raceways and their quiescent zones, offline settling basins, full-flow settling basins, ponds, or other areas of accumulation.

Source of Drinking Water: any water designated as municipal or domestic supply (MUN) in a Regional Water Board Basin Plan.

Standard Deviation (σ): a measure of variability that is calculated as follows:

$$\sigma \quad = (\sum[(x - \mu)^2]/(n - 1))^{0.5}$$

where:

x is the observed value;

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μ is the arithmetic mean of the observed values; and

n is the number of samples.

Toxicity Reduction Evaluation (TRE): a study conducted in a step-wise process designed to identify the causative agents of effluent or ambient toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity. The first steps of the TRE consist of the collection of data relevant to the toxicity, including additional toxicity testing, and an evaluation of facility operations and maintenance practices, and best management practices. A Toxicity Identification Evaluation (TIE) may be required as part of the TRE, if appropriate. (A TIE is a set of procedures to identify the specific chemical(s) responsible for toxicity. These procedures are performed in three phases (characterization, identification, and confirmation) using aquatic organism toxicity tests.)

Test of Significant Toxicity (TST): the statistical approach described in National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document (EPA 833-R10-003, 2010). TST was developed by the U.S. Environmental Protection Agency (EPA) for analyzing WET and ambient toxicity data. Using the TST approach, the sample is declared toxic if there is greater than or equal to a 25% effect in chronic tests, or if there is greater than or equal to a 20% effect in acute tests at the permitted instream waste concentration (IWC) (referred to as the toxic regulatory management decision (RMD)). The sample is declared non-toxic if there is less than or equal to a 10% effect at the IWC in acute or chronic tests (referred to as the non-toxic RMD).

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ATTACHMENT B – NOTICE OF INTENT

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
NORTH COAST REGION

NOTICE OF INTENT

TO COMPLY WITH THE TERMS OF
ORDER NO. R1-2015-0009
GENERAL NPDES NO. CAG131015

WASTE DISCHARGE REQUIREMENTS
FOR
COLD WATER CONCENTRATED AQUATIC ANIMAL PRODUCTION FACILITY DISCHARGES TO SURFACE WATERS

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I. OWNER

Name:		
Mailing Address:		
City:	State:	ZIP:
Contact Person:		
Phone:	Fax:	E-mail:
Signature:		Date:

II. OPERATOR (*if different from owner*)

Name:		
Mailing Address:		
City:	State:	ZIP:
Contact Person:		
Phone:	Fax:	E-mail:
Signature:		Date:

III. PROPERTY OWNER

Name:		
Mailing Address:		
City:	State:	ZIP:
Contact Person:		
Phone:	Fax:	E-mail:
Signature:		Date:

IV. BILLING ADDRESS

Name:		
Mailing Address:		
City:	State:	ZIP:
Contact Person:		
Phone:	Fax:	E-mail:

V. FACILITY INFORMATION

Name:		
Location Address:		
City:	State:	ZIP:
County:		
Mailing Address:		
City:	State:	ZIP:
Contact Person:		
Phone:	Fax:	E-mail:
Active Orders or Permits adopted by the Regional Water Board, including effective dates:		
☐ *Attach a map at least 1:24000 (1" = 2000') showing the location of the discharge (e.g., USGS 7.5" topographic map). The map should show the facility location, discharge point(s), and surface waters.*		

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VI. OPERATIONS AND PRODUCTION INFORMATION

Is the production system best described as a *flow-through*, a *recirculating*, or a *pond system*?
Number and type (e.g., concrete raceways, earthen ponds, etc.) of rearing units: Total number of rearing units:
Number and type of treatment units (full-flow settling basins, off-line settling basins, quiescent zones, etc.):
Does the facility operate year-round? If not, project the number of operating days on a monthly basis throughout the calendar year.
☐ *Attach a flow diagram of the production operations, wastewater collection and treatment, and location of monitoring locations.*

In the table below, list the species grown or held at your facility and estimate the annual production of each in gross harvestable weight (if fish are released rather than harvested, production is the estimated weight at the time of release) for the 5-year term of the permit, based on historical operations, planned changes, and/or design capacity.

Species	Gross Harvestable Weight (lbs)				
	Year One	Year Two	Year Three	Year Four	Year Five

VII. WATER SOURCES

For each water source, indicate the minimum and maximum flow and the period in which that source contributes flow.

Source	Minimum Flow (MGD)	Maximum Flow (MGD)	Period

Does the facility alter the intake water chemically or physically? ☐Yes ☐No

If yes, describe how the Facility alters the intake water:

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VIII. WASTEWATER CHARACTERIZATION

For each discharge point to surface waters, describe the facility process from which water is discharged through each discharge point.

Discharge Point	Description of source, frequency, duration, and volume of discharge

Discharge Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

- ☐ For each discharge point to surface waters, attach the results of effluent monitoring for the priority pollutants identified by the California Toxics Rule at 40 C.F.R. section 131.38. The Permittee is not required to sample and analyze for asbestos. Effluent hardness shall be monitored concurrently with the priority pollutant sample. Analytical methods must achieve the lowest minimum level (ML) specified in Attachment 4 of the SIP; and in accordance with Section 2.4 of the SIP, the Permittee shall report the ML and MDL for each sample result.
- ☐ For chemical or drug applied in solution for immersive treatment attach chronic toxicity test information in accordance with methods specified in the U.S. EPA *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms* (EPA-821-R-02-014) using *Ceriodaphnia dubia* and apply the Test of Significant Toxicity (TST) described in *National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document* (EPA 833-R10-003, 2010). The submission may include previous, valid chronic toxicity test results.

IX. RECEIVING WATER CHARACTERIZATION

Receiving Water Name:

Hydrologic Unit:

Is the receiving water listed as impaired pursuant to Section 303(d) of the Clean Water Act? ☐Yes ☐No

If yes, for what pollutants?

Identify the applicable water quality objectives established by Table 3-1 of the Basin Plan, as listed in Attachment G of this General Order.

Constituent	**Objectives**			
	Minimum	**Maximum**	**90% Upper Limit**	**50% Upper Limit**
Specific Conductance (μmhos/cm)				
Total Dissolved Solids (mg/L)				
Dissolved Oxygen (mg/L)				
pH (pH units)				
Hardness (mg/L)				
Boron (mg/L)				

X. FEED USE

Describe the facility's use of feed. This may be a range expected over the next 5 years.

Type of Feed	**Maximum Monthly (lbs)**	**Month of Maximum Use**	**Annual Average (lbs)**

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XI. AQUACULTURE DRUGS AND CHEMICALS

List all projected use of chemicals and therapeutic drugs, including cleaners and disinfectants, feed additives or other ingested drugs, immersion or injected treatments. (Use an attachment if necessary.)

Drug or Chemical	**Maximum Daily Amount Used**	**Method of Application**	**Location of Application**

XII. FEE REQUIREMENTS

☐ *Provide the applicable fees. Information concerning the applicable fees can be found at www.waterboards.ca.gov/resources/fees/. Checks must be made payable to the State Water Resources Control Board.*

XIII. CERTIFICATION AND SIGNATURE

"I hereby certify under penalty of perjury that the information provided in this application and in any attachments is true and accurate to the best of my knowledge. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. By signing this NOI, I agree to comply with the provisions of the General Order. The Regional Water Board will be immediately notified of any violation of the General Order."

Printed Name of Person Signing: ______________________

Date: ______________________

Signature: ______________________

Title: ______________________

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ATTACHMENT C – CHEMICAL USE REPORT

<table>
<tr><th>Date</th><th>Chemical Name</th><th>Purpose</th><th>Amount Applied</th><th>Units</th><th>Treatment Duration</th><th>Treatment Type (Immersion, Feed, Injection)</th><th>Flow Treated (MGD)</th><th>Total Effluent Flow (MGD)</th><th>Calculated Effluent Concentration</th></tr>
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<tr><td colspan="9">For drugs and chemicals used for the treatment and control of diseases (other than NaCl), use the space below to describe the method used to demonstrate compliance with Discharge Prohibition IV.G of this General Order. Information that may be used to demonstrate compliance includes monitoring data for the drug or chemical at the time of application or calculation of the concentration (C) at the point of discharge as compared to the reporting level for the drug or chemical using the equation C = (treatment concentration) x (flow in treatment area) ÷(flow at point of discharge).</td><td></td></tr>
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ATTACHMENT D – STANDARD PROVISIONS

I. STANDARD PROVISIONS – PERMIT COMPLIANCE

A. Duty to Comply

1. The Permittee must comply with all of the conditions of this General Order. Any noncompliance constitutes a violation of the Clean Water Act (CWA) and the California Water Code and is grounds for enforcement action, for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. (40 C.F.R. § 122.41(a).)
2. The Permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants and with standards for sewage sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if this General Order has not yet been modified to incorporate the requirement. (40 C.F.R. § 122.41(a)(1).)

B. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Order. (40 C.F.R. § 122.41(c).)

C. Duty to Mitigate

The Permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this General Order that has a reasonable likelihood of adversely affecting human health or the environment. (40 C.F.R. § 122.41(d).)

D. Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this General Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by a Permittee only when necessary to achieve compliance with the conditions of this General Order. (40 C.F.R. § 122.41(e).)

E. Property Rights

1. This General Order does not convey any property rights of any sort or any exclusive privileges. (40 C.F.R. § 122.41(g).)
2. The issuance of this General Order does not authorize any injury to persons or property or invasion of other private rights, or any infringement of state or local law or regulations. (40 C.F.R. § 122.5(c).)

F. Inspection and Entry

The Permittee shall allow the Regional Water Board, State Water Board, U.S. EPA, and/or their authorized representatives (including an authorized contractor acting as their representative), upon the presentation of credentials and other documents, as may be required by law, to (40 C.F.R. § 122.41(i); Wat. Code, § 13383):

1. Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this General Order (40 C.F.R. § 122.41(i)(1));

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2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this General Order (40 C.F.R. § 122.41(i)(2));

3. Inspect and photograph, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this General Order (40 C.F.R. § 122.41(i)(3)); and

4. Sample or monitor, at reasonable times, for the purposes of assuring General Order compliance or as otherwise authorized by the CWA or the Water Code, any substances or parameters at any location. (40 C.F.R. § 122.41(i)(4).)

G. Bypass

1. Definitions

  a. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility. (40 C.F.R. § 122.41(m)(1)(i).)

  b. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities, which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production. (40 C.F.R. § 122.41(m)(1)(ii).)

2. Bypass not exceeding limitations. The Permittee may allow any bypass to occur which does not cause exceedances of effluent limitations, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions listed in Standard Provisions – Permit Compliance I.G.3, I.G.4, and I.G.5 below. (40 C.F.R. § 122.41(m)(2).)

3. Prohibition of bypass. Bypass is prohibited, and the Regional Water Board may take enforcement action against a Permittee for bypass, unless (40 C.F.R. § 122.41(m)(4)(i)):

  a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage (40 C.F.R. § 122.41(m)(4)(i)(A));

  b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance (40 C.F.R. § 122.41(m)(4)(i)(B)); and

  c. The Permittee submitted notice to the Regional Water Board as required under Standard Provisions – Permit Compliance I.G.5 below. (40 C.F.R. § 122.41(m)(4)(i)(C).)

4. The Regional Water Board may approve an anticipated bypass, after considering its adverse effects, if the Regional Water Board determines that it will meet the three conditions listed in Standard Provisions – Permit Compliance I.G.3 above. (40 C.F.R. § 122.41(m)(4)(ii).)

5. Notice

  a. Anticipated bypass. If the Permittee knows in advance of the need for a bypass, it shall submit a notice, if possible at least 10 days before the date of the bypass. (40 C.F.R. § 122.41(m)(3)(i).)

  b. Unanticipated bypass. The Permittee shall submit notice of an unanticipated bypass as required in Standard Provisions - Reporting V.E below (24-hour notice). (40 C.F.R. § 122.41(m)(3)(ii).)

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H. Upset

Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. (40 C.F.R. § 122.41(n)(1).)

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Standard Provisions – Permit Compliance I.H.2 below are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review. (40 C.F.R. § 122.41(n)(2).)
2. Conditions necessary for a demonstration of upset. A Permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that (40 C.F.R. § 122.41(n)(3)):
   - **a.** An upset occurred and that the Permittee can identify the cause(s) of the upset (40 C.F.R. § 122.41(n)(3)(i));
   - **b.** The permitted facility was, at the time, being properly operated (40 C.F.R. § 122.41(n)(3)(ii));
   - **c.** The Permittee submitted notice of the upset as required in Standard Provisions – Reporting V.E.2.b below (24-hour notice) (40 C.F.R. § 122.41(n)(3)(iii)); and
   - **d.** The Permittee complied with any remedial measures required under Standard Provisions – Permit Compliance I.C above. (40 C.F.R. § 122.41(n)(3)(iv).)
3. Burden of proof. In any enforcement proceeding, the Permittee seeking to establish the occurrence of an upset has the burden of proof. (40 C.F.R. § 122.41(n)(4).)

II. STANDARD PROVISIONS – PERMIT ACTION

A. General

This General Order may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any Order condition. (40 C.F.R. § 122.41(f).)

B. Duty to Reapply

If the Permittee wishes to continue an activity regulated by this General Order after the expiration date of this General Order, the Permittee must apply for and obtain a new permit. (40 C.F.R. § 122.41(b).)

C. Transfers

This General Order is not transferable to any person except after notice to the Regional Water Board. The Regional Water Board may require modification or revocation and reissuance of the General Order to change the name of the Permittee and incorporate such other requirements as may be necessary under the CWA and the Water Code. (40 C.F.R. § 122.41(l)(3); § 122.61.)

III. STANDARD PROVISIONS – MONITORING

A. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. (40 C.F.R. § 122.41(j)(1).)

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B. Monitoring results must be conducted according to test procedures under 40 C.F.R. part 136 or, in the case of sludge use or disposal, approved under 40 C.F.R. part 136 unless otherwise specified in 40 C.F.R. part 503 unless other test procedures have been specified in this General Order. (40 C.F.R. § 122.41(j)(4); § 122.44(i)(1)(iv).)

IV. STANDARD PROVISIONS – RECORDS

A. Except for records of monitoring information required by this General Order related to the Permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 C.F.R. part 503), the Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this General Order, and records of all data used to complete the application for this General Order, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Regional Water Board Executive Officer at any time. (40 C.F.R. § 122.41(j)(2).)

B. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements (40 C.F.R. § 122.41(j)(3)(i));

2. The individual(s) who performed the sampling or measurements (40 C.F.R. § 122.41(j)(3)(ii));

3. The date(s) analyses were performed (40 C.F.R. § 122.41(j)(3)(iii));

4. The individual(s) who performed the analyses (40 C.F.R. § 122.41(j)(3)(iv));

5. The analytical techniques or methods used (40 C.F.R. § 122.41(j)(3)(v)); and

6. The results of such analyses. (40 C.F.R. § 122.41(j)(3)(vi).)

C. Claims of confidentiality for the following information will be denied (40 C.F.R. § 122.7(b)):

1. The name and address of any permit applicant or Permittee (40 C.F.R. § 122.7(b)(1)); and

2. Permit applications and attachments, permits and effluent data. (40 C.F.R. § 122.7(b)(2).)

V. STANDARD PROVISIONS – REPORTING

A. Duty to Provide Information

The Permittee shall furnish to the Regional Water Board, State Water Board, or U.S. EPA within a reasonable time, any information which the Regional Water Board, State Water Board, or U.S. EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this General Order or to determine compliance with this General Order. Upon request, the Permittee shall also furnish to the Regional Water Board, State Water Board, or U.S. EPA copies of records required to be kept by this General Order. (40 C.F.R. § 122.41(h); Wat. Code, § 13267.)

B. Signatory and Certification Requirements

1. All applications, reports, or information submitted to the Regional Water Board, State Water Board, and/or U.S. EPA shall be signed and certified in accordance with Standard Provisions – Reporting V.B.2, V.B.3, V.B.4, and V.B.5 below. (40 C.F.R. § 122.41(k).)

2. All permit applications shall be signed as follows:

a. For a corporation, all permit applications shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or

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decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures. (40 C.F.R. § 122.22(a)(1).)

b. For a partnership or sole proprietorship, all permit applications shall be signed by a general partner or the proprietor, respectively. (40 C.F.R. § 122.22(a)(2).)

c. For a municipality, state, federal, or other public agency, all permit applications shall be signed by either a principal executive officer or ranking elected official. For purposes of this provision, a principal executive officer of a federal agency includes: (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA). (40 C.F.R. § 122.22(a)(3).).

3. All reports required by this General Order and other information requested by the Regional Water Board, State Water Board, or U.S. EPA shall be signed by a person described in Standard Provisions – Reporting V.B.2 above, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Standard Provisions – Reporting V.B.2 above (40 C.F.R. § 122.22(b)(1));

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) (40 C.F.R. § 122.22(b)(2)); and

c. The written authorization is submitted to the Regional Water Board and State Water Board. (40 C.F.R. § 122.22(b)(3).)

4. If an authorization under Standard Provisions – Reporting V.B.3 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Standard Provisions – Reporting V.B.3 above must be submitted to the Regional Water Board and State Water Board prior to or together with any reports, information, or applications, to be signed by an authorized representative. (40 C.F.R. § 122.22(c).)

5. Any person signing a document under Standard Provisions – Reporting V.B.2 or V.B.3 above shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for

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submitting false information, including the possibility of fine and imprisonment for knowing violations." (40 C.F.R. § 122.22(d).)

C. Monitoring Reports

1. Monitoring results shall be reported at the intervals specified in the Monitoring and Reporting Program (Attachment E) in this General Order. (40 C.F.R. § 122.41(l)(4).)
2. Monitoring results must be reported on a Discharge Monitoring Report (DMR) form or forms provided or specified by the Regional Water Board or State Water Board for reporting results of monitoring of sludge use or disposal practices. (40 C.F.R. § 122.41(l)(4)(i).)
3. If the Permittee monitors any pollutant more frequently than required by this General Order using test procedures approved under 40 C.F.R. part 136, or another method required for an industry-specific waste stream under 40 C.F.R. subchapters N or O, the results of such monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Regional Water Board. (40 C.F.R. § 122.41(l)(4)(ii).)
4. Calculations for all limitations, which require averaging of measurements, shall utilize an arithmetic mean unless otherwise specified in this General Order. (40 C.F.R. § 122.41(l)(4)(iii).)

D. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this General Order, shall be submitted no later than 14 days following each schedule date. (40 C.F.R. § 122.41(l)(5).)

E. Twenty-Four Hour Reporting

1. The Permittee shall report any noncompliance that may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the Permittee becomes aware of the circumstances. A written submission shall also be provided within five (5) days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. (40 C.F.R. § 122.41(l)(6)(i).)
2. The following shall be included as information that must be reported within 24 hours under this paragraph (40 C.F.R. § 122.41(l)(6)(ii)):
   - a. Any unanticipated bypass that exceeds any effluent limitation in this General Order. (40 C.F.R. § 122.41(l)(6)(ii)(A).)
   - b. Any upset that exceeds any effluent limitation in this General Order. (40 C.F.R. § 122.41(l)(6)(ii)(B).)
3. The Regional Water Board may waive the above-required written report under this provision on a case-by-case basis if an oral report has been received within 24 hours. (40 C.F.R. § 122.41(l)(6)(iii).)

F. Planned Changes

The Permittee shall give notice to the Regional Water Board as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required under this provision only when (40 C.F.R. § 122.41(l)(1)):

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1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in section 122.29(b) (40 C.F.R. § 122.41(l)(1)(i)); or
2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are subject neither to effluent limitations in this General Order nor to notification requirements under section 122.42(a)(1) (see Additional Provisions—Notification Levels VII.A.1). (40 C.F.R. § 122.41(l)(1)(ii).)
3. The alteration or addition results in a significant change in the Permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan. (40 C.F.R.§ 122.41(l)(1)(iii).)

G. Anticipated Noncompliance

The Permittee shall give advance notice to the Regional Water Board or State Water Board of any planned changes in the permitted facility or activity that may result in noncompliance with this General Order's requirements. (40 C.F.R. § 122.41(l)(2).)

H. Other Noncompliance

The Permittee shall report all instances of noncompliance not reported under Standard Provisions – Reporting V.C, V.D, and V.E above at the time monitoring reports are submitted. The reports shall contain the information listed in Standard Provision – Reporting V.E above. (40 C.F.R. § 122.41(l)(7).)

I. Other Information

When the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Water Board**,** State Water Board, or U.S. EPA, the Permittee shall promptly submit such facts or information. (40 C.F.R. § 122.41(l)(8).)

VI. STANDARD PROVISIONS – ENFORCEMENT

The Regional Water Board is authorized to enforce the terms of this permit under several provisions of the Water Code, including, but not limited to, sections 13385, 13386, and 13387.

VII. ADDITIONAL PROVISIONS – NOTIFICATION LEVELS

A. Non-Municipal Facilities

Existing manufacturing, commercial, mining, and silvicultural Permittees shall notify the Regional Water Board as soon as they know or have reason to believe (40 C.F.R. § 122.42(a)):

1. That any activity has occurred or will occur that would result in the discharge, on a routine or frequent basis, of any toxic pollutant that is not limited in this General Order, if that discharge will exceed the highest of the following "notification levels" (40 C.F.R. § 122.42(a)(1)):
    - **a.** 100 micrograms per liter (μg/L) (40 C.F.R. § 122.42(a)(1)(i));
    - **b.** 200 μg/L for acrolein and acrylonitrile; 500 μg/L for 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol; and 1 milligram per liter (mg/L) for antimony (40 C.F.R. § 122.42(a)(1)(ii));

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  - **c.** Five (5) times the maximum concentration value reported for that pollutant in the Report of Waste Discharge (40 C.F.R. § 122.42(a)(1)(iii)); or
  - **d.** The level established by the Regional Water Board in accordance with section 122.44(f). (40 C.F.R. § 122.42(a)(1)(iv).)

2. That any activity has occurred or will occur that would result in the discharge, on a non-routine or infrequent basis, of any toxic pollutant that is not limited in this General Order, if that discharge will exceed the highest of the following “notification levels" (40 C.F.R. § 122.42(a)(2)):

  - **a.** 500 micrograms per liter (µg/L) (40 C.F.R. § 122.42(a)(2)(i));
  - **b.** 1 milligram per liter (mg/L) for antimony (40 C.F.R. § 122.42(a)(2)(ii));
  - **c.** Ten (10) times the maximum concentration value reported for that pollutant in the Report of Waste Discharge (40 C.F.R. § 122.42(a)(2)(iii)); or
  - **d.** The level established by the Regional Water Board in accordance with section 122.44(f). (40 C.F.R. § 122.42(a)(2)(iv).)

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ATTACHMENT E – MONITORING AND REPORTING PROGRAM

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ATTACHMENT E – MONITORING AND REPORTING PROGRAM (MRP)

The Code of Federal Regulations (40 C.F.R. § 122.48) requires that all NPDES permits specify monitoring and reporting requirements. Water Code sections 13267 and 13383 also authorize the Regional Water Board to require technical and monitoring reports. This MRP establishes monitoring and reporting requirements that implement federal and California regulations.

I. GENERAL MONITORING PROVISIONS

A. **Wastewater Monitoring Provision.** Composite samples may be taken by a proportional sampling device approved by the Executive Officer or by grab samples composited in proportion to flow. In compositing grab samples, the sampling interval shall not exceed one hour.

B. **Supplemental Monitoring Provision.** If the Permittee monitors any pollutant more frequently than required by this General Order, using test procedures approved by 40 C.F.R. part 136 or as specified in this General Order, the results of such monitoring shall be included in the calculation and reporting of the data submitted in the monthly and annual discharge monitoring reports.

C. **Data Quality Assurance Provision.** Laboratories analyzing monitoring samples shall be certified by the State Water Resources Control Board (State Water Board) Division of Drinking Water (DDW), in accordance with the provision of Water Code section 13176, and must include quality assurance/quality control data with their reports.

D. **Instrumentation and Calibration Provision.** All monitoring instruments and devices used by the Permittee to fulfill the prescribed monitoring program shall be properly installed, calibrated, operated, and maintained to ensure that the accuracy of the measurements is consistent with the accepted capability of that type of device.

E. **Minimum Levels (ML) and Reporting Levels (RL) Provision.** Compliance and reasonable potential priority pollutant monitoring analyses shall be conducted using commercially available and reasonably achievable detection limits that are lower than the applicable effluent limitation and/or water quality criteria. If no ML value is below these levels, the lowest ML shall be selected as the RL. Test methods and required MLs for priority pollutants assigned effluent limitations in accordance with Order No. R1-2015-0009 are included in Table E-1. Applicable MLs for all priority pollutants can be referenced in Appendix 4 of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP).

Table E-1. Test Methods and MLs for Priority Pollutants

CTR#	Constituent	Types of Analytical Methods MLs (µg/L)					
		Flame Atomic Absorption (FAA)	Inductively Coupled Plasma (ICP)	Inductively Coupled Plasma/ Mass Spectroscopy (ICPMS)	Stabilized Platform Graphite Furnace Atomic Absorption (SPGFAA)	Colorimetric (Color)	Gas Chromatography/ Mass Spectroscopy (GCMS)
5b	Chromium VI	---	10	0.5	1	---	---
14	Cyanide, Total (as CN)	---	---	---	---	5	---
68	Bis (2-Ethylhexyl) Phthalate	---	---	---	---	---	5

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II. MONITORING LOCATIONS

The Permittee shall establish the following monitoring locations to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in this General Order:

Table E-2. Monitoring Station Locations

Discharge Point Name	Monitoring Location Name	Monitoring Location Description
---	**INF-001**	Shall be located where a representative sample of influent water can be collected prior to entering the CAAP facility. If there is more than one influent source, each source shall be designated in sequence and designated as INF-002, INF-003, etc.
001	**EFF-001**	Shall be located where a representative sample of the effluent can be collected prior to discharging to surface water. If there is more than one discharge, each discharge point where a representative sample of the effluent can be collected prior to discharging to surface waters shall be designated as EFF-002, EFF-003, etc.
---	**RSW-001**	Shall be located in the receiving water upstream of all discharge points.
---	**RSW-002**	Shall be located downstream of all discharge points.

III. INFLUENT MONITORING REQUIREMENTS

A. Influent Monitoring

1. The Permittee shall monitor the raw water supply to the CAAP facility at Monitoring Location INF-001 (INF-002, etc. if there is more than one water supply) when discharges from the CAAP facility are occurring. Samples shall be collected at approximately the same time as effluent and receiving water samples. Influent monitoring shall include the following:

Table E-3. Influent Monitoring[1]

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Total Suspended Solids	mg/L	Grab	Quarterly	Standard Methods[2]
Settleable Solids	ml/L	Grab	Quarterly	Standard Methods

Table Notes:

1. Influent monitoring is not required at Mad River Hatchery because (a) contrary to all other Permittees, Mad River Hatchery's compliance with the effluent limit of 8 mg/L for total suspended solids is not dependent upon an incremental increase above the concentration present in the influent; and (b) the source of influent at Mad River Hatchery is from groundwater wells and therefore not expected to contain significant amounts of settleable solids.
2. In accordance with the current edition of Standard Methods for Examination of Water and Wastewater (American Public Health Administration) or current test procedures specified in 40 C.F.R. part 136.

IV. EFFLUENT MONITORING REQUIREMENTS

A. Effluent Monitoring – Applicable to All CAAP Facilities

1. The Permittee shall monitor effluent at Monitoring Location EFF-001 (EFF-002, etc. if there is more than one discharge point) as follows. Effluent samples shall be collected during or immediately following raceway cleaning or administration of drug or chemical treatments. Time of collection of samples shall be recorded. If more than one analytical test method is listed for a given parameter, the Permittee must select from the listed methods and corresponding Minimum Level:

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Table E-4. Effluent Monitoring – Applicable to All CAAP Facilities

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method and (Minimum Level, units), respectively
Flow	MGD	Meter or Gauge	Daily[1]	---
Total Suspended Solids	mg/L	Grab	Quarterly[2]	Standard Methods[3]
Net Total Suspended Solids	mg/L	Calculation[4]	Quarterly	---
Settleable Solids	ml/L	Grab	Quarterly[2]	Standard Methods
Net Settleable Solids	ml/L	Calculation[4]	Quarterly	---
Turbidity	NTU	Grab	Quarterly	Standard Methods
pH	pH units	Grab	Quarterly	Standard Methods
Temperature	°F	Grab	Quarterly	Standard Methods
Ammonia Nitrogen	mg/L	Grab	Quarterly[5]	Standard Methods
CTR Priority Pollutants[6]	µg/L	Grab	Once per permit term[7]	Standard Methods[8]

Table Notes:

1. The Permittee shall monitor the discharge flow rates when there is a discharge. Daily flows shall be calculated or measured and recorded monthly.
2. Accelerated Monitoring. If the test result exceeds an effluent limitation the Permittee shall take two more samples, one within 14 days and one within 21 days following receipt of the initial sample result. During the intervening period, the Permittee shall take steps to identify the pollutant source and take steps needed to return to compliance.
3. In accordance with the current edition of Standard Methods for Examination of Water and Wastewater (American Public Health Administration) or current test procedures specified in 40 C.F.R. part 136.
4. The net concentration shall be calculated by subtracting the influent concentration from the effluent concentration. The Mad River Fish Hatchery is not required to report the net concentration.
5. Measurements must be taken to coincide with quarterly effluent and receiving water sampling for temperature and pH.
6. Those pollutants identified by the California Toxics Rule at 40 C.F.R. section 131.38.
7. Monitoring shall consist of a full priority pollutant scan one time at least 180 days but no more than 365 days prior to expiration of this General Order, and the results shall be submitted with the Notice of Intent (NOI) no later than 180 days prior to the expiration date of this Order. The Permittee is not required to sample and analyze for asbestos. Effluent hardness shall be monitored concurrently with the priority pollutant sample.
8. Analytical methods must achieve the lowest minimum level (ML) specified in Attachment 4 of the SIP; and in accordance with Section 2.4 of the SIP, the Permittee shall report the ML and MDL for each sample result.

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B. Effluent Monitoring – Applicable to the Coyote Valley Fishery Mitigation Facility

1. The Permittee shall monitor effluent at Monitoring Locations EFF-001 as follows. Time of collection of samples shall be recorded. If more than one analytical test method is listed for a given parameter, the Permittee must select from the listed methods and corresponding Minimum Level:

Table E-5. Effluent Monitoring – Applicable to the Coyote Valley Fishery Mitigation Facility

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method[1]
Chromium VI	µg/L	Grab	2X/permit term	ICP[2] (10 µg/L), ICPMS[3] (0.5 µg/L), or SPGFAA[4] (2.0 µg/L)

Table Notes:

1. The Permittee may use a different analytical method than those specified in this table if the analytical method is more sensitive than the test methods contained in 40 C.F.R. part 136 or if the reporting level is lower than the MLs listed in Appendix 4 of the SIP.
2. Inductively Coupled Plasma.
3. Inductively Coupled Plasma / Mass Spectroscopy.
4. Stabilized Platform Graphite Furnace Atomic Absorption.

C. Effluent Monitoring – Applicable to the Trinity River Salmon and Steelhead Hatchery

1. The Permittee shall monitor effluent at Monitoring Locations EFF-002, EFF-003, and EFF-004 as follows. Time of collection of samples shall be recorded. If more than one analytical test method is listed for a given parameter, the Permittee must select from the listed methods and corresponding Minimum Level:

Table E-6. Effluent Monitoring – Applicable to the Trinity River Salmon and Steelhead Hatchery

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method[1]
Cyanide, Total (as CN)	µg/L	Grab[2]	2X/permit term	Color[3] (5 µg/L)

Table Notes:

1. The Permittee may use a different analytical method than those specified in this table if the analytical method is more sensitive than the test methods contained in 40 C.F.R. part 136 or if the reporting level is lower than the MLs listed in Appendix 4 of the SIP.
2. In lieu of grab samples at each location, the Permittee may collect a flow-weighted composite sample from Monitoring Locations EFF-002, EFF-003, and EFF-004.
3. Colorimetric.

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D. Effluent Monitoring – Applicable to the Warm Springs Fish Hatchery

1. The Permittee shall monitor effluent at Monitoring Location EFF-001 (also referred to as Monitoring Location M-002) as follows. Time of collection of samples shall be recorded. If more than one analytical test method is listed for a given parameter, the Permittee must select from the listed methods and corresponding Minimum Level:

Table E-7. Effluent Monitoring – Applicable to the Warm Springs Fish Hatchery

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method[1]
Bis (2-Ethylhexyl) Phthalate	µg/L	Grab	Semi-Annually	GCMS[2] (5 µg/L)

Table Notes:

1. The Permittee may use a different analytical method than those specified in this table if the analytical method is more sensitive than the test methods contained in 40 C.F.R. part 136 or if the reporting level is lower than the MLs listed in Appendix 4 of the SIP.
2. Gas Chromatography / Mass Spectrometry.

V. WHOLE EFFLUENT TOXICITY TESTING REQUIREMENTS – NOT APPLICABLE

VI. LAND DISCHARGE MONITORING REQUIREMENTS – NOT APPLICABLE

The Permit does not authorize discharges to land.

VII. RECYCLING MONITORING REQUIREMENTS – NOT APPLICABLE

The Permit does not authorize use or application of recycled water.

VIII. RECEIVING WATER MONITORING REQUIREMENTS

A. Monitoring Location RSW-001

1. The Permittee shall monitor the upstream receiving water at Monitoring Location RSW-001 as follows:

Table E-8. Upstream Receiving Water Monitoring Requirements

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Dissolved Oxygen	mg/L	Grab	Quarterly	Standard Methods[1]
pH	pH Units	Grab	Quarterly[2]	Standard Methods
Temperature	°F	Grab	Quarterly[2]	Standard Methods
Turbidity	NTU	Grab	Quarterly	Standard Methods
Hardness ($CaCO_3$)	mg/L	Grab	4X/permit term[3]	Standard Methods
CTR Priority Pollutants[4]	µg/L	Grab	1X/permit term[5]	Standard Methods[6]

Table Notes:

1. In accordance with the current edition of *Standard Methods for Examination of Water and Wastewater* (American Public Health Administration) or current test procedures specified in 40 C.F.R. part 136.
2. Measurements must be taken to coincide with monthly effluent monitoring for ammonia.
3. Samples shall be collected in a manner representing seasonal variations. One sample shall be collected in concert with CTR priority pollutant sample collection.
4. Those pollutants identified by the California Toxics Rule at 40 C.F.R. section 131.38.
5. Monitoring shall consist of a full priority pollutant scan one time at least 180 days but no more than 365 days prior to expiration of this General Order, concurrent with effluent sampling. The Permittee is not required to sample and analyze for asbestos. Upstream receiving water hardness shall be monitored concurrently with the priority pollutant sample.
6. Analytical methods must achieve the lowest minimum level (ML) specified in Attachment 4 of the SIP; and in accordance with Section 2.4 of the SIP, the Permittee shall report the ML and MDL for each sample result.

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B. Monitoring Location RSW-002

1. The Permittee shall monitor the downstream receiving water at Monitoring Location RSW-002 as follows:

Table E-9. Downstream Receiving Water Monitoring Requirements

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Dissolved Oxygen	mg/L	Grab	Quarterly	Standard Methods[1]
pH	pH Units	Grab	Quarterly[2]	Standard Methods
Temperature	°F	Grab	Quarterly[2]	Standard Methods
Turbidity	NTU	Grab	Quarterly	Standard Methods

Table Notes:

1. In accordance with the current edition of *Standard Methods for Examination of Water and Wastewater* (American Public Health Administration) or current test procedures specified in 40 C.F.R. part 136.
2. Measurements must be taken to coincide with monthly effluent monitoring for ammonia.

IX. OTHER MONITORING REQUIREMENTS

A. Quarterly Drug and Chemical Use Report

The Permittee shall submit a quarterly report describing all aquaculture drugs or chemicals used at the Facility using the Chemical Use Report in Attachment C of this General Order. The information that shall be provided includes:

1. The name(s) and active ingredient(s) of the drug or chemical;

2. The date(s) of application;

3. The purpose(s) for the application;
4. The method of application (e.g., immersion bath, administered in feed), duration of treatment, whether the treatment was static or flush (for drugs or chemicals applied directly to water), amount in gallons or pounds used, treatment concentration(s), and the flow measured in million gallons per day (MGD) in the treatment units;
5. The total flow through the facility measured in MGD to the discharge point after mixing with the treated water;
6. For drugs and chemicals used for the treatment and control of diseases (other than NaCl), the method used to demonstrate compliance with Discharge Prohibition IV.G of this General Order; and
7. The method of disposal for drugs or chemicals used but not discharged in the effluent.

X. REPORTING REQUIREMENTS

A. General Monitoring and Reporting Requirements

The Permittee shall comply with all Standard Provisions (Attachment D) related to monitoring, reporting, and recordkeeping.

B. Self-Monitoring Reports (SMRs)

1. The Permittee shall electronically submit SMRs using the State Water Board's California Integrated Water Quality System (CIWQS) Program Web site (http://www.waterboards.ca.gov/ciwqs/index.html). The CIWQS Web site will provide additional information for SMR submittal in the event there will be a planned service interruption for electronic submittal.
2. The Permittee shall report in the SMR the results for all monitoring specified in this MRP under sections III through IX. The Permittee shall submit quarterly as well as annual SMRs including the results of all required monitoring using U.S. EPA-approved test methods or other test methods specified in this General Order. SMRs are to include all new monitoring results obtained since the last SMR was submitted. If the Permittee monitors any pollutant more frequently than required by this General Order, the results of this monitoring shall be included in the calculations and reporting of the data submitted in the SMR.
3. Monitoring periods and reporting for all required monitoring shall be completed according to the following schedule:

Table E-10. Monitoring Periods and Reporting Schedule

Sampling Frequency	Monitoring Period Begins On	Monitoring Period	SMR Due Date
Continuous	**August 1, 2015**	All	Submit with monthly SMR
Daily	**August 1, 2015**	(Midnight through 11:59 PM) or any 24-hour period that reasonably represents a calendar day for purposes of sampling.	Submit with monthly SMR
Weekly	**August 1, 2015**	Sunday through Saturday	Submit with monthly SMR
Monthly	**August 1, 2015**	1st day of calendar month through last day of calendar month	1st of the second month following the monitoring period

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Sampling Frequency	Monitoring Period Begins On	Monitoring Period	SMR Due Date
Quarterly	**August 1, 2015**	January 1 through March 31 April 1 through June 30 July 1 through September 30 October 1 through December 31	May 1 August 1 November 1 February 1 (of the following year)
Annually	**January 1, 2015**	January 1 through December 31	February 1 (of the following year)

4. **Reporting Protocols.** The Permittee shall report with each sample result the applicable Reporting Level (RL) and the current Method Detection Limit (MDL), as determined by the procedure in 40 C.F.R. part 136. The Permittee shall report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting protocols:

   a. Sample results greater than or equal to the RL shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).

   b. Sample results less than the RL, but greater than or equal to the laboratory's MDL, shall be reported as "Detected, but Not Quantified," or DNQ. The estimated chemical concentration of the sample shall also be reported.

   For the purposes of data collection, the laboratory shall write the estimated chemical concentration next to DNQ. The laboratory may, if such information is available, include numerical estimates of the data quality for the reported result. Numerical estimates of data quality may be percent accuracy (± a percentage of the reported value), numerical ranges (low to high), or any other means considered appropriate by the laboratory.

   c. Sample results less than the laboratory's MDL shall be reported as "Not Detected," or ND.

   d. Permittees are to instruct laboratories to establish calibration standards so that the ML value (or its equivalent if there is differential treatment of samples relative to calibration standards) is the lowest calibration standard. At no time is the Permittee to use analytical data derived from extrapolation beyond the lowest point of the calibration curve.

5. **Compliance Determination.** Compliance with effluent limitations for priority pollutants shall be determined using sample reporting protocols defined above and Attachment A. For purposes of reporting and administrative enforcement by the Regional Water Board and State Water Board, the Permittee shall be deemed out of compliance with effluent limitations if the concentration of the priority pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the reporting level (RL).

6. **Multiple Sample Data.** When determining compliance with an AMEL for priority pollutants and more than one sample result is available, the Permittee shall compute the arithmetic mean unless the data set contains one or more reported determinations of "Detected, but Not Quantified" (DNQ) or "Not Detected" (ND). In those cases, the Permittee shall compute the median in place of the arithmetic mean in accordance with the following procedure:

   a. The data set shall be ranked from low to high, ranking the reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

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b. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

7. The Permittee shall submit SMRs in accordance with the following requirements:

a. The Permittee shall arrange all reported data in a tabular format. The data shall be summarized to clearly illustrate whether the facility is operating in compliance with interim and/or final effluent limitations. The Permittee is not required to duplicate the submittal of data that is entered in a tabular format within CIWQS. When electronic submittal of data is required and CIWQS does not provide for entry into a tabular format within the system, the Permittee shall electronically submit the data in a tabular format as an attachment.

b. The Permittee shall attach a cover letter to the SMR. The information contained in the cover letter shall clearly identify violations of the WDRs; discuss corrective actions taken or planned; and the proposed time schedule for corrective actions. Identified violations must include a description of the requirement that was violated and a description of the violation.

C. Discharge Monitoring Reports (DMRs) – Not Applicable

D. Other Reports

1. **Annual Report.** The Permittee shall submit an annual report to the Regional Water Board for each calendar year. The report shall be submitted by February 1st of the following year. The report shall, at a minimum, include the following:

a. Both tabular and, where appropriate, graphical summaries of the monitoring data and disposal records from the previous year. If the Permittee monitors any pollutant more frequently than required by this General Order, using test procedures approved under 40 C.F.R. part 136 or as specified in this General Order, the results of this monitoring shall be included in the calculation and report of the data submitted SMR.

b. A comprehensive discussion of the Permittee’s compliance (or lack thereof) with all effluent limitations and other WDRs, and the corrective actions taken or planned, which may be needed to bring the discharge into full compliance with this General Order.

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ATTACHMENT F – FACT SHEET

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ATTACHMENT F – FACT SHEET

As described in section III.B of this General Order, the Regional Water Board incorporates this Fact Sheet as findings of the Regional Water Board supporting the issuance of this General Order. This Fact Sheet includes the legal requirements and technical rationale that serve as the basis for the requirements of this General Order.

This General Order has been prepared under a standardized format to accommodate a broad range of discharge requirements for Permittees in California. Only those sections or subsections of this General Order that are specifically identified as “not applicable” have been determined not to apply to the Permittees covered by this General Order. Sections or subsections of this General Order not specifically identified as “not applicable” are fully applicable to the Permittees covered by this General Order.

I. PERMIT INFORMATION

A. Federal Regulations at 40 C.F.R. section 122.24 define a cold water concentrated aquatic animal production (CAAP) facility as a fish hatchery, fish farm, or other facility which contains, grows, or holds cold water fish species or other cold water aquatic animals including, but not limited to, the *Salmonidae* family of fish (e.g., trout and salmon) in ponds, raceways or other similar structures. Flows from CAAP facilities are ultimately discharged to receiving waters and 40 C.F.R. section 122.24 specifies that CAAP facilities are point sources subject to the requirements of the National Pollutant Discharge Elimination System (NPDES) program. A CAAP facility must discharge at least 30 calendar days per year, produce at least 20,000 pounds harvest weight (9,090 kilograms) of aquatic animals per year, and feed at least 5,000 pounds (2,272 kilograms) of food during the calendar month of maximum feeding to be considered a point source. A small fish rearing operation that does not meet the production and feeding criteria may be designated as a CAAP facility by the Regional Water Board Executive Officer if it is determined that the facility is a significant contributor of pollution to waters of the United States. CAAP facilities not meeting the above criteria or not designated as a significant contributor are not considered to be a point source and are, therefore, not required to obtain an NPDES permit.

On 22 September 1989, the United States Environmental Protection Agency (U.S. EPA) granted the State of California, through the State Water Resources Control Board (State Water Board) and the Regional Water Boards the authority to issue general NPDES permits pursuant to 40 C.F.R. parts 122 and 123. General permits may be issued to regulate a category of point sources if the sources involve the same or substantially similar types of operations; discharge the same type of waste; require the same type of effluent limitations or operation conditions; require similar monitoring; and are more appropriately regulated under a general permit rather than individual permits. The Regional Water Board has determined that existing and new CAAP facilities are more appropriately regulated by a general NPDES permit.

For the purposes of this General Order, references to the “Discharger” or “permittee” in applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Permittee herein.

B. There are currently five CAAP facilities permitted through individual NPDES permits issued by the Regional Water Board to discharge wastewater to waters of the United States, as shown in the table below.

Table F-1. Existing CAAP Facilities

Permittee(s)	Facility	Individual Order No.	Individual Permit No.	Receiving Water
United States Army Corp of Engineers (ACOE) and California Department of Fish and Wildlife (DFW)	Coyote Valley Fishery Mitigation Facility	97-60	CA0024791	Russian River

Permittee(s)	Facility	Individual Order No.	Individual Permit No.	Receiving Water
Pacificorp and DFW	Iron Gate Hatchery	R1-2000-17	CA0006688	Klamath River
DFW	Mad River Fish Hatchery	R1-2005-0036	CA0006670	Mad River
United States Bureau of Reclamation (USBR) and DFW	Trinity River Salmon and Steelhead Hatchery	R1-2000-18	CA0006696	Trinity River
ACOE and DFW	Warm Springs Fish Hatchery	97-61	CA0024350	Dry Creek, tributary to the Russian River

The individual permits for the existing CAAP facilities have expired. The terms and conditions of the individual permits have been automatically continued and remain in effect until new Waste Discharge Requirements (WDRs) and NPDES permit requirements are adopted pursuant to this General Order, except for Iron Gate Hatchery for which the Regional Water Board will adopt individual WDRs and NPDES permit at a future date. Further references in this Order to “existing Permittees” and/or “existing Facilities” exclude Iron Gate Hatchery.

B. Prior to making any change in the point of discharge, place of use, or purpose of use of treated wastewater that results in a decrease of flow in any portion of a watercourse, the Permittee must file a petition with the State Water Board, Division of Water Rights, and receive approval for such a change. The State Water Board retains the jurisdictional authority to enforce such requirements under Water Code section 1211.

II. NOTIFICATION REQUIREMENTS

A. General Order Application

The Notice of Intent (NOI), as shown in Attachment B, for existing and new CAAP facilities is intended to provide the Regional Water Board with information necessary for a determination of suitability for coverage or continued coverage under this General Order. The information required to be completed in the NOI in Attachment B meets the requirements for NOIs established at 40 C.F.R. section 122.25(b)(2) and satisfies the requirements for a ROWD established by Water Code section 13260. Water Code section 13260 requires a ROWD to start the application process for all WDRs and NPDES permits, except for general WDRs or general NPDES permits that use the NOI to comply or specify the use of an alternative application form designed for the permit. Submittal of the NOI is intended to replace the requirement of discharges to provide State of California Form 200 and U.S. EPA Application Forms 1 and 2B. The requirement to provide a single application form for both new and existing facilities represents a less burdensome procedure for applicants and the Regional Water Board, while requiring submittal of all necessary information pursuant to NPDES regulations at 40 C.F.R. section 122.28(b)(2) and Water Code section 13260.

To obtain coverage under this General Order, which also serves as the NPDES permit, both new and existing CAAP facilities must submit an NOI for coverage. Existing CAAP facilities (other than Iron Gate Hatchery) must submit a complete NOI within 60 days of the effective date of this General Order. New CAAP facilities that are not currently covered by an individual NPDES permit must submit an NOI, including the first annual filing fee, at least 120 days prior to the anticipated start date of the discharge. “New Sources” are defined as any facility that discharges pollutants where construction commenced after promulgation of effluent limitation guidelines (ELGs). Therefore, new aquaculture facilities that are constructed after September 22, 2004 are “new sources”, as defined in 40 C.F.R. sections 122.2 and 122.29. Additional “new source” determination criteria include “*if (1) the facility is constructed at a site where no other facility is located, (2) the facility totally replaces the process or production equipment that causes the discharge of pollutants at the existing facility, or (3) the facility process is substantially independent*

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of an existing facility at the same site". New sources must also comply with the California Environmental Quality Act (CEQA).

Existing Permittees who fail to submit a complete NOI by the deadline established herein will be deemed as out of compliance with the General Order and subject to all penalties allowable pursuant to applicable provisions of the Clean Water Act and the Water Code, including section 13261 thereof. New discharges will not be authorized until a complete NOI has been submitted to the Regional Water Board and the Executive Officer has given notice of authorization of coverage.

The NOI, as detailed in Attachment B, requires the submittal of the following information and data:

1. General information about the Permittee(s) and facility.
2. Location map.
3. Operations and production information, including description of system type (e.g., flow-through, recirculating, or pond system), rearing units, treatment units, operation duration, and species and annual production amounts.
4. Flow diagram.
5. Water source information, including minimum and maximum flows, period of use, and description of how the intake water is altered.
6. Wastewater characterization for each discharge point to surface waters, including description of source, frequency, duration, volume of discharge; location of discharge; and effluent monitoring for the priority pollutants identified by the California Toxics Rule (CTR) at 40 C.F.R. section 131.8.
7. Receiving water characterization, including name, hydrologic unit, pollutants for which the waterbody is impaired pursuant to the Clean Water Act 303(d) list (see www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls), and applicable water quality objectives from Table 3-1 of the Basin Plan.
8. Feed use information.
9. Aquaculture drug and chemical use information.
10. Annual filing fee. The State Water Board has determined that individual or general permits for aquaculture activities (including fish hatcheries) will be subject to the same annual fee, currently $2,062 (State Water Board 2015-2016 Fee Schedule).

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B. General Order Coverage

Upon review of the NOI, the Executive Officer shall determine the applicability of this General Order to the CAAP facility discharge(s). If the CAAP facility is deemed eligible for coverage, the Executive Officer shall issue a Notice of Applicability (NOA) to the facility. The NOA will contain an individual general permit number and serve to notify the CAAP facility that the discharge is authorized under the terms and conditions of this General Order. Once the Permittee has received the NOA, this General Order shall supersede any previous Order applicable to surface water discharges from the facility except for enforcement purposes. The NOA may specify additional site-specific monitoring and reporting requirements. For existing CAAP facilities, the NOA shall serve to rescind coverage under the existing NPDES permit. A new discharge (new source) for which coverage under this General Order is being sought shall not commence until after receiving the Executive Officer's written NOA or until the Regional Water Board has issued an individual NPDES permit for the discharge.

The Regional Water Board may require any facility requesting coverage under this General Order to apply for and obtain an individual NPDES permit in accordance with 40 C.F.R. section

122.28(b)(3)(i). CAAP facilities that discharge to a Clean Water Act section 303(d) listed waterbody, or a waterbody subject to one or more applicable Total Maximum Daily Loads (TMDLs) will be evaluated on a case-by-case basis for coverage under this General Order or coverage under an individual permit.

In accordance with 40 C.F.R. section 122.28(b)(3)(iii), any facility may request to be excluded from coverage under a general NPDES permit by applying for an individual NPDES permit. The facility must provide justification supporting the request for an individual NPDES permit and reasons why coverage under this General Order is not appropriate. Upon receipt of the request, the Executive Officer shall determine if an individual NPDES permit should be issued.

The CAAP facility is subject to the terms and conditions of this General Order and is responsible for submitting the annual fee associated with this General Order until a written request for official termination of coverage is made to and is received by the Regional Water Board. If the Regional Water Board issues an individual NPDES permit or WDRs with more specific requirements to a CAAP facility, the applicability of this General Order is automatically terminated on the effective date of the individual permit.

III. FACILITY DESCRIPTION

The existing CAAP facilities are operated to mitigate the loss of fish habitat above constructed dams and/or for recreational stocking purposes. CAAP facilities are constructed to simulate natural cold water streams and are used to produce cold water fish species, typically trout or salmon. Fresh water is usually supplied to CAAP facilities by springs or surface water diversions. Fresh water continuously enters the headworks of the CAAP facility and passes through a series of aquatic animal production units (e.g., a series of holding tanks, ponds or raceways). Wastewater from these production units can be treated in settling basins or discharged directly to surface waters or percolation ponds prior to discharge. Fish rearing operations at a typical CAAP facility can consist of fish spawning, egg incubation, hatching structures, and rearing areas.

Annual fish production at the existing CAAP facilities ranges from approximately 135,000 pounds to 650,000 pounds of fish per year. Average effluent flow rates from these facilities range from approximately 7.1 million gallons per day (MGD) to 61 MGD.

A. Description of Wastewater and Biosolids Treatment and Controls

The operation of CAAP facilities may introduce a variety of pollutants into receiving waters. The NPDES permit program regulates three classes of pollutants: 1) conventional pollutants (i.e., total suspended solids (TSS), oil and grease, biochemical oxygen demand (BOD), fecal coliform organisms, and pH); 2) toxic pollutants (e.g., metals such as copper, lead, nickel, and zinc); and 3) non-conventional pollutants (e.g., contaminants of emerging concern (CECs), ammonia, formalin, and phosphorus). Pollutants in all three of these categories are discharged from CAAP facilities. The most significant of these pollutants are solids from fish feces and uneaten feed that settle to the bottom of the raceways. Both of these types of solids are primarily composed of organic matter including BOD, organic nitrogen, and organic phosphorus. Raceway cleaning wastewater is diverted at some CAAP facilities to settling basins prior to discharge to surface waters.

Fish raised in CAAP facilities may become vulnerable to disease and parasite infestations. Various aquaculture drugs and chemicals are used periodically at CAAP facilities to ensure the health and productivity of the confined fish population, as well as to maintain production efficiency. Aquaculture drugs and chemicals are used to clean raceways and to treat fish for parasites, fungal growths and bacterial infections. Aquaculture drugs and chemicals are also used to anesthetize fish prior to spawning or prior to the annual “tagging” process.

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B. Discharge Points and Receiving Waters

Effluent discharges and receiving waters for the existing CAAP facilities are described in the following table:

Table F-2. Discharge Points and Receiving Waters for Existing CAAP Facilities

Facility	Receiving Water	Discharge Point	Discharge Description
Coyote Valley Fishery Mitigation Facility	Russian River	001	Sedimentation pond
Mad River Fish Hatchery	Mad River	001	Fish ladder
		002	Spawning/hatchery building
		003	Settling basins[1]
		004	Fish release water
Trinity River Salmon and Steelhead Hatchery	Trinity River	001	Fish ladder
		002	Hatchery building
		003	Settling basin
		004	Production ponds
Warm Springs Fish Hatchery	Dry Creek, tributary to the Russian River	001(a)	Pollution control pond
		001(b)	Fish ladder
		003	Pollution control pond flood control pump
		004	Pollution control pond control overflow culvert

Table Notes:

1. Represents discharges from the production ponds to the settling basins. Direct discharges to surface waters from the production ponds and the settling basins are not permitted by Order No. R1-2005-0036.

C. Summary of Existing Requirements

1. Effluent limitations contained in the individual Orders for the existing CAAP facilities are as follows:

Table F-3. Historic Effluent Limitations for Existing CAAP Facilities

Parameter	Units	Facility	Effluent Limitations	
			Average Monthly	Maximum Daily
Total Suspended Solids (TSS)	mg/L	Coyote Valley Fishery Mitigation Facility	8[1]	15[1]
		Mad River Fish Hatchery	8	15
		Trinity River Salmon and Steelhead Hatchery	8[1]	15[1]
		Warm Springs Fish Hatchery	8[1]	15[1]
	lbs/day[2]	Coyote Valley Fishery Mitigation Facility	475[1]	890[1]
		Mad River Fish Hatchery	138	259
		Trinity River Salmon and Steelhead Hatchery (002)	334[1]	626[1]
		Warm Springs Fish Hatchery	1,035[1]	1,940[1]
Settleable Solids	ml/L	Coyote Valley Fishery Mitigation Facility	0.1[1]	0.2[1]
		Mad River Fish Hatchery	0.1	0.2
		Trinity River Salmon and Steelhead Hatchery	0.1[1]	0.2[1]
		Warm Springs Fish Hatchery	0.1[1]	0.2[1]

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Parameter	Units	Facility	Effluent Limitations	
			Average Monthly	Maximum Daily
pH	pH units	Mad River Fish Hatchery	Not less than 6.5 nor greater than 8.5	
		Trinity River Salmon and Steelhead Hatchery	Not less than 6.5 nor greater than 8.5	
Chloride	mg/L	Coyote Valley Fishery Mitigation Facility	---	250[1]
		Warm Springs Fish Hatchery	---	250[1]
Chronic Toxicity	TUc	Mad River Fish Hatchery	[3]	---

Table Notes:

1. This limitation represents an allowable incremental increase above that concentration present in the influent water. The concentration of constituents in the influent shall be subtracted from the final effluent concentration for the purpose of applying this effluent limitation.
2. The daily discharge (lbs/day) is obtained from the following calculation for any calendar day:
   Daily Discharge (lbs/day) = $\frac{8.34}{N}\sum_{i}^{N} Q_i C_i$
   in which N is the number of samples analyzed in any calendar day. Q_i and C_i are the flow rate (mgd) and the constituent concentration (mg/L), respectively, which are associated with each of the N grab samples which may be taken in any calendar day. If a composite sample is taken, C_i is the concentration measured in the composite sample; and Q_i is the average flow rate occurring during the period over which samples are composited.
3. Not more than 10 percent of critical life stage chronic toxicity bioassay determinations in any calendar year shall produce statistically significant deleterious effects to any test organism from exposure to undiluted effluent.

D. Compliance Summary

An Administrative Civil Liability Complaint (Complaint) was issued on August 29, 2005 to DFW for the Trinity River Salmon and Steelhead Hatchery assessing administrative civil liability for failure to file two quarterly reports in a timely manner. The Complaint alleged: five (5) serious violations subject to mandatory minimum penalties for violations occurring during the complaint period.

The other existing CAAP facilities did not experience any violations of the effluent limitations or permit requirements during their respective permit terms.

E. Planned Changes – Not Applicable

IV. APPLICABLE PLANS, POLICIES, AND REGULATIONS

The requirements contained in this General Order are based on the requirements and authorities described in this section.

A. Legal Authorities

This General Order serves as WDRs pursuant to article 4, chapter 4, division 7 of the California Water Code (commencing with section 13260). This General Order is also issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by the U.S. EPA and chapter 5.5, division 7 of the Water Code (commencing with section 13370). It shall serve as an NPDES permit for point source discharges from this facility to surface waters.

40 C.F.R. section 122.28 authorizes the U.S. EPA and approved states to issue general permits to regulate a point source category, if the sources:

1. Involve the same or substantially similar types of operations;
2. Discharge the same type of waste;
3. Require the same type of effluent limitations or operating conditions;
4. Require similar monitoring; and
5. Are more appropriately regulated under a general permit rather than individual permits.

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On September 22, 1989, U.S. EPA granted the State of California, through the State Water Board and Regional Water Boards, the authority to issue general NPDES permits pursuant to 40 C.F.R. parts 122 and 123.

B. California Environmental Quality Act (CEQA)

Under Water Code section 13389, this action to adopt an NPDES permit is exempt from the provisions of Chapter 3 of CEQA, (commencing with section 21100) of division 13 of the Public Resources Code.

For any "new source"[1], compliance with CEQA must be achieved before an NOA for coverage under this General Order can be issued for the CAAP facility.

C. State and Federal Laws, Regulations, Policies, and Plans

1. **Water Quality Control Plans.** The Regional Water Board adopted a *Water Quality Control Plan for the North Coast Region* (hereinafter Basin Plan) that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. The Basin Plan at section 2, Beneficial Uses, states that the beneficial uses of any specifically identified water body generally apply to its tributary streams. In addition, the Basin Plan implements State Water Board Resolution 88-63, which established state policy that all waters, with certain exceptions, should be considered suitable or potentially suitable for municipal or domestic supply. Thus, beneficial uses applicable to the Russian River, the Mad River, the Trinity River, and area groundwater, are as follows:

Table F-4. Basin Plan Beneficial Uses

Beneficial Use(s)	Receiving Water Name (Hydrologic Subarea)			
	Russian River (Coyote Valley and Warm Springs)	Mad River (Blue Lake)	Trinity River (Douglas City)	Groundwater
Municipal and Domestic Water Supply (MUN)	Existing	Existing	Existing	Existing
Agricultural Supply (AGR)	Existing	Existing	Existing	Existing
Industrial Service Supply (IND)	Existing	Existing	Existing	Existing
Industrial Process Supply (PRO)	Potential	Existing	Potential	Potential
Groundwater Recharge (GWR)	Existing	Existing	Existing	---
Freshwater Replenishment (FRESH)	Existing	Existing	Existing	---
Navigation (NAV)	Existing	Existing	Existing	---
Hydropower Generation (POW)	Existing	Potential	Potential	---
Water Contact Recreation (REC-1)	Existing	Existing	Existing	---
Non-contact Water Recreation (REC-2)	Existing	Existing	Existing	---

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[1] A "new source" is a discharge type for which U.S. EPA has issued New Source Performance Standards. A "new source" does not mean a new discharge. See also section II.A of this Fact Sheet.

Beneficial Use(s)	Receiving Water Name (Hydrologic Subarea)			
	Russian River (Coyote Valley and Warm Springs)	Mad River (Blue Lake)	Trinity River (Douglas City)	Groundwater
Commercial and Sport Fishing (COMM)	Existing	Existing	Existing	---
Warm Freshwater Habitat (WARM)	Existing	---	---	---
Cold Freshwater Habitat (COLD)	Existing	Existing	Existing	---
Preservation of Areas of Special Biological Significance (ASBS)	---	---	---	---
Inland Saline Water Habitat (SAL)	---	---	---	---
Wildlife Habitat (WILD)	Existing	Existing	Existing	---
Preservation of Rare, Threatened, or Endangered Species (RARE)	Existing	Existing	Existing	---
Marine Habitat (MAR)	---	Potential	---	---
Migration of Aquatic Species (MIGR)	Existing	Existing	Existing	---
Spawning, Reproduction, and/or Early Development (SPWN)	Existing	Existing	Existing	---
Shellfish Harvesting (SHELL)	---	---	---	---
Estuarine Habitat (EST)	---	Existing	---	---
Aquaculture (AQUA)	Potential (Coyote Valley) Existing (Warm Springs)	Existing	Potential	Potential
Native American Culture (CUL)	---	Existing	---	Existing
Flood Peak Attentuation/Flood Water Storage (FLD)	---	---	---	---
Wetland Habitat (WET)	---	---	---	---
Water Quality Enhancement (WQE)	---	---	---	---

The Basin Plan includes waste discharge prohibitions which prohibit point source discharges to the Klamath River and its tributaries, including the Trinity River, year-round and to the Mad River and Russian River during the period May 15 through September 30 and during all other periods when the waste discharge flow is greater than one percent of the receiving stream's flow. These prohibitions are applicable except as stipulated in action plans and policies contained in the Point Source Measures section of the Basin Plan. As described in section IV.E.2 of this Fact Sheet, the discharges authorized by this General Order are consistent with the Basin Plan's *Policy on the Regulation of Fish Hatcheries, Fish Rearing Facilities, and Aquaculture Operations*. Therefore, this General Order authorizes discharges to the Trinity, River, Mad River and Russian River year-round.

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2. **National Toxics Rule (NTR) and California Toxics Rule (CTR).** U.S. EPA adopted the NTR on December 22, 1992, and later amended it on May 4, 1995 and November 9, 1999. About forty criteria in the NTR applied in California. On May 18, 2000, U.S. EPA adopted the CTR. The CTR promulgated new toxics criteria for California and, in addition, incorporated the previously adopted NTR criteria that were applicable in the state. The CTR was amended on February 13, 2001. These rules contain federal water quality criteria for priority pollutants.

3. **State Implementation Policy.** On March 2, 2000, the State Water Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP). The SIP became effective on April 28, 2000, with respect to the priority pollutant criteria promulgated for California by the U.S. EPA through the NTR and to the priority pollutant objectives established by the Regional Water Board in the Basin Plan. The SIP became effective on May 18, 2000, with respect to the priority pollutant criteria promulgated by the U.S. EPA through the CTR. The State Water Board adopted amendments to the SIP on February 24, 2005, that became effective on July 13, 2005. The SIP establishes implementation provisions for priority pollutant criteria and objectives and provisions for chronic toxicity control. Requirements of this General Order implement the SIP.

4. **Antidegradation Policy.** Federal regulation 40 C.F.R. section 131.12 requires that the state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution 68-16. Resolution 68-16 is deemed to incorporate the federal antidegradation policy where the federal policy applies under federal law. Resolution 68-16 requires that existing water quality be maintained unless degradation is justified based on specific findings. The Regional Water Board's Basin Plan implements, and incorporates by reference, both the State and federal antidegradation policies. The permitted discharge must be consistent with the antidegradation provision of 40 C.F.R. section 131.12 and State Water Board Resolution 68-16. If, however, the Regional Water Board, subsequent to review of any NOI, finds that the impact of a discharge will not be consistent, then authorization for coverage under this General Order will be denied and coverage under an individual permit will be required (including preparation of an antidegradation analysis).

5. **Anti-Backsliding Requirements.** Sections 402(o) and 303(d)(4) of the CWA and federal regulations at 40 C.F.R. section 122.44(l) restrict backsliding in NPDES permits. These anti-backsliding provisions require that effluent limitations in a reissued permit must be as stringent as those in the previous permit, with some exceptions in which limitations may be relaxed.

6. **Endangered Species Act Requirements.** This General Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code, §§ 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C.A. §§ 1531 to 1544). This General Order requires compliance with effluent limits, receiving water limits, and other requirements to protect the beneficial uses of waters of the state. Each Permittee is responsible for meeting all requirements of the applicable Endangered Species Act.

D. Impaired Water Bodies on CWA 303(d) List

Section 303(d) of the federal CWA requires states to identify waterbodies that do not meet water quality standards and are not supporting their beneficial uses after implementation of technology-based effluent limitations on point sources. Each state must submit an updated list, the 303(d) List of Impaired Waterbodies, to U.S. EPA by April of each even numbered year. In addition to identifying the waterbodies that are not supporting beneficial uses, the 303(d) list also identifies the pollutant or stressor causing impairment and establishes a schedule for

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developing a control plan to address the impairment. U.S. EPA requires the Regional Water Board to develop TMDLs for each 303(d) listed pollutant and water body contaminant. TMDLs establish the maximum quantity of a given pollutant that can be added to a water body from all sources without exceeding the applicable water quality standard for that pollutant and determine waste load allocations (the portion of a TMDL allocated to existing and future point sources) for point sources and load allocations (the portion of a TMDL attributed to existing and future nonpoint sources) for nonpoint sources.

On October 11, 2011 U.S. EPA gave final approval to the 2008-2010 303(d) list of impaired water bodies prepared by the State. As described below, each of the water bodies to which the existing CAAP facilities discharge is listed as impaired on the 2010 303(d) list of impaired water bodies.

1. **Russian River.** The Russian River within the Warm Springs Hydrologic Subarea (HSA) and the Coyote Valley HSA is listed as impaired for sedimentation/siltation and temperature on the 2010 303(d) list of impaired water bodies. Regional Water Board staff is currently developing TMDLs for sedimentation/siltation and temperature for the Russian River, which are scheduled for completion in 2019.

   Aspects of the sediment impairing the Russian River include settleable solids, TSS, and turbidity. The impact of settleable solids results when they collect on the bottom of a water body over time, making them a persistent or accumulative constituent. The impact of suspended solids and turbidity, by contrast, results from their concentration in the water column.

   An analysis of effluent monitoring data from the Coyote Valley Fishery Mitigation Facility and the Warm Springs Fish Hatchery indicates that the discharges do not typically contain sediment (e.g., settleable solids, suspended solids, and turbidity) at elevated levels. This General Order includes technology-based effluent limitations for settleable solids and TSS, and requires Permittees to implement best management practices (BMPs) to prevent or minimize the generation and discharge of wastes and pollutants to waters of the United States, including operational requirements for solids control.

   The 303(d) listing for the Russian River lists sources of elevated temperature as flow regulation/modification, habitat modifications, nonpoint sources, and removal of riparian vegetation. Receiving water data upstream and downstream of the Coyote Valley Fishery Mitigation Facility and the Warm Springs Fish Hatchery are not available; however, discharges from the facilities are not expected to have the reasonable potential to cause, or contribute to increases in temperatures in the Russian River. This General Order includes receiving water limitations for temperature based on the Basin Plan water quality objectives, and requires effluent and receiving water monitoring for temperature to assess the impact of the discharge on the receiving water.

2. **Mad River.** The Mad River is listed for sedimentation/siltation, temperature, and turbidity. On December 21, 2007, U.S. EPA established the *Mad River Total Maximum Daily Loads for Sediment and Turbidity*. The TMDL identified that almost all sources of sediment in the Mad River watershed are from diffuse, nonpoint sources. Sediment is the pollutant for both the sediment and the turbidity TMDLs. Turbidity can be measured directly in the stream, but the pollutant causing the exceedance of the turbidity water quality standards in the Mad River watershed is fine sediment, or the suspended sediment load.

   The TMDL identifies the Mad River Fish Hatchery as a point source of sediment and suspended sediment. Section 3.2.2 of the TMDL specifies waste load allocations for TSS of 8 mg/L and for settleable solids of 0.1 mg/L. The TMDL expressed the waste load allocation for turbidity as "*no net increases in turbidity in receiving water greater than 20 percent over naturally occurring background level.*" The waste load allocations for TSS and settleable solids were developed using limitations for these substances from the existing NPDES

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permit for the Mad River Fish Hatchery. The waste load allocation for turbidity was derived from the water quality objective for turbidity in the Basin Plan. This General Order includes effluent limitations for TSS and settleable solids consistent with the TMDL. This General Order also includes a receiving water limitation for turbidity based on the Basin Plan objective. The receiving water limitation for turbidity is an appropriate mechanism to implement the waste load allocation because the allocation is the net increase in receiving water turbidity over naturally occurring background levels. In addition, this General Order contains requirements to implement BMPs, including operational requirements for solids control, which will further reduce sediment discharges from the hatchery. The effluent limitations for TSS and settleable solids, receiving water limitation for turbidity, and the BMP requirements in this General Order are consistent with the Mad River TMDL.

3. **Trinity River.** The Trinity River within the Middle Hydrologic Area is listed for sedimentation/siltation. On December 20, 2001, U.S. EPA established the *Trinity River Total Maximum Daily Load for Sediment*. The TMDL identified that almost all sources of sediment in the Trinity River watershed are from diffuse, nonpoint sources. The TMDL established waste load allocations for point sources identical to the load allocations for nonpoint sources according to subarea. Section 5.2 of the TMDL states, *"Although nonpoint sources are responsible for most sediment loading in the watershed, point sources may also discharge some sediment in the watershed. Current and prospective future point sources that may discharge in the watershed and are therefore at issue in this TMDL include: CalTrans facilities that discharge pursuant to the CalTrans' statewide NPDES permit issued by the State Water Resources Control Board, and [c]onstruction sites larger than 5 acres that discharge pursuant to California's NPDES general permit for construction site runoff."* The TMDL does not identify the Trinity River Salmon and Steelhead Hatchery as a point source subject to specific waste load allocations. Nevertheless, this General Order is consistent with the TMDL because it includes technology-based effluent limitations for TSS and settleable solids and contains requirements to implement BMPs, including operational requirements for solids control.

E. Other Plans, Policies and Regulations

1. **Storm Water**. Coverage under the State Water Board Water Quality Order No. 97-03-DWQ, NPDES General Permit No. CAS000001, Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities (Industrial Storm Water General Permit) is not required for CAAP facilities.

2. **Policy on the Regulation of Fish Hatcheries, Fish Rearing Facilities, and Aquaculture Operations.** The Basin Plan includes the *Policy on the Regulation of Fish Hatcheries, Fish Rearing Facilities, and Aquaculture Operations*, which establishes the following criteria applicable to discharges from fish hatcheries, rearing facilities, and aquaculture operations:

    a. The discharge shall not adversely impact the recognized existing and potential beneficial uses of the receiving waters.

    b. The discharge of waste resulting from cleaning activities shall be prohibited.

    c. The discharge of detectable levels of chemicals used for the treatment and control of disease, other than salt (NaCl) shall be prohibited.

    d. The discharge will be subject to review by the Regional Water Board for possible issuance of Waste Discharge Requirements/NPDES permit.

    e. The Regional Water Board may waive WDRs for fish hatcheries, fish rearing, and aquaculture facilities, provided that the discharge complies with applicable sections of the Basin Plan and satisfies the conditions for waiver which are described in Regional Water Board Resolution No. 87-113.

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f. The public interest is served by the fish hatchery, rearing facility, or aquaculture operation.

Requirements of this General Order implement the *Policy on the Regulation of Fish Hatcheries, Fish Rearing Facilities, and Aquaculture Operations*. In lieu of establishing numeric effluent limitations or detection levels, ensure compliance with the *Policy on the Regulation of Fish Hatcheries, Fish Rearing Facilities, and Aquaculture Operations* and demonstrate that discharges are protective of aquatic life and other beneficial uses, section X.C.2.a of the Order and section VIII of the NOI (Attachment B) require chronic toxicity test information and calculation of effluent concentrations for all chemicals and drugs applied in solution for immersive treatment.

3. Regulations for Use of Aquaculture Drugs and Chemicals. CAAP facilities produce fish and other aquatic animals in greater numbers than natural stream conditions would allow; therefore, system management is important to ensure that fish do not become overly stressed, making them more susceptible to disease outbreaks. The periodic use of various aquaculture drugs and chemicals is needed to ensure the health and productivity of cultured aquatic stocks and to maintain production efficiency. It is the responsibility of those using, prescribing, or recommending the use of these products to know which aquaculture drugs and chemicals may be used in CAAP facilities under all applicable federal, State, and local regulations and which aquaculture drugs and chemicals may be discharged to waters of the United States and waters of the State in accordance with this General Order.

Drugs and chemicals used in aquaculture are strictly regulated by the U.S. Food and Drug Administration (FDA) through the Federal Food, Drug, and Cosmetic Act (FFDCA; 21 U.S.C 301 - 392). FFDCA, the basic food and drug law of the United States, includes provisions for regulating the manufacture, distribution, and the use of, among other things, new animal drugs and animal feed. FDA's Center for Veterinary Medicine (CVM) regulates the manufacture, distribution, and use of animal drugs. CVM is responsible for ensuring that drugs used in food-producing animals are safe and effective and that food products derived from treated animals are free from potentially harmful residues. CVM approves the use of new animal drugs based on data provided by a sponsor (usually a drug company). To be approved by CVM, an animal drug must be effective for the claim on the label, and safe when used as directed for 1) treated animals; 2) persons administering the treatment; 3) the environment, including non-target organisms; and 4) consumers. CVM establishes tolerances and animal withdrawal periods as needed for all drugs approved for use in food-producing animals. CVM has the authority to grant investigational new animal drug (INAD) exemptions so that data can be generated to support the approval of a new animal drug.

CAAP facilities may legally obtain and use aquaculture drugs in one of several ways. Some aquaculture drugs and chemicals used at CAAP facilities in the North Coast Region are approved by the FDA for certain aquaculture uses on certain aquatic species. Others have an exemption from this approval process when used under certain specified conditions. Others are not approved for use in aquaculture, but are considered to be of "low regulatory priority" by FDA (hereafter "LRP drug"). FDA is unlikely to take regulatory action related to the use of a LRP drug if an appropriate grade of the chemical or drug is used, good management practices are followed, and local environmental requirements are met (including NPDES permit requirements). Finally, some drugs and chemicals may be used for purposes, or in a manner not listed on their label (i.e., "extra-label" use), under the direction of licensed veterinarians for the treatment of specific fish diseases diagnosed by fish pathologists. It is assumed that veterinarian-prescribed aquaculture drugs are used only for short periods of duration during acute disease outbreaks. Each of these methods of obtaining and using aquaculture drugs is discussed in further detail below.

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a. **FDA-approved New Animal Drugs**. Approved new animal drugs have been screened by the FDA to determine whether they cause significant adverse public health or environmental impacts when used in accordance with label instructions. Currently, there are eight new animal drugs approved by FDA for use in food-producing aquatic species. These eight FDA-approved new animal drugs include the following:

   i. Chorionic gonadotropin (Chlorulun®), used for spawning;
   ii. Oxytetracycline (Terramycin®), an antibiotic;
   iii. Sulfadimethoxine - ormetoprim (Romet - 30®), an antibiotic;
   iv. Tricaine methanesulfonate (MS-222, Finquel® and Tricaine-S), an anesthetic;
   v. Formalin (Formalin-F®, Paracide F® and PARASITE-S®), used as a fungus and parasite treatment;
   vi. Sulfamerazine, an antibiotic;
   vii. Florfenicol (Aquaflor), an antibiotic; and
   viii. Hydrogen peroxide, used to control fungal and bacterial infections.

   Each aquaculture drug in this category is approved by the FDA for use on specific fish species, for specific disease conditions, at specific dosages, and with specific withdrawal times. Product withdrawal times must be observed to ensure that any product used on aquatic animals at a CAAP facility does not exceed legal tolerance levels in the animal tissue. Observance of the proper withdrawal time helps ensure that products reaching consumers are safe and wholesome.

   FDA-approved new animal drugs that are added to aquaculture feed must be specifically approved for use in aquaculture feed. Drugs approved by FDA for use in feed must be found safe and effective. Approved new animal drugs may be mixed in feed for uses and at levels that are specified in FDA medicated - feed regulations only. It is unlawful to add drugs to feed unless the drugs are approved for such feed use. For example, producers may not top-dress feed with water-soluble, over-the-counter antibiotic product. Some medicated feeds, such as Romet-30®, may be manufactured only after the FDA has approved a medicated-feed application (FDA Form 1900) submitted by the feed manufacturer.

b. **FDA Investigational New Animal Drugs (INAD)**. Aquaculture drugs in this category can only be used under an investigational new animal drug or "INAD" exemption. INAD exemptions are granted by CVM to permit the purchase, shipment and use of an unapproved new animal drug for investigational purposes. INAD exemptions are granted by CVM with the expectation that meaningful data will be generated to support the approval of a new animal drug by FDA in the future. Numerous FDA requirements must be met for the establishment and maintenance of aquaculture INADs.

   There are two types of INADs: standard and compassionate. Aquaculture INADs, most of which are compassionate, consist of two types: routine and emergency. A compassionate INAD exemption is used in cases in which the aquatic animal's health is of primary concern. In certain situations, producers can use unapproved drugs for clinical investigations (under a compassionate INAD exemption) subject to FDA approval. In these cases, CAAP facilities are used to conduct closely monitored clinical field trials. FDA reviews test protocols, authorizes specific conditions of use, and closely monitors any drug use under an INAD exemption. An application to renew an INAD exemption is required each year. Data recording and reporting are required under the INAD exemption in order to support the approval of a new animal drug or an extension of approval for new uses of the drug.

c. **FDA Unapproved New Animal Drugs Of Low Regulatory Priority (LRP drugs)**. LRP drugs do not require a new animal drug application (NADA) or INAD exemptions from FDA. Further regulatory action is unlikely to be taken by FDA on LRP drugs as long as

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an appropriate grade of the drug or chemical is used, good management practices are followed, and local environmental requirements are met (such as NPDES permit requirements contained in this General Order). LRP drugs commonly used at CAAP facilities in the North Coast Region include the following:

i. Acetic acid, a parasiticide;

ii. Carbon dioxide gas, an anesthetic;

iii. Povidone iodine (PVP) compounds, a fish egg disinfectant;

iv. Sodium bicarbonate (baking soda), an anesthetic;

v. Sodium chloride (salt), an osmoregulatory aid for the relief of stress and prevention of shock; and

vi. Copper sulfate[2] and potassium permanganate are LRP but regulatory action has been deferred pending further study.

FDA is unlikely to object at present to the use of these LRP drugs if the following conditions are met:

i. The aquaculture drugs are used for the prescribed indications, including species and life stages where specified.

ii. The aquaculture drugs are used at the prescribed dosages.

iii. The aquaculture drugs are used according to good management practices.

iv. The product is of an appropriate grade for use in food animals.

v. An adverse effect on the environment is unlikely.

FDA's enforcement position on the use of these substances should be considered neither an approval nor an affirmation of their safety and effectiveness. Based on information available in the future, FDA may take a different position on their use. In addition, FDA notes that classification of substances as new animal drugs of LRP does not exempt CAAP facilities from complying with all other federal, state and local environmental requirements, including compliance with this General Order.

d. **Extra-Label Use Of An Approved New Animal Drug.** Extra-label drug use is the actual or intended use of an approved new animal drug in a manner that is not in accordance with the approved label directions. This includes, but is not limited to, use on species or for indications not listed on the label. Only a licensed veterinarian may prescribe extra-label drugs under CVM's extra-label drug use policy. CVM's extra-label use drug policy (CVM Compliance Policy Guide 7125.06) states that licensed veterinarians may consider extra-label drug use in treating food-producing animals if the health of the animals is immediately threatened and if further suffering or death would result from failure to treat the affected animals. CVM's extra-label drug use policy does not allow the use of drugs to prevent diseases (prophylactic use), improve growth rates, or enhance reproduction or fertility. Spawning hormones cannot be used under the extra-label policy. In addition, the veterinarian assumes the responsibility for drug safety and efficacy and for potential residues in the aquatic animals.

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[2] In an August 3, 2011 memorandum, *Prohibition of Copper Sulfate and Copper Based Compounds at DFG Operated Fish Hatcheries*, DFW imposed a ban of copper sulfate and copper-based compounds at all DFW hatcheries in accordance with their Hatchery and Stocking Program EIR/EIS.

V. RATIONALE FOR EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

The CWA requires point source Permittees to control the amount of conventional, non-conventional, and toxic pollutants that are discharged into the waters of the United States. The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. There are two principal bases for effluent limitations in the Code of Federal Regulations: 40 C.F.R. section 122.44(a) requires that permits include applicable technology-based limitations and standards; and 40 C.F.R. section 122.44(d) requires that permits include water quality-based effluent limitations (WQBELs) to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of the receiving water.

A. Discharge Prohibitions

1. **Discharge Prohibition III.A.** The discharge of any waste not disclosed by the Permittee or not within the reasonable contemplation of the Regional Water Board is prohibited.

   This prohibition is based on the Basin Plan and State Water Board Order No. WQO-2002-0012 regarding the petition of WDRs Order No. 01-072 for the East Bay Municipal Utility District and Bay Area Clean Water Agencies. In State Water Board Order No. WQO 2002-0012, the State Water Board found that this prohibition is acceptable in orders, but should be interpreted to apply only to constituents that are either not disclosed by the Permittee, or are not reasonably anticipated to be present in the discharge but have not been disclosed by the Permittee. It specifically does not apply to constituents in the discharge that do not have "reasonable potential" to exceed water quality objectives.

   The State Water Board has stated that the only pollutants not covered by this prohibition are those which were "*disclosed to the permitting authority and … can be reasonably contemplated*." [In re the Petition of East Bay Municipal Utilities District et al., (State Water Board, 2002) Order No. WQO 2002-0012, p. 24] In that Order, the State Water Board cited a case which held the Permittee is liable for the discharge of pollutants "*not within the reasonable contemplation of the permitting authority ….whether spills or otherwise*…" [Piney Run Preservation Assn. v. County Commissioners of Carroll County, Maryland (4th Cir. 2001) 268 F. 3d 255, 268.] Thus the State Water Board authority provides that, to be permissible, the constituent discharged 1) must have been disclosed by the Permittee and 2) can be reasonably contemplated by the Regional Water Board.

   Whether or not the Permittee reasonably contemplates the discharge of a constituent is not relevant. What matters is whether the Permittee disclosed the constituent to the Regional Water Board or whether the presence of the pollutant in the discharge can otherwise be reasonably contemplated by the Regional Water Board at the time of Order adoption.

2. **Discharge Prohibition III.B.** Creation of pollution, contamination, or nuisance, as defined by section 13050 of the Water Code, is prohibited.

   This prohibition is based on section 13050 of the Water Code.

3. **Discharge Prohibition III.C.** The discharge of waste to land that is not under the control of the Permittee is prohibited, except as authorized under section X.C.6.a. of this General Order (Solids Disposal and Handling Requirements).

   Land used for the application of wastewater must be owned by, or be under the control of, the Permittee by contract so that the Permittee maintains a means for ultimate disposal of treated wastewater.

4. **Discharge Prohibition III.D.** The discharge of waste at any point not described in the NOA or authorized by permit issued by the State Water Board or another Regional Water Board Order is prohibited.

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This prohibition is a general prohibition that allows the Permittee to discharge waste only in accordance with WDRs. It is based on sections 301 and 402 of the federal CWA and section 13263 of the Water Code.

5. **Discharge Prohibition III.E.** The discharge of any radiological, chemical, or biological warfare agent into waters of the state is prohibited under Water Code section 13375.

   This prohibition is a general prohibition that allows the Permittee to discharge waste only in accordance with WDRs. It is based on section 13375 of the Water Code.

6. **Discharge Prohibition III.F.** The discharge of waste resulting from cleaning activities is prohibited.

   This prohibition applies to the direct discharge of untreated cleaning waste to waters of the United States and is based on the Basin Plan's *Policy on the Regulation of Fish Hatcheries, Fish Rearing Facilities, and Aquaculture Operations*.

7. **Discharge Prohibition III.G.** The discharge detectable levels of chemicals used for the treatment and control of disease, other than salt (NaCl), is prohibited.

   This prohibition is based on the Basin Plan's *Policy on the Regulation of Fish Hatcheries, Fish Rearing Facilities, and Aquaculture Operations*. Based on information provided by the existing CAAP facilities in the North Coast Region, chemicals and aquaculture drugs used for the treatment and control of disease include oxytetracycline, penicillin G, florfenicol, amoxicillin trihydrate, erythromycin, Romet, formalin, PVP iodine, hydrogen peroxide, potassium permanganate, sodium chloride, acetic acid, chloramine-T, SLICE, and ivermectin. When chemicals and aquaculture drugs used for the treatment and control of disease are used, the Permittee is required to submit a chemical use report documenting the method used to determine compliance with this prohibition.

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B. Technology-Based Effluent Limitations

1. Scope and Authority

Section 301(b) of the CWA and implementing U.S. EPA permit regulations at 40 C.F.R. section 122.44 require that permits include conditions meeting applicable technology-based requirements at a minimum, and any more stringent effluent limitations necessary to meet applicable water quality standards. The discharge authorized by this General Order must meet minimum federal technology-based requirements based on Effluent Limitations Guidelines and Standards for the Concentrated Aquatic Animal Production Point Source Category in 40 C.F.R. part 451 and Best Professional Judgment (BPJ) in accordance with 40 C.F.R. section 125.3.

The CWA requires that technology-based effluent limitations be established based on several levels of controls:

- **a.** Best practicable treatment control technology (BPT) represents the average of the best existing performance by well-operated facilities within an industrial category or subcategory. BPT standards apply to toxic, conventional, and non-conventional pollutants.
- **b.** Best available technology economically achievable (BAT) represents the best existing performance of treatment technologies that are economically achievable within an industrial point source category. BAT standards apply to toxic and non-conventional pollutants.
- **c.** Best conventional pollutant control technology (BCT) represents the control from existing industrial point sources of conventional pollutants including BOD, TSS, fecal coliform, pH, and oil and grease. The BCT standard is established after considering a

two-part reasonableness test. The first test compares the relationship between the costs of attaining a reduction in effluent discharge and the resulting benefits. The second test examines the cost and level of reduction of pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources. Effluent limitations must be reasonable under both tests.

d. New source performance standards (NSPS) represent the best available demonstrated control technology standards. The intent of NSPS guidelines is to set limitations that represent state-of-the-art treatment technology for new sources.

The CWA requires U.S. EPA to develop effluent limitations, guidelines and standards (ELGs) representing application of BPT, BAT, BCT, and NSPS. Section 402(a)(1) of the CWA and 40 C.F.R. section 125.3 authorize the use of BPJ to derive technology-based effluent limitations on a case-by-case basis where ELGs are not available for certain industrial categories and/or pollutants of concern. Where BPJ is used, the Regional Water Board must consider specific factors outlined in 40 C.F.R. section 125.3.

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2. Applicable Technology-Based Effluent Limitations

a. Best Management Practices (BMP) Plan. On August 23, 2004, U.S. EPA published ELGs for the Flow-Through and Recirculating Systems Subcategory of the Concentrated Aquatic Animal Production Point Source Category at 40 C.F.R. part 451, subpart A. The ELGs became effective on September 22, 2004. The ELGs establish national technology-based effluent discharge requirements for CAAP facilities that produce 100,000 pounds or more of aquatic animals in flow-through and recirculation systems based on BPT, BCT, BAT and NSPS. In its proposed rule, published on September 12, 2002, U.S. EPA proposed to establish numeric limitations for TSS while controlling the discharge of other constituents through narrative requirements. In the final rule, however, U.S. EPA determined that, for a nationally applicable regulation, it would be more appropriate to promulgate qualitative TSS limitations in the form of solids control BMP requirements.

In the process of developing the ELG, U.S. EPA identified an extensive list of pollutants of concern in discharges from the aquaculture industry, including several metals, nutrients, solids, BOD, bacteria, drugs, and residuals of federally registered pesticides. U.S. EPA did not include specific numeric limitations in the ELG for any pollutants on this list, believing that BMPs would provide acceptable control of these pollutants. U.S. EPA did conclude during the development of the ELG that control of TSS would also effectively control concentrations of other pollutants of concern, such as BOD, metals and nutrients, because other pollutants are either bound to the solids or are incorporated into them. And, although certain bacteria are found at high levels in effluents from settling basins, U.S. EPA concluded that disinfection is not economically achievable. U.S. EPA also allowed permitting authorities to apply technology-based limits for other pollutants and WQBELs for pollutants considered in the ELGs in order to comply with applicable water quality standards.

The ELGs at 40 C.F.R. part 451, subpart A require implementation of BMPs, including solids control, materials storage, structural maintenance, recordkeeping, and training requirements, to represent the application of BPT. Consistent with the ELGs at 40 C.F.R. part 451, subpart A, Special Provision X.C.3.a of this General Order requires Permittees to maintain a BMP Plan.

b. TSS and Settleable Solids. Technology-based requirements in this General Order are based on numeric limitations developed using BPJ and retained from the individual permits for the existing CAAP facilities. The effluent limitations retained in this General Order for TSS are 8 mg/L as an average monthly effluent limitation (AMEL) and 15 mg/L as a maximum daily effluent limitation (MDEL); and for settleable solids are 0.1 ml/L as an AMEL and 0.2 ml/L as an MDEL. Section 402(o) of the CWA prohibits backsliding of effluent limitations that are based on BPJ to reflect a subsequently promulgated ELG which is less stringent. Removal of the numeric limitations for TSS and settleable solids would constitute backsliding under CWA Section 402(o). These limitations were established prior to the issuance of the ELGs and were established as a means of controlling the discharge of solids from algae, silt, fish feces and uneaten feed. Except for the NPDES permit for the Mad River Fish Hatchery, the individual NPDES permits for the existing CAAP facilities expressed effluent limitations for TSS and settleable solids in terms of a net increase limitation. The Regional Water Board finds the use of net increase TSS and settleable solids effluent limitations are an appropriate measure of performance. Results of monitoring required by the individual NPDES permits indicates that the existing CAAP facilities are capable of meeting these limitations.

Existing wastewater treatment technology (such as settling basins and vacuum cleaning) is capable of dependably removing solids (primarily fish feces and uneaten feed) from CAAP facility effluent prior to discharge. Some CAAP facilities treat their entire discharge using a full-flow settling basin, while some include additional settling basins in series. Other CAAP facilities use lower flow rates through raceways, allowing solids to accumulate and decompose by natural processes. In some cases, all of the raceway flows are transferred to one or more large settling basins for "off-line settling". Finally, some CAAP facilities place barriers in the lower portion of each raceway to create a "quiescent zone". This quiescent zone allows solids to settle at the end of each raceway, which are collected and removed by facility staff. Existing self-monitoring data show that CAAP facilities in the Region are able to reliably meet the numeric effluent limitations for TSS and settleable solids using existing wastewater treatment and control technologies, and implementation of BMPs.

c. **Flow.** This General Order does not contain a maximum daily effluent discharge flow limitation. A maximum daily effluent flow limitation will be specified in the NOA issued by the Executive Officer for each facility seeking coverage under this General Order.

C. Water Quality-Based Effluent Limitations (WQBELs)

1. Scope and Authority

CWA Section 301(b) and 40 C.F.R. section 122.44(d) require that permits include limitations more stringent than applicable federal technology-based requirements where necessary to achieve applicable water quality standards.

Section 122.44(d)(1)(i) of 40 C.F.R. requires that permits include effluent limitations for all pollutants that are or may be discharged at levels that have the reasonable potential to cause or contribute to an exceedance of a water quality standard, including numeric and narrative objectives within a standard. Where reasonable potential has been established for a pollutant, but there is no numeric criterion or objective for the pollutant, water quality-based effluent limitations (WQBELs) must be established using: (1) U.S. EPA criteria guidance under CWA section 304(a), supplemented where necessary by other relevant information; (2) an indicator parameter for the pollutant of concern; or (3) a calculated numeric water quality criterion, such as a proposed state criterion or policy interpreting the state's narrative criterion, supplemented with other relevant information, as provided in section 122.44(d)(1)(vi).

The process for determining reasonable potential and calculating WQBELs when necessary is intended to protect the designated uses of the receiving water as specified in the Basin Plan, and achieve applicable water quality objectives and criteria that are contained in other

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state plans and policies, or any applicable water quality criteria contained in the CTR and NTR.

2. Applicable Beneficial Uses and Water Quality Criteria and Objectives

a. **Beneficial Uses.** Beneficial use designations for receiving waters are presented in section IV.C.1 of this Fact Sheet.

b. **Basin Plan Water Quality Objectives.** In addition to the specific water quality objectives indicated above, the Basin Plan contains narrative objectives for color, tastes and odors, floating material, suspended material, settleable material, oil and grease, biostimulatory substances, sediment, turbidity, pH, dissolved oxygen, bacteria, temperature, toxicity, pesticides, chemical constituents, and radioactivity that apply to inland surface waters, enclosed bays, and estuaries. For waters designated for use as domestic or municipal supply (MUN), the Basin Plan establishes as applicable water quality criteria the Maximum Contaminant Levels (MCLs) established by the State Water Board, Division of Drinking Water (DDW) for the protection of public water supplies at Cal. Code Regs., tit. 22 § 64431 (Inorganic Chemicals) and § 64444 (Organic Chemicals).

c. **SIP, CTR and NTR**. Water quality criteria and objectives applicable to the receiving waters are established by the California Toxics Rule (CTR), established by the U.S. EPA at 40 C.F.R. section 131.38; and the National Toxics Rule (NTR), established by the U.S. EPA at 40 C.F.R. § 131.36. Criteria for most of the 126 priority pollutants are contained within the CTR and the NTR.

The SIP, which is described in section IV.C.3 of this Fact Sheet, includes procedures for determining the need for, and the calculation of, WQBELs and requires Permittees to submit data sufficient to do so.

At Cal. Code Regs., tit. 22, division 4, chapter 15, DDW has established MCLs for certain pollutants for the protection of drinking water. Chapter 3 of the Basin Plan establishes these MCLs as water quality objectives applicable to receiving waters with the beneficial use designation of municipal and domestic supply.

Aquatic life freshwater and saltwater criteria are identified as criterion maximum concentrations (CMC) and criterion continuous concentrations (CCC). The CTR defines the CMC as the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time without deleterious effects and the CCC as the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effects. The CMC is used to calculate an acute or 1-hour average numeric effluent limitation and the CCC is used to calculate a chronic or 4-day average numeric effluent limitation. Aquatic life freshwater criteria were used for the RPA.

Human health criteria are further identified as “water and organisms” and “organisms only.” “Water and organism” criteria are designed to address risks to human health from multiple exposure pathways. The criteria from the “water and organisms” column of CTR were used for the RPA because the Basin Plan identifies that the receiving waters have an existing or potential beneficial use designation of municipal and domestic supply.

3. Determining the Need for WQBELs

NPDES regulations at 40 C.F.R. section 122.44(d) require effluent limitations to control all pollutants which are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard.

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a. Non-Priority Pollutants

i. **Chloride.** Order Nos. 97-60 and 97-61 for the Coyote Valley Fishery Mitigation Facility and the Warm Springs Fish Hatchery, respectively, established MDELs for chloride of 250 mg/L. The Orders did not document the basis of the effluent limitations; however, the effluent limitations are consistent with the Secondary MCL for chloride of 250 mg/L established at Cal. Code Regs., tit. 22, division 4, chapter 15, § 64449.

Sodium chloride (NaCl or salt) is used as need at CAAP facilities as a fish-cleansing agent to control parasites and fish disease, and as an osmoregulatory aid to reduce stress amongst the confined fish population. Salt usage is generally restricted to one raceway at a time and water from the raceway mixes with flow from other raceways and other areas of the facility prior to discharge.

Based on effluent monitoring data collected at all existing CAAP facilities, maximum effluent chloride concentrations ranged from 2.8 mg/L at the Trinity River Salmon and Steelhead Hatchery to 23 mg/L at the Warm Springs Fish Hatchery. Based on chloride monitoring results for the existing CAAP facilities, the current BMPs employed at CAAP facilities have been adequate to ensure effluent chloride concentrations do not exceed the Secondary MCL. Therefore, the discharge of chloride from CAAP facilities does not have reasonable potential to cause or contribute to an exceedance of water quality objectives for chloride, and effluent limitations for chloride have not been included in this General Order.

ii. **pH.** The Basin Plan includes water quality objectives for specific water bodies in Table 3-1. For waters not listed in Table 3-1 and where pH objectives are not prescribed, the Basin Plan specifies that the pH shall not be depressed below 6.5 nor raised above 8.5. The discharge of hatchery wastewater has a reasonable potential to cause or contribute to an exceedance of the water quality objectives for pH. Therefore, this General Order includes effluent limitations for pH based on the respective site-specific water quality objectives established in Chapter 3 of the Basin Plan.

As shown in the following table, based on influent data collected during the term of the existing permits, the influent pH is occasionally at or above the maximum pH objective of 8.5 and, consequently, the effluent pH may exceed the objective due to the flow-through nature of the facilities. The influent water to the facilities is from the same water body as the receiving water body[3] and the facilities do not alter the influent water chemically or physically with respect to pH. Therefore, in instances where the pH of the influent exceeds 8.5, this Order specifies that the effluent pH shall not exceed the pH of the influent, but in no case shall the effluent pH exceed 9.0.

Table F-5. Summary of Influent pH Data

Facility	Influent pH		
	Maximum (s.u.)	Number of Exceedances	Number of Samples
Coyote Valley Fishery Mitigation Facility	8.84	3	84
Mad River Fish Hatchery	Data Not Available		
Trinity River Salmon and Steelhead Hatchery	8.5	0[1]	41

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[3] The Mad River Fish Hatchery draws intake water from a series of 18 wells at varying depths adjacent to the Mad River. Due to the proximity of the wells to the receiving water within the floodplain of the Mad River, there is a likely hydrologic connection between the intake water and the receiving water and the Regional Water Board considers the intake water to be from the same water body as the receiving water body.

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Facility	Influent pH		
	Maximum (s.u.)	Number of Exceedances	Number of Samples
Warm Springs Fish Hatchery	12.28	8	238

Table Notes:
1. The influent pH was equivalent to the pH objective five times.

iii. **TSS and Settleable Solids.** As described further in section IV.D of this Fact Sheet, the Mad River Fish Hatchery is subject to waste load allocations for TSS and settleable solids. The TMDL identifies the Mad River Fish Hatchery as a point source of sediment and suspended sediment. Section 3.2.2 of the TMDL specifies waste load allocations for TSS of 8 mg/L and for settleable solids of 0.1 mg/L. The waste load allocations for TSS and settleable solids were developed using limitations for these substances from the existing NPDES permit. This General Order includes effluent limitations for TSS and settleable solids consistent with the TMDL.

b. Priority Pollutants

The SIP establishes procedures to implement water quality criteria from the NTR and CTR and for priority, toxic pollutant objectives established in the Basin Plan. The implementation procedures of the SIP include methods to determine reasonable potential (for pollutants to cause or contribute to excursions above State water quality standards) and to establish numeric effluent limitations, if necessary, for those pollutants showing reasonable potential.

Section 1.3 of the SIP requires the Regional Water Board to use all available, valid, relevant, and representative receiving water and effluent data and information to conduct an RPA. Effluent and receiving water monitoring data used to conduct the RPA for the CAAP facilities included the following:

i. **Coyote Valley Fishery Mitigation Facility:** Effluent data collected between December 2011 and January 2014; effluent chromium VI data from June 27, 2013, January, 6, 2014, and May 28, 2014; and an effluent priority pollutant data collected on January 6, 2014.

ii. **Mad River Fish Hatchery:** Effluent data collected between March 2005 and December 2013 and effluent priority pollutant data collected on November 19, 2012 and March 20, 2013.

iii. **Trinity River Salmon and Steelhead Hatchery:** Effluent and receiving water data collected between January 2005 and December 2013; effluent cyanide data from November 19-20, 2012, March 19, 2013, and April, 16, 2014; and effluent priority pollutant data collected on November 19-20, 2012, and March 19, 2013.

iv. **Warm Springs Fish Hatchery:** Effluent data collected between August 2011 and January 2014; effluent bis (2-ethylhexyl) phthalate data from June 27, 2013, January 7, 2014, and May 28, 2014; and effluent priority pollutant data collected on June 27, 2013, and January 7, 2014.

Hardness: The CTR and the NTR contain water quality criteria for seven metals that vary as a function of hardness; the lower the hardness, the lower the water quality criteria. The hardness-dependent metal criteria include cadmium, copper, chromium (III), lead, nickel, silver, and zinc.

Effluent limitations for the discharge must be set to protect the beneficial uses of the receiving water for all discharge conditions. Effluent limitations must be set using a reasonable worst-case condition in order to protect beneficial uses for all discharge

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conditions. The SIP does not address how to determine hardness for application to the equations for the protection of aquatic life when using hardness dependent metals criteria. It simply states, in Section 1.2, that the criteria shall be properly adjusted for hardness using the hardness of the receiving water. The CTR requires that, for waters with a hardness of 400 mg/L (as $CaCO_3$), or less, the actual ambient hardness of the surface water must be used. It further requires that the hardness values used must be consistent with the design discharge conditions for design flows and mixing zones (See 40 C.F.R. section 131.38(c)(4)(i)). The CTR does not define whether the term "ambient", as applied in the regulations, necessarily requires the consideration of the upstream as opposed to downstream hardness conditions.

State Water Board Order No. WQ-2008-0008 (City of Davis) further interpreted the SIP by stating "*…the regional water boards have considerable discretion in the selection of hardness. Regardless of which method is used for determining hardness, the selection must be protective of water quality criteria, given the flow conditions under which a particular hardness exists….Regardless of the hardness used, the resulting limits must always be protective of water quality under all flow conditions*."

Effluent and receiving water data for hardness was not available for the existing facilities covered by this General Order, but was available for the Iron Gate Hatchery, which had a minimum effluent hardness of 51 mg/L and a minimum upstream receiving water hardness of 48 mg/L. Nevertheless, these hardness values are expected to be representative of effluent and receiving water conditions for the effluent from the CAAP facilities and receiving waters in the North Coast Region. Therefore, water quality criteria for hardness-dependent metals were calculated for this General Order using a reported minimum receiving water hardness of 48 mg/L as $CaCO_3$.

c. Reasonable Potential Determination

Reasonable potential could not be determined for all pollutants, as there are not applicable water quality criteria for all pollutants. The RPA determined that there is either no reasonable potential or there was insufficient information to conclude affirmative reasonable potential for the 126 priority pollutants.

Section 1.2 of the SIP states "*The RWQCB shall have discretion to consider if any data are inappropriate or insufficient for use in implementing this Policy. Instances where such consideration is warranted include, but are not limited to the following…questionable quality control/quality assurance practices.*" As described below, the Regional Water Board has determined that effluent monitoring data for bis (2-ethylhexyl) phthalate at the Warm Springs Fish Hatchery, chromium VI at the Coyote Valley Fishery Mitigation Facility, and cyanide at the Trinity River Salmon and Steelhead Hatchery is inappropriate or insufficient for use in determining reasonable potential to cause or contribute to exceedances of applicable water quality criteria. Section 1.3, Step 8 of the SIP states "*If data are unavailable or insufficient, as described in section 1.2, to conduct the above analysis for the pollutant…the Regional Water Board shall require additional monitoring for the pollutant in place of a water quality-based effluent limitation.*" Consistent with the SIP, this General Order requires annual effluent monitoring for these constituents at the respective CAAP facilities.

i. **Bis (2-ethylhexyl) Phthalate.** Bis (2-ethylhexyl) phthalate was detected but not quantified (DNQ) in an effluent sample collected from the Warm Springs Fish Hatchery on January 7, 2014 at an estimated concentration of 2.9 μg/L, which exceeds the CTR criterion for protection of human health for consumption of water and organisms of 1.8 μg/L. The quality assurance/quality control data submitted in the laboratory report for the January 7, 2014 sample indicates that bis (2-ethylhexyl) phthalate was also detected in the method blank, which may be

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an indication of sample contamination in the analytical process. Bis (2-ethylhexyl) phthalate is used primarily as one of several plasticizers in polyvinyl chloride (PVC) resins for fabricating flexible vinyl products. In comments provided to the Regional Water Board on July 17, 2015, DFW indicated that the January 7, 2014 detection potentially resulted from flushing of new infrastructure constructed in the round tanks, which primarily has PVC plumbing, at the time of sampling. Bis (2-ethylhexyl) phthalate was not detected in the effluent from the Warm Springs Fish Hatchery in a sample on June 27, 2013 or May 28, 2014. Due to the concerns with the January 7, 2014 sample, potential source (PVC pipes), and the limited dataset, this Order requires additional effluent monitoring for bis (2-ethylhexyl) phthalate at the Warm Springs Fish Hatchery to ensure sufficient data is available to perform an RPA during the next permit renewal per section 1.3, step 8 of the SIP. Bis (2-ethylhexyl) phthalate was not detected in the effluent samples from any of the other CAAP facilities.

ii. **Chromium VI.** Chromium VI was detected but not quantified (DNQ) in an effluent sample collected from the Coyote Valley Fishery Mitigation Facility on January 6, 2014 at an estimated concentration of 21 µg/L, which exceeds the CTR chronic criterion for protection of aquatic life of 11 µg/L. The case narrative in the laboratory report for the January 6, 2014 sample indicates that the sample was received with insufficient hold time remaining to run the analysis. The analysis was performed as soon as possible after receipt by the laboratory, but was 22 minutes past hold time. Furthermore, total chromium was analyzed in the same effluent sample and had a resulting concentration of 1.10 µg/L. Since chromium VI is a component of total chromium, the concentration of chromium VI should not be greater than the concentration for total chromium. Chromium VI was not detected in the effluent from the Coyote Valley Fishery Mitigation Facility in samples collected on June 27, 2013 or May 28, 2014. Due to the concerns with the January 6, 2014 sample and the limited dataset, this Order requires additional effluent monitoring for chromium VI at the Coyote Valley Fishery Mitigation Facility to ensure sufficient data is available to perform an RPA during the next permit renewal per section 1.3, step 8 of the SIP. Chromium VI was not detected above the CTR criterion in the effluent samples from any of the other CAAP facilities.

iii. **Cyanide.** Cyanide was detected in an effluent sample collected from the Trinity River Salmon and Steelhead Hatchery on November 19-20, 2012 at a concentration of 52 µg/L, which exceeds the CTR chronic criterion for protection of aquatic life of 5.2 µg/L. The quality assurance/quality control data submitted in the laboratory report for the November 19-20, 2012 sample included a qualifier of "MS-01" for the matrix spike and two matrix spike duplicates, which is defined as "*The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.*" Cyanide was not detected in the effluent from the Trinity River Salmon and Steelhead Hatchery in samples collected on March 19, 2013 or April 16, 2014. Due to the concerns with the November 19-20, 2012 sample and the limited dataset, this Order requires additional effluent monitoring for cyanide at the Trinity River Salmon and Steelhead Hatchery to ensure sufficient data is available to perform an RPA during the next permit renewal per section 1.3, step 8 of the SIP. Cyanide was not detected in effluent samples from any of the other CAAP facilities.

The following table summarizes the RPA for each pollutant that was reported in detectable concentrations in the effluent or the receiving water from the existing CAAP facilities. The MECs, most stringent water quality objectives/water quality criteria

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(WQO/WQCs), and background concentrations (B) used in the RPA are presented, along with the RPA results (Yes or No and which trigger) for each toxic pollutant analyzed. No other pollutants with applicable, numeric water quality criteria from the NTR, CTR, and the Basin Plan were measured above detectable concentrations during the monitoring events conducted by the existing CAAP facilities.

Table F-6. Summary of Reasonable Potential Analysis Results

CTR #	Pollutants	C or Most Stringent WQO/WQC (µg/L)	MEC or Minimum DL (µg/L)[1]	B or Minimum DL (µg/L)	RPA Results[2]
1	Antimony	6	0.324	NA[3]	No
2	Arsenic	10	1	NA	No
3	Beryllium	4	0.058	NA	No
4	Cadmium	1.4	0.006	NA	No
5b	Chromium (VI)	11	21	NA	Ud[4]
6	Copper	5.0	1.82	NA	No
7	Lead	1.2	0.168	NA	No
8	Mercury	0.050	0.0014	NA	No
9	Nickel	28	5.5	NA	No
11	Silver	1.1	0.015	NA	No
12	Thallium	1.7	0.0135	NA	No
13	Zinc	64	7.3	NA	No
14	Cyanide	5.2	52	NA	Ud[5]
35	Methyl Chloride	No Criteria	0.09	NA	Ud
39	Toluene	150	0.26	NA	No
68	Bis (2-Ethylhexyl) Phthalate	1.8	2.9	NA	Ud[6]
103	alpha-BHC	0.0039	0.00025	NA	No
	Aluminum	1,000	253	NA	No
	Barium	1,000	91	NA	No
	Chloride	250,000[7]	23,000	NA	No
	Nitrate Plus Nitrite (as N)	10,000	1,300	NA	No

Table Notes:

1. The Maximum Effluent Concentration (MEC) or maximum background concentration (B) is the actual detected concentration unless it is preceded by "<", in which case the value shown is the minimum detection level as the analytical result was reported as not detected (ND).
2. RPA Results:
   = Yes, if MEC > WQO/WQC, or B > WQO/WQC and MEC is detected;
   = No, if MEC and B are < WQO/WQC or all effluent data are undetected;
   = Undetermined (Ud).
3. NA = Not available.
4. As described further in section V.C.3.c of this Fact Sheet, effluent data for the Coyote Valley Fishery Mitigation Facility is inappropriate or insufficient. Effluent concentrations for the remaining CAAP facilities were below the applicable water quality criteria.
5. As described further in section V.C.3.c of this Fact Sheet, effluent data for the Trinity River Salmon and Steelhead Hatchery is inappropriate or insufficient. Effluent concentrations for the remaining CAAP facilities were below the applicable water quality criteria.
6. As described further in section V.C.3.c of this Fact Sheet, effluent data for the Warm Springs Fish Hatchery is inappropriate or insufficient. Effluent concentrations for the remaining CAAP facilities were below the applicable water quality criteria.
7. Represents the Secondary MCL for chloride, which was the basis for effluent limitations in the NPDES permits for the Coyote Valley Fishery Mitigation Facility and the Warm Springs Fish Hatchery. The Secondary MCL for chloride is not included in the Basin Plan.

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4. WQBEL Calculations

Final WQBELs for pH have been established based on the site-specific Basin Plan objectives and final WQBELs for TSS and settleable solids for the Mad River Fish Hatchery have been established based on the WLAs in the applicable TMDL.

5. Whole Effluent Toxicity (WET)

Effluent limitations for whole effluent, acute and chronic toxicity, protect the receiving water from the aggregate effect of a mixture of pollutants that may be present in effluent. There are two types of WET tests – acute and chronic. An acute toxicity test is conducted over a short time period and measures mortality. A chronic test is conducted over a longer period of time and may measure mortality, reproduction, and/or growth.

WET requirements are derived from the CWA and the Basin Plan. The Basin Plan establishes a narrative water quality objective for toxicity that states "*All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, or aquatic life*." Detrimental responses may include, but are not limited to, decreased growth rate, decreased reproductive success of resident or indicator species, and/or significant alterations in population, community ecology, or receiving water biota.

Due to the nature of CAAP facility operations, the effluent quality is very consistent and additions consist of feed and occasionally drugs and chemicals under controlled use. This General Order prohibits detectable amounts of aquaculture drugs and chemicals used for the treatment or control of disease and includes reporting requirements for the Permittees to demonstrate compliance with this prohibition during use. Therefore, the Regional Water Board finds that discharges from CAAP facilities do not have reasonable potential to cause or contribute to an exceedance of the narrative toxicity objective, and this General Order does not include effluent limitations or monitoring requirements for acute or chronic toxicity.

D. Final Effluent Limitation Considerations

1. Anti-Backsliding Requirements

Sections 402(o) and 303(d)(4) of the CWA and federal regulations at 40 C.F.R. section 122.44(l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require effluent limitations in a reissued permit to be as stringent as those in the previous permit, with some exceptions where limitations may be relaxed. With the exception of mass-based effluent limitations for TSS for each of the existing CAAP facilities; effluent limitations for TSS, settleable solids, and chronic toxicity for the Mad River Fish Hatchery; and chloride at the Coyote Valley Fishery Mitigation Facility and Warm Springs Fish Hatchery, all effluent limitations in this General Order are at least as stringent as the effluent limitations in the previous Order.

The individual permits for the existing CAAP facilities included mass-based effluent limitations for TSS. CWA section 402(o)(2)(B)(ii) allows a renewed, reissued, or modified permit to contain a less stringent effluent limitation for a pollutant if technical mistakes or mistaken interpretations of law were made in issuing the permit. 40 C.F.R. section 122.45(f)(1)(iii) states that mass limitations are not required for effluent limitations established under 40 C.F.R. section 125.3 (i.e., based on BPJ) if the mass of the pollutant discharged cannot be related to a measure of operation and permit conditions ensure that dilution will not be used as a substitute for treatment. There are no standards that specifically require a mass-based effluent limitation, and mass of the pollutant discharged is not specifically related to a measure of operation. In addition, mass-based effluent limitations for TSS are not necessary because this General Order includes a concentration-

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based limitation and a maximum daily flow limitation will be specified in the NOA for each facility seeking coverage. Therefore, the mass-based effluent limitations for TSS have not been retained in this Order.

Existing Order R1-2005-0036 for the Mad River Fish Hatchery included a final effluent limitation specifying that "*Not more than ten percent of critical life stage chronic toxicity bioassay determinations in any calendar year shall produce statistically significant deleterious effects to any test organism from exposure to undiluted effluent*." The Mad River Fish Hatchery conducted chronic toxicity bioassays in June 2008 (associated with treatment using potassium permanganate) and June 2012 (associated with treatment using florfenicol and potassium permanganate), which did not demonstrate toxicity to *Ceriodaphnia dubia* survival or reproduction or *Selenastrum capricornutum* growth. Furthermore, as described in section V.C.5 of this Fact Sheet, the Regional Water Board finds that discharges from CAAP facilities do not have reasonable potential to cause or contribute to an exceedance of the narrative toxicity objective due to the nature of CAAP facility operations, and this General Order's prohibition of detectable amounts of aquaculture drugs and chemicals used for the treatment or control of disease. CWA 402(o)(2)(B)(i) allows a renewed, reissued, or modified permit to contain a less stringent effluent limitation for a pollutant if information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time of permit issuance. Therefore, consistent with CWA section 402(o)(2)(B)(i), this General Order does not include a narrative chronic toxicity effluent limitation based on updated information which indicates that the discharge does not exhibit reasonable potential to cause or contribute to an exceedance of the Basin Plan objective.

Existing Orders 97-60 and 97-61 for the Coyote Valley Fishery Mitigation Facility and the Warm Springs Fish Hatchery, respectively, included a final effluent MDEL for chloride of 250 mg/L based on the Secondary MCL. Based on chloride monitoring results for the existing CAAP facilities, the current BMPs employed at CAAP facilities have been adequate to ensure effluent chloride concentrations do not exceed the Secondary MCL. Therefore, the discharge of chloride from CAAP facilities does not have reasonable potential to cause or contribute to an exceedance of water quality objectives for chloride. CWA 402(o)(2)(B)(i) allows a renewed, reissued, or modified permit to contain a less stringent effluent limitation for a pollutant if information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time of permit issuance. Therefore, consistent with CWA section 402(o)(2)(B)(i), this General Order does not include effluent limitations for chloride based on updated information which indicates that the discharges do not exhibit reasonable potential to cause or contribute to an exceedance of the Secondary MCL.

Existing Order R1-2005-0036 for the Mad River Fish Hatchery and existing Order R1-2000-18 for the Trinity River Salmon and Steelhead Hatchery included a final effluent limitation for pH specifying that the pH shall not be less than 6.5 nor greater than 8.5. Based on influent pH monitoring results for the existing CAAP facilities, the influent pH is occasionally at or above the maximum pH objective of 8.5 and, consequently, the effluent pH may exceed the objective due to the flow-through nature of the facilities. The influent water to the facilities is from the same water body as the receiving water body and the facilities do not alter the influent water chemically or physically with respect to pH. CWA 402(o)(2)(B)(i) allows a renewed, reissued, or modified permit to contain a less stringent effluent limitation for a pollutant if information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time

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of permit issuance. Therefore, consistent with CWA section 402(o)(2)(B)(i), this General Order includes less stringent effluent limitations for pH in instances when the influent pH exceeds the Basin Plan objective based on updated information which indicates that the influent pH is occasionally at or above the maximum pH objective of 8.5.

2. Antidegradation Policies

Provisions of this General Order are consistent with applicable anti-degradation policy expressed by NPDES regulations at 40 C.F.R. section 131.12 and by State Water Board Resolution No. 68-16. This General Order requires compliance with applicable federal technology-based standards, including implementation of a BMP plan to minimize the discharge of pollutants to the receiving waters, and with WQBELs where the discharge could have the reasonable potential to cause or contribute to an exceedance of water quality standards. Discharges from the CAAP facilities covered by this General Order will be required to maintain protection of the beneficial uses of the receiving water and comply with applicable provisions of the Basin Plan. Limitations and conditions of this General Order assure protection and maintenance of the existing quality of receiving waters. However, if the Regional Water Board, subsequent to review of any application, finds that the impact of a discharge will not be insignificant, then authorization for coverage under this General Order will be denied and coverage under an individual permit will be required (including preparation of an anti-degradation analysis).

This General Order does not retain the mass-based effluent limitations for TSS from the individual NPDES permits for the five existing CAAP facilities; however, this General Order retains the concentration-based effluent limitations for TSS and the NOAs will specify applicable maximum daily flow limitations. Compliance with the concentration-based effluent limitations for TSS and the flow limitations specified in the NOA will ensure that additional mass of TSS will not be discharged to the receiving water. Thus, the Regional Water Board finds that the removal of the mass-based effluent limitations for TSS will not result in an allowed increase in pollutants or any additional degradation of the receiving water. Thus, the removal of effluent limitations is consistent with the antidegradation provisions of 40 C.F.R. section 131.12 and State Water Board Resolution No. 68-16.

3. Stringency of Requirements for Individual Pollutants

This General Order contains both technology-based effluent limitations and WQBELs for individual pollutants. The technology-based effluent limitations consist of restrictions on TSS and settleable solids. Restrictions on these pollutants are discussed in sections V.B.2 and V.D of the Fact Sheet. This General Order's technology-based pollutant restrictions implement the minimum, applicable federal technology-based requirements. In addition, this General Order contains effluent limitations for pH for all CAAP facilities and TSS and settleable solids for the Mad River Fish Hatchery that are more stringent than the minimum, federal technology-based requirements but are necessary to meet water quality standards. These requirements are discussed in section V.C.3 of the Fact Sheet.

WQBELs have been scientifically derived to implement water quality objectives that protect beneficial uses. Both the beneficial uses and the water quality objectives have been approved pursuant to federal law and are the applicable federal water quality standards. To the extent that toxic pollutant WQBELs were derived from the CTR, the CTR is the applicable standard pursuant to section 131.38. The scientific procedures for calculating the individual WQBELs for priority pollutants are based on the CTR-SIP, which was approved by U.S. EPA on May 18, 2000. Most beneficial uses and water quality objectives contained in the Basin Plan were approved under State law and submitted to and approved by U.S. EPA prior to May 30, 2000. Any water quality objectives and beneficial uses submitted to U.S. EPA prior to May 30, 2000, but not approved by U.S. EPA before that date, are nonetheless "applicable water quality standards for purposes of the CWA" pursuant to section 131.21(c)(1). The

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remaining water quality objectives and beneficial uses implemented by this General Order (specifically the addition of the beneficial use of Native American Culture (CUL) and the General Objective regarding antidegradation) were approved by U.S. EPA on March 4, 2005, and are applicable water quality standards pursuant to section 131.21(c)(2). Collectively, this General Order's restrictions on individual pollutants are no more stringent than required to implement the requirements of the CWA.

E. Interim Effluent Limitations – Not Applicable

This Order does not establish interim effluent limitations or schedules for compliance with final limitations.

F. Recycling Specifications – Not Applicable

This General Order does not establish recycling specifications.

VI. RATIONALE FOR RECEIVING WATER LIMITATIONS

A. Surface Water

CWA section 303(a-c) requires states to adopt water quality standards, including criteria where they are necessary to protect beneficial uses. The Regional Water Board adopted water quality criteria as water quality objectives in the Basin Plan. The Basin Plan states that "[t]*he numerical and narrative water quality objectives define the least stringent standards that the Regional [Water] Board will apply to regional waters in order to protect the beneficial uses.*" The Basin Plan includes numeric and narrative water quality objectives for various beneficial uses and water bodies. This General Order contains Receiving Surface Water Limitations based on the Basin Plan numerical and narrative water quality objectives for biostimulatory substances, bacteria, chemical constituents, color, dissolved oxygen, floating material, oil and grease, pH, pesticides, radioactivity, sediment, settleable material, suspended material, tastes and odors, temperature, toxicity, and turbidity.

Water body-specific objectives have been published in Table 3-1 of the Basin Plan for specific conductivity, total dissolved solids, dissolved oxygen, pH, hardness, and boron. The NOI of this General Order requires applicants to identify water quality objectives from Table 3-1 applicable to the receiving water to which their facility discharges. If water quality objectives from Table 3-1 of the Basin Plan are applicable, the NOA shall specify additional receiving water limitations for the applicable constituents based on the water quality objectives.

B. Groundwater – Not Applicable

VII. RATIONALE FOR PROVISIONS

A. Standard Provisions

1. Federal Standard Provisions

Standard Provisions, which apply to all NPDES permits in accordance with 40 C.F.R. section 122.41, and additional conditions applicable to specified categories of permits in accordance with 40 C.F.R. section 122.42, are provided in Attachment D. The Permittee must comply with all standard provisions and with those additional conditions that are applicable under 40 C.F.R. section 122.42. The Regional Water Board has also included in this General Order special provisions applicable to the Permittee. The rationale for the special provisions contained in the General Order is provided in section VII.B, below.

40 C.F.R. section 122.41(a)(1) and (b) through (n) establish conditions that apply to all State-issued NPDES permits. These conditions must be incorporated into the permits either expressly or by reference. If incorporated by reference, a specific citation to the regulations must be included in the Order. 40 C.F.R. section 123.25(a)(12) allows the state to omit or modify conditions to impose more stringent requirements. In accordance with 40 C.F.R.

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section 123.25, this General Order omits federal conditions that address enforcement authority specified in 40 C.F.R. sections 122.41(j)(5) and (k)(2) because the enforcement authority under the Water Code is more stringent. In lieu of these conditions, this General Order incorporates by reference Water Code section 13387(e).

2. Regional Water Board Standard Provisions

In addition to the Federal Standard Provisions (Attachment D), the Permittee shall comply with the Regional Water Board Standard Provisions provided in Standard Provisions X.A.2.

a. Order Provision X.A.2.a identifies the State's enforcement authority under the Water Code, which is more stringent than the enforcement authority specified in the federal regulations (e.g., 40 C.F.R. sections 122.41(j)(5) and (k)(2)).

b. Order Provision X.A.2.b requires the Permittee to notify Regional Water Board staff, orally and in writing, in the event that the Permittee does not comply or will be unable to comply with any Order requirement. This provision requires the Permittee to make direct contact with a Regional Water Board staff person. This Provision implements federal requirements at 40 C.F.R. section 122.41(I)(6) and (7) for notification of noncompliance and spill reporting.

B. Special Provisions

1. Reopener Provisions

a. Standard Revisions (Special Provision X.C.1.a). Conditions that necessitate a major modification of a permit are described in 40 C.F.R. section 122.62, which include the following:

i. When standards or regulations on which the permit was based have been changed by promulgation of amended standards or regulations or by judicial decision. Therefore, if revisions of applicable water quality standards are promulgated or approved pursuant to section 303 of the CWA or amendments thereto, the Regional Water Board will revise and modify this General Order in accordance with such revised standards.

ii. When new information that was not available at the time of permit issuance would have justified different permit conditions at the time of issuance.

b. Reasonable Potential (Special Provision X.C.1.b). This provision allows the Regional Water Board to modify, or revoke and reissue, this General Order if present or future investigations demonstrate that a Permittee governed by this Permit is causing or contributing to excursions above any applicable priority pollutant criterion or objective, or adversely impacting water quality and/or the beneficial uses of receiving waters.

c. 303(d)-Listed Pollutants (Special Provision X.C.1.c). This provision allows the Regional Water Board to reopen this General Order to modify existing effluent limitations or add effluent limitations for pollutants that are the subject of any future TMDL action.

d. Water Effects Ratios (WERs) and Metal Translators (Special Provision X.C.1.d). This provision allows the Regional Water Board to reopen this General Order if future studies undertaken by a Permittee provide new information and justification for applying a water effects ratio or metal translator to a water quality objective for one or more priority pollutants.

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2. Special Studies and Additional Monitoring Requirements

a. **New Chemical and Aquaculture Drug Use Reporting (Special Provision X.C.2.a).** The Effluent Limitations Guidelines and New Source Performance Standards for the Concentrated Aquatic Animal Production Point Source Category at 40 C.F.R. part 451 include the following reporting and narrative requirements for CAAP facilities:

   i. Each facility must notify the permitting authority of any INAD or extra-label drug use where the use may lead to a discharge to waters of the United States.

   ii. Each facility must report for failure in or damage to the structure of an aquatic animal containment system, resulting in an unanticipated material discharge of pollutant to waters of the United States.

   iii. Each facility must develop and maintain a BMP Plan for solids control, material storage, structural maintenance, record keeping, and training.

   Prior to using any new chemical or aquaculture drug at a CAAP facility, a Permittee is required to notify the Regional Water Board of the proposed use. The notification must contain the toxicity testing results of the new chemical or aquaculture drug as specified in Section X.C.2.a of this General Order. These reporting and toxicity testing requirements are needed for the Regional Water Board to determine if the discharge of a new drug or chemical by the Facility has reasonable potential to cause, or contribute to an in-stream excursion above any chemical-specific water quality criteria, narrative water quality objective for chemical constituents from the Basin Plan, or narrative water quality objective for toxicity from the Basin Plan.

3. Best Management Practices and Pollution Prevention

a. **Pollutant Minimization Plan (Special Provision X.C.3.a)**. Provision X.C.3.a is included in this General Order as required by section 2.4.5 of the SIP. The Regional Water Board includes standard provisions in all NPDES permits requiring development of a Pollutant Minimization Program when there is evidence that a toxic pollutant is present in the effluent at a concentration greater than an applicable effluent limitation.

b. **Best Management Practices (BMP) Plan (Special Provision X.C.3.b).** Provision X.C.3.b is established based on requirements in Effluent Limitations Guidelines and New Source Performance Standards for the Concentrated Aquatic Animal Production Point Source Category at 40 C.F.R. part 451. CAAP facilities are required to develop and maintain a BMP Plan that addresses the following requirements: solids control, material storage, structural maintenance, record-keeping, and training. Each Permittee must make the BMP Plan available to the Regional Water Board upon request, and submit certification that the BMP Plan has been developed.

c. **Chemical Controls Verification Monitoring and Reporting Plan (Special Provision X.C.3.b).** Provision X.C.3.c is necessary to determine the effectiveness of the BMP Plan required in accordance with Special Provision X.C.3.b above as well as prohibitions established by this General Order. Monitoring is necessary to demonstrate the absence of whole effluent toxicity and verify chemical concentrations in the effluent associated with periodic disease control activities. Because the antibiotics and other disease control chemical may vary in application at each CAAP and analytical methods for detecting these chemicals may be unique, the requirement for a plan to monitor these constituents is required as a special provision of the General Order.

4. Construction, Operation, and Maintenance Specifications

a. 40 C.F.R. section 122.41(e) requires proper operation and maintenance of permitted wastewater systems and related facilities to achieve compliance with permit

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conditions. An up-to-date operation and maintenance manual, as required by Provision X.C.4.b of this General Order, is an integral part of a well-operated and maintained facility.

5. Special Provisions for Municipal Facilities (POTWs Only) – Not Applicable

6. Other Special Provisions

a. **Solids Disposal (Special Provision X.C.6.a).** Provision X.C.6.a is based on the requirements of title 27 of the California Code of Regulations and prevention of unauthorized discharges of solid wastes into waters of the United States or waters of the State. Other waste disposal specifications for drugs and chemicals are to prevent other unauthorized discharges to waters of the United States or waters of the State.

7. Compliance Schedules – Not Applicable

This Order does not establish interim effluent limitations or schedules of compliance for final numeric effluent limitations.

VIII. RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

Section 122.48 of 40 C.F.R. requires that all NPDES permits specify requirements for recording and reporting monitoring results. Water Code sections 13267 and 13383 authorize the Regional Water Board to require technical and monitoring reports. The Monitoring and Reporting Program (MRP), Attachment E, establishes monitoring and reporting requirements that implement federal and state requirements. The following provides the rationale for the monitoring and reporting requirements contained in the MRP for CAAP facilities.

A. Influent Monitoring

Influent monitoring is required for all CAAP facilities, except the Mad River Fish Hatchery, for TSS and settleable solids when discharges from a CAAP facility are occurring. Influent TSS and settleable solids concentrations will be subtracted from the effluent concentrations to calculate the net increase of these pollutants in the effluent for comparison with the applicable effluent limitations. This Order does not allow net effluent limitations for TSS and settleable solids for the Mad River Fish Hatchery; therefore, influent monitoring for TSS and settleable solids is unnecessary and is not required by this General Order.

B. Effluent Monitoring

Pursuant to the requirements of 40 C.F.R. section 122.44(i)(2) effluent monitoring is required for all constituents with effluent limitations.

Effluent monitoring requirements are necessary to determine compliance with prohibitions and/or effluent limitations established by this General Order. Effluent monitoring is necessary to demonstrate compliance with technology-based effluent limitations and WQBELs, and demonstrate whether or not the discharge poses reasonable potential for a pollutant to exceed any numeric or narrative water quality objectives.

Effluent monitoring is required for flow (daily), TSS (quarterly), settleable solids (quarterly), and pH (quarterly) to characterize the effluent and determine compliance with the applicable effluent limitations for these constituents.

Effluent monitoring for turbidity is required to assess the effectiveness of solids removal and the impact of discharges on the receiving water.

U.S. EPA published updated National Ambient Water Quality Criteria for protection of aquatic life for ammonia, which are based on pH and temperature. Effluent monitoring data for ammonia at the existing CAAP facilities is not available. Therefore, this General Order requires quarterly monitoring for ammonia in order to evaluate if discharges from CAAP facilities have reasonable

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potential to cause or contribute to an exceedance of the Basin Plan's narrative toxicity objective. In order to properly adjust the criteria for ammonia, this General Order requires quarterly monitoring for pH and temperature concurrent with ammonia sampling.

This General Order establishes annual effluent monitoring for hardness to ensure that adequate data is available to properly adjust water quality criteria for hardness-based metals.

In accordance with Section 1.3 of the SIP, periodic monitoring is required for priority pollutants for which criteria or objectives apply and for which no effluent limitations have been established. This General Order requires effluent monitoring for priority pollutants one time at least 180 days but no more than 365 days prior to expiration of this General Order.

As described further in section V.C.3.c of this Fact Sheet, the Regional Water Board has determined that effluent monitoring data for bis (2-ethylhexyl) phthalate at the Warm Springs Fish Hatchery, chromium VI at the Coyote Valley Fishery Mitigation Facility, and cyanide at the Trinity River Salmon and Steelhead Hatchery is inappropriate or insufficient for use in determine reasonable potential to cause or contribute to exceedances of applicable water quality criteria. Section 1.3, Step 8 of the SIP states "*If data are unavailable or insufficient, as described in section 1.2, to conduct the above analysis for the pollutant…the Regional Water Board shall require additional monitoring for the pollutant in place of a water quality-based effluent limitation*." Therefore, this General Order requires annual effluent monitoring for these constituents at the respective CAAP facilities.

C. Whole Effluent Toxicity Testing Requirements

As discussed in section V.C.5 of this Fact Sheet, discharges from CAAP facilities do not have reasonable potential to cause or contribute to an exceedance of the Basin Plan's narrative toxicity objective. Therefore, this General Order does not require routine acute or chronic toxicity monitoring.

D. Receiving Water Monitoring

1. Surface Water

Receiving water monitoring is required to demonstrate compliance with the receiving water limitations. This General Order requires quarterly monitoring in the upstream and downstream receiving water for dissolved oxygen, pH, temperature, and turbidity.

This General Order establishes annual upstream receiving water monitoring for hardness to ensure that adequate data is available to properly adjust water quality criteria for hardness-based metals.

In accordance with Section 1.3 of the SIP, periodic monitoring is required for priority pollutants for which criteria or objectives apply and for which no effluent limitations have been established. This General Order requires upstream receiving water monitoring for priority pollutants one time at least 180 days but no more than 365 days prior to expiration of this General Order.

The Regional Water Board staff is exploring the possibility of regional coordinated monitoring programs in various watersheds within the North Coast Region. Should a regional monitoring program (RMP) be developed for a watershed applicable to an enrollee authorized to discharge under this General Order, participation in the RMP will be required and receiving water monitoring requirements for that enrollee revised accordingly.

2. Groundwater

This General Order does not authorize discharges to groundwater. Therefore no groundwater monitoring is required.

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E. Other Monitoring Requirements

1. **Quarterly Drug and Chemical Use Report.** The ELGs for CAAP facilities require reporting on the use of drugs, disinfectants, and other chemicals in discharges authorized by NPDES permits. Consistent with the ELGs, this General Order requires quarterly reporting of drug and chemical use using the Chemical Use Report in Attachment C.

IX. PUBLIC PARTICIPATION

The California Regional Water Quality Control Board, North Coast Region (Regional Water Board) is considering the issuance of waste discharge requirements (WDRs) that will serve as a National Pollutant Discharge Elimination System (NPDES) permit for CAAP facilities. As a step in the WDR adoption process, the Regional Water Board staff has developed tentative WDRs. The Regional Water Board encourages public participation in the WDR adoption process.

A. Notification of Interested Parties

The Regional Water Board notified the potential Permittees and other interested agencies and persons of its intent to prescribe WDRs for the discharge and provided an opportunity to submit written comments and recommendations. Notification was provided through the following posting on the Regional Water Board's Internet site at: http://www.waterboards.ca.gov/northcoast/public_notices/public_hearings/npdes_permits_and_wdrs.shtml

B. Written Comments

The staff determinations are tentative. Interested persons are invited to submit written comments concerning these tentative WDRs. Comments must be submitted either in person or by mail to the Executive Office at the Regional Water Board at the address above on the cover page of this General Order.

To be fully responded to by staff and considered by the Regional Water Board, written comments must be received at the Regional Water Board offices by 5:00 p.m. on **June 26, 2015**. In response to written request from California Department of Fish and Wildlife, the public comment period was extended to July 17, 2015.

C. Public Hearing

The Regional Water Board will hold a public hearing on the tentative WDRs during its regular Board meeting on the following date and time and at the following location:

Date: **November 19, 2015**
Time: 8:30 a.m. or as announced in the Regional Water Board's agenda
Location: Regional Water Board Hearing Room, 5550 Skylane Blvd., Suite A, Santa Rosa, CA 95403

Interested persons are invited to attend. At the public hearing, the Regional Water Board will hear testimony, if any, pertinent to the discharge, WDRs, and permit. Oral testimony will be heard; however, for accuracy of the record, important testimony should be in writing.

Please be aware that dates and venues may change. Our Web address is http://www.waterboards.ca.gov/northcoast where you can access the current agenda for changes in dates and locations.

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D. Waste Discharge Requirements Petitions

Any person affected by this action of the Regional Water Board may petition the State Water Resources Control Board (State Water Board) to review the action in accordance with Water Code section 13320 and Cal. Code Regs., tit. 23, § 2050. The petition must be received by the State Water Board within 30 days of the date of this General Order. Copies of the law and regulations applicable to filing petitions will be provided upon request. In addition to filing a petition with the State Water Board, any person affected by this General Order may request the Regional Water Board to reconsider this General Order. To be timely, such request must be made within 30 days of the date of this General Order. Note that even if reconsideration by the Regional water Board is sought, filing a petition with the State Water Board within the 30-day period is necessary to preserve the petitioner's legal rights. If the Permittee chooses to request reconsideration of this General Order or file a petition with the State Water Board, the Permittee must comply with the General Order while the request for reconsideration and/or petition is being considered. The petition must be submitted within 30 days of the Regional Water Board's action to the following address:

State Water Resources Control Board
Office of Chief Counsel
P.O. Box 100, 1001 I Street
Sacramento, CA 95812-0100

For instructions on how to file a petition for review, see http://www.waterboards.ca.gov/public_notices/petitions/water_quality/wqpetition_instr.shtml

E. Information and Copying

The Report of Waste Discharge (ROWD), related documents, tentative effluent limitations and special provisions, comments received, and other information are on file and may be inspected at the address above at any time between 8:30 a.m. and 4:45 p.m., Monday through Friday. Copying of documents may be arranged through the Regional Water Board by calling (707) 576-2220.

F. Register of Interested Persons

Any person interested in being placed on the mailing list for information regarding the WDRs and NPDES permit should contact the Regional Water Board, reference this Facility, and provide a name, address, and phone number.

G. Additional Information

Requests for additional information or questions regarding this General Order should be directed to Lisa Bernard at Justin.Smith@waterboards.ca.gov or (707) 576-2082.

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ATTACHMENT G –SPECIFIC WATER QUALITY OBJECTIVES FROM BASIN PLAN TABLE 3-1

TABLE 3-1

SPECIFIC WATER QUALITY OBJECTIVES FOR NORTH COAST REGION

	Specific Conductance (micromhos) @ 77°F		Total Dissolved Solids (mg/L)		Dissolved Oxygen (mg/L)			Hydrogen Ion (pH)		Hardness (mg/L)	Boron (mg/L)	
Waterbody[1]	90% Upper Limit[3]	50% Upper Limit[2]	90% Upper Limit[3]	50% Upper Limit[2]	Min	90% Lower Limit[3]	50% Lower Limit[2]	Max	Min	50% Upper Limit[2]	90% Upper Limit[3]	50% Upper Limit[2]
Lost River HA												
Clear Lake Reservoir & Upper Lost River	300	200			5.0		8.0	9.0	7.0	60	0.5	0.1
Lower Lost River	1000	700			5.0		-	9.0	7.0	-	0.5	0.1
Other Streams	250	150			7.0		8.0	8.4	7.0	50	0.2	0.1
Tule Lake	1300	900			5.0		-	9.0	7.0	400	-	-
Lower Klamath Lake	1150	850			5.0		-	9.0	7.0	400	-	-
Groundwaters [4]	1100	500			-		-	8.5	7.0	250	0.3	0.2
Butte Valley HA												
Streams	150	100			7.0		9.0	8.5	7.0	30	0.1	0.0
Meiss Lake	2000	1300			7.0		8.0	9.0	7.5	100	0.3	0.1
Groundwaters [4]	800	400			-		-	8.5	6.5	120	0.2	0.1
Shasta Valley HA												
Shasta River	800	600			7.0		9.0	8.5	7.0	220	1.0	0.5
Other Streams	700	400			7.0		9.0	8.5	7.0	200	0.5	0.1
Lake Shastina	300	250			6.0		9.0	8.5	7.0	120	0.4	0.2
Groundwaters [4]	800	500			-		-	8.5	7.0	180	1.0	0.3
Scott River HA												
Scott River	350	250			7.0		9.0	8.5	7.0	100	0.4	0.1
Other Streams	400	275			7.0		9.0	8.5	7.0	120	0.2	0.1
Groundwaters [4]	500	250			-		-	8.0	7.0	120	0.1	0.1
Salmon River HA												
All Streams	150	125			9.0		10.0	8.5	7.0	60	0.1	0.0
Middle Klamath River HA												
Klamath River above Iron Gate Dam including Iron Gate & Copco Reservoirs	425	275			[13]		[13]	8.5	7.0	60	0.3	0.2
Klamath River below Iron Gate Dam	350	275			[13]		[13]	8.5	7.0	80	0.5	0.2
Other Streams	300	150			7.0		9.0	8.5	7.0	60	0.1	0.0
Groundwaters [4]	750	600			-		-	8.5	7.5	200	0.3	0.1
Applegate River HA												
All Streams	250	175			7.0		9.0	8.5	7.0	60	-	-
Upper Trinity River HA												
Trinity River [5]	200	175			7.0		10.0	8.5	7.0	80	0.1	0.0
Other Streams	200	150			7.0		10.0	8.5	7.0	60	0.0	0.0
Clair Engle Lake and Lewiston Reservoir	200	150			7.0		10.0	8.5	7.0	60	0.0	0.0

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TABLE 3-1 (CONTINUED)

SPECIFIC WATER QUALITY OBJECTIVES FOR NORTH COAST REGION

	Specific Conductance (micromhos) @ 77°F		Total Dissolved Solids (mg/L)		Dissolved Oxygen (mg/L)			Hydrogen Ion (pH)		Hardness (mg/L)	Boron (mg/L)	
Waterbody[1]	90% Upper Limit[3]	50% Upper Limit[2]	90% Upper Limit[3]	50% Upper Limit[2]	Min	90% Lower Limit[3]	50% Lower Limit[2]	Max	Min	50% Upper Limit[2]	90% Upper Limit[3]	50% Upper Limit[2]
Hayfork Creek												
Hayfork Creek	400	275			7.0		9.0	8.5	7.0	150	0.2	0.1
Other Streams	300	250			7.0		9.0	8.5	7.0	125	0.0	0.0
Ewing Reservoir	250	200			7.0		9.0	8.0	6.5	150	0.1	0.0
Groundwaters [4]	350	225			-		-	8.5	7.0	100	0.2	0.1
S.F. Trinity River HA												
S.F. Trinity River	275	200			7.0		10.0	8.5	7.0	100	0.2	0.0
Other Streams	250	175			7.0		9.0	8.5	7.0	100	0.0	0.0
Lower Trinity River HA												
Trinity River	275	200			8.0		10.0	8.5	7.0	100	0.2	0.0
Other Streams	250	200			9.0		10.0	8.5	7.0	100	0.1	0.0
Groundwaters [4]	200	150			-		-	8.5	7.0	75	0.1	0.1
Lower Klamath River HA												
Klamath River	300[6]	200[6]			[13]		[13]	8.5	7.0	75[6]	0.5[6]	0.2[6]
Other Streams	200[6]	125[6]			8.0		10.0	8.5	6.5	25[6]	0.1[6]	0.0[6]
Groundwaters [4]	300	225			-		-	8.5	6.5	100	0.1	0.0
Illinois River HA												
All Streams	200	125			8.0		10.0	8.5	7.0	75	0.1	0.0
Winchuck River HU												
All Streams	200[6]	125[6]			8.0		10.0	8.5	7.0	50[6]	0.0[6]	0.0[6]
Smith River HU												
Smith River-Main Forks	200	125			8.0		11.0	8.5	7.0	60	0.1	0.1
Other Streams	150[6]	125[6]			7.0		10.0	8.5	7.0	60[6]	0.1[6]	0.0[6]
Smith River Plain HSA												
Smith River	200[6]	150[6]			8.0		11.0	8.5	7.0	60[6]	0.1[6]	0.0[6]
Other Streams	150[6]	125[6]			7.0		10.0	8.5	6.5	60[6]	0.1[6]	0.0[6]
Lakes Earl & Talawa	-	-			7.0		9.0	8.5	6.5	-	-	-
Groundwaters [4]	350	100			-		-	8.5	6.5	75	1.0	0.0
Crescent City Harbor	-	-										
Redwood Creek HU												
Redwood Creek	220[6]	125[6]	115[6]	75[6]	7.0	7.5	10.0	8.5	6.5			
Mad River HU												
Mad River	300[6]	150[6]	160[6]	90[6]	7.0	7.5	10.0	8.5	6.5			
Eureka Plain HU												
Humboldt Bay	-	-	-	-	6.0	6.2	7.0	8.5	[7]			
Eel River HU												
Eel River	375[6]	225[6]	275[6]	140[6]	7.0	7.5	10.0	8.5	6.5			
Van Duzen River	375	175	200	100	7.0	7.5	10.0	8.5	6.5			

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TABLE 3-1 (CONTINUED)

SPECIFIC WATER QUALITY OBJECTIVES FOR NORTH COAST REGION

	Specific Conductance (micromhos) @ 77°F		Total Dissolved Solids (mg/L)		Dissolved Oxygen (mg/L)			Hydrogen Ion (pH)		Hardness (mg/L)	Boron (mg/L)	
Waterbody[1]	90% Upper Limit[3]	50% Upper Limit[2]	90% Upper Limit[3]	50% Upper Limit[2]	Min	90% Lower Limit[3]	50% Lower Limit[2]	Max	Min	50% Upper Limit[2]	90% Upper Limit[3]	50% Upper Limit[2]
South Fork Eel River	350	200	200	120	7.0	7.5	0.0	8.5	6.5			
Middle Fork Eel River	450	200	230	130	7.0	7.5	10.0	8.5	6.5			
Outlet Creek	400	200	230	125	7.0	7.5	10.0	8.5	6.5			
Cape Mendocino HU												
Bear River	390[6]	255[6]	240[6]	150[6]	7.0	7.5	10.0	8.5	6.5			
Mattole River	300[6]	170[6]	170[6]	105[6]	7.0	7.5	10.0	8.5	6.5			
Mendocino Coast HU												
Ten Mile River	-	-	-	-	7.0	7.5	10.0	8.5	6.5			
Noyo River	185[6]	150[6]	120[6]	105[6]	7.0	7.5	10.0	8.5	6.5			
Jug Handle Creek	-	-	-	-	7.0	7.5	10.0	8.5	6.5			
Big River	300[6]	195[6]	190[6]	130[6]	7.0	7.5	10.0	8.5	6.5			
Albion River	-	-	-	-	7.0	7.5	10.0	8.5	6.5			
Navarro River	285[6]	250[6]	170[6]	150[6]	7.0	7.5	10.0	8.5	6.5			
Garcia River	-	-	-	-	7.0	7.5	10.0	8.5	6.5			
Gualala River	-	-	-	-	7.0	7.5	10.0	8.5	6.5			
Russian River HU												
(upstream) [8]	320	250	170	150	7.0	7.5	10.0	8.5	6.5			
(downstream) [9]	375[6]	285[6]	200[6]	170[6]	7.0	7.5	10.0	8.5	6.5			
Laguna de Santa Rosa	-	-	-	-	7.0	7.5	10.0	8.5	6.5			
Bodega Bay	-	-	-	-	6.0	6.2	7.0	8.5	[7]			
Coastal Waters [10]	-	-	-	-	[11]	[11]	[11]	[12]	[12]			

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[1] Water bodies are grouped by hydrologic unit (HU), hydrologic area (HA), or hydrologic subarea (HSA).

[2] 50% upper and lower limits represent the 50 percentile values of the monthly means for a calendar year. 50% or more of the monthly means must be less than or equal to an upper limit and greater than or equal to a lower limit.

[3] 90% upper and lower limits represent the 90 percentile values for a calendar year. 90% or more of the values must be less than or equal to an upper limit and greater than or equal to a lower limit.

[4] Value may vary depending on the aquifer being sampled. This value is the result of sampling over time, and as pumped, from more than one aquifer.

[5]

Daily Average Not to Exceed	Period	River Reach
60°F	July 1 - Sept. 14	Lewiston Dam to Douglas City Bridge
56°F	Sept. 15 - Oct. 1	Lewiston Dam to Douglas City Bridge
56°F	Oct. 1 - Dec. 31	Lewiston Dam to confluence of North Fork Trinity River

[6] Does not apply to estuarine areas.

[7] pH shall not be depressed below natural background levels.

[8] Russian River (upstream) refers to the mainstem river upstream of its confluence with Laguna de Santa Rosa.

[9] Russian River (downstream) refers to the mainstem river downstream of its confluence with Laguna de Santa Rosa.

[10] The State's Ocean Plan applies to all North Coast Region coastal waters.

[11] Dissolved oxygen concentrations shall not at any time be depressed more than 10 percent from that which occurs naturally.

[12] pH shall not be changed at any time more than 0.2 units from that which occurs naturally.

[13] The Site Specific Objectives (SSOs) for dissolved oxygen (DO) have been recalculated for the mainstem Klamath River and are presented separately in Table 3-1a.

- no water body specific objective available

.

TABLE 3-1a[1]

Location[2]	Percent DO Saturation Based On Natural Receiving Water Temperatures[3]	Time Period
Stateline to the Scott River	90%	October 1 through March 31
	85%	April 1 through September 30
Scott River to Hoopa	90%	Year round
Downstream of Hoopa-California boundary to Turwar	85%	June 1 through August 31
	90%	September 1 through May 31
Upper and Middle Estuary	80%	August 1 through August 31
	85%	September 1 through October 31 and June 1 through July 31
	90%	November 1 through May 31
Lower Estuary	For the protection of estuarine habitat (EST), the dissolved oxygen content of the lower estuary shall not be depressed to levels adversely affecting beneficial uses as a result of controllable water quality factors.	

[1] States may establish site specific objectives equal to natural background (USEPA, 1986. Ambient Water Quality Criteria for Dissolved Oxygen, EPA 440/5-86-033; USEPA Memo from Tudor T. Davies, Director of Office of Science and Technology, USEPA Washington, D.C. dated November 5, 1997). For aquatic life uses, where the natural background condition for a specific parameter is documented, by definition that condition is sufficient to support the level of aquatic life expected to occur naturally at the site absent any interference by humans (Davies, 1997). These DO objectives are derived from the T1BSR run of the Klamath TMDL model and described in Tetra Tech, December 23, 2009 *Modeling Scenarios: Klamath River Model for TMDL Development.* They represent natural DO background conditions due only to non-anthropogenic sources and a natural flow regime.

[2] These objectives apply to the maximum extent allowed by law. To the extent that the State lacks jurisdiction, the Site Specific Dissolved Oxygen Objectives for the Mainstem Klamath River are extended as a recommendation to the applicable regulatory authority.

[3] Corresponding DO concentrations are calculated as daily minima, based on site-specific barometric pressure, site-specific salinity, and natural receiving water temperatures as estimated by the T1BSR run of the Klamath TMDL model and described in Tetra Tech, December 23, 2009. Modeling Scenarios: Klamath River Model for TMDL Development. The estimates of natural receiving water temperatures used in these calculations may be updated as new data or method(s) become available. After opportunity for public comment, any update or improvements to the estimate of natural receiving water temperature must be reviewed and approved by Executive Officer before being used for this purpose.

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B

RWQCB Form 200: Report of Waste Discharge

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

STATE WATER RESOURCES CONTROL BOARD
EUREKA
CALIFORNIA

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

I. FACILITY INFORMATION

A. Facility:

Name: Redwood Marine Terminal II

Address: 1 TCF Drive

City: Samoa
County: Humboldt
State: CA
Zip Code: 95564

Contact Person: Jack Crider, Executive Director
Telephone Number: (707) 443-0801

B. Facility Owner:

Name: Humboldt Bay Harbor, Recreation & Conservation District

Address: P.O. Box 1030

City: Eureka
State: CA
Zip Code: 95502

Contact Person: Jack Crider, Executive Director
Telephone Number: (707) 443-0801
Federal Tax ID:

Owner Type (Check One)
1. ☐ Individual
2. ☐ Corporation
3. ☑ Governmental Agency
4. ☐ Partnership
5. ☐ Other: ____________

C. Facility Operator (The agency or business, not the person):

Name: same as owner

Address:

City:
State:
Zip Code:

Contact Person:
Telephone Number:

Operator Type (Check One)
1. ☐ Individual
2. ☐ Corporation
3. ☑ Governmental Agency
4. ☐ Partnership
5. ☐ Other: ____________

D. Owner of the Land:

Name: same as owner

Address:

City:
State:
Zip Code:

Contact Person:
Telephone Number:

Owner Type (Check One)
1. ☐ Individual
2. ☐ Corporation
3. ☑ Governmental Agency
4. ☐ Partnership
5. ☐ Other: ____________

E. Address Where Legal Notice May Be Served:

Address: same as owner

City:
State:
Zip Code:

Contact Person:
Telephone Number:

F. Billing Address:

Address: same as owner

City:
State:
Zip Code:

Contact Person:
Telephone Number:

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CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

STATE WATER RESOURCES CONTROL BOARD
EUREKA
CALIFORNIA

II. TYPE OF DISCHARGE

Check Type of Discharge(s) Described in this Application (A or B):

☐ **A. WASTE DISCHARGE TO LAND** ☑ **B. WASTE DISCHARGE TO SURFACE WATER**

Check all that apply:

☐ Domestic/Municipal Wastewater Treatment and Disposal
☐ Cooling Water
☐ Mining
☐ Waste Pile
☐ Wastewater Reclamation
☐ Other, please describe: ____________________

☐ Animal Waste Solids
☐ Land Treatment Unit
☐ Dredge Material Disposal
☐ Surface Impoundment
☐ Industrial Process Wastewater

☑ Animal or Aquacultural Wastewater
☐ Biosolids/Residual
☐ Hazardous Waste (see instructions)
☐ Landfill (see instructions)
☐ Storm Water

III. LOCATION OF THE FACILITY

Describe the physical location of the facility.

1. Assessor's Parcel Number(s)	**2. Latitude**	**3. Longitude**
Facility: 401-112-021	**Facility:** 40°, 48', 14.8" N	**Facility:** 124°, 11', 44.5" W
Discharge Point: Ocean Outfall	**Discharge Point:** 40º, 49’, 10” N	**Discharge Point:** 124º, 13’, 32” W

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IV. REASON FOR FILING

☑ New Discharge or Facility
☐ Change in Design or Operation
☐ Change in Quantity/Type of Discharge

☐ Changes in Ownership/Operator (see instructions)
☑ Waste Discharge Requirements Update or NPDES Permit Reissuance
☐ Other: ____________________

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Name of Lead Agency: Humboldt Bay Harbor, Conservation, and Recreation District

Has a public agency determined that the proposed project is exempt from CEQA? ☐ **Yes** ☑ **No**

If Yes, state the basis for the exemption and the name of the agency supplying the exemption on the line below.

Basis for Exemption/Agency: ____________________

Has a "Notice of Determination" been filed under CEQA? ☐ **Yes** ☑ **No**

If Yes, enclose a copy of the CEQA document, Environmental Impact Report, or Negative Declaration. If no, identify the expected type of CEQA document and expected date of completion.

Expected CEQA Documents:

☐ **EIR** ☑ **Negative Declaration**

Expected CEQA Completion Date: TBD

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

VI. OTHER REQUIRED INFORMATION

Please provide a COMPLETE characterization of your discharge. A complete characterization includes, but is not limited to, design and actual flows, a list of constituents and the discharge concentration of each constituent, a list of other appropriate waste discharge characteristics, a description and schematic drawing of all treatment processes, a description of any Best Management Practices (BMPs) used, and a description of disposal methods.

Also include a site map showing the location of the facility and, if you are submitting this application for an NPDES permit, identify the surface water to which you propose to discharge. Please try to limit your maps to a scale of 1:24,000 (7.5' USGS Quadrangle) or a street map, if more appropriate.

VII. OTHER

Attach additional sheets to explain any responses which need clarification. List attachments with titles and dates below:

CEQA to be completed upon RWQCB approval of final project description

You will be notified by a representative of the RWQCB within 30 days of receipt of your application. The notice will state if your application is complete or if there is additional information you must submit to complete your Application/Report of Waste Discharge, pursuant to Division 7, Section 13260 of the California Water Code.

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VIII. CERTIFICATION

"I certify under penalty of law that this document, including all attachments and supplemental information, were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Print Name: ______ **Title:** ______

Signature: ______ **Date:** ______

FOR OFFICE USE ONLY

Date Form 200 Received:	**Letter to Discharger:**	**Fee Amount Received:**	**Check #:**

C

EPA Form 1: NPDES Permit Application, General Information

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Please print or type in the unshaded areas only.

Form Approved. OMB No. 2040-0086.

FORM
1
GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

S		T/A	C
F	1B77005OHUM		D
1	2 – 13	14	15

LABEL ITEMS	
I. EPA I.D. NUMBER	PLEASE PLACE LABEL IN THIS SPACE
III. FACILITY NAME	
V. FACILITY MAILING ADDRESS	
VI. FACILITY LOCATION	

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill-in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of **bold-faced terms**.

	Mark "X"				Mark "X"		
SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.**? (FORM 2A)	16	X 17	18	B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge** to **waters of the U.S.**? (FORM 2B)	X 19	20	X 21
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C)	22	X 23	24	D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.**? (FORM 2D)	25	X 26	27
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)	28	X 29	30	F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)	31	X 32	33
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)	34	X 35	36	H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)	37	X 38	39
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)	40	X 41	42	J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)	43	X 44	45

III. NAME OF FACILITY

C	SKIP	
1		Redwood Marine Terminal II
15	16 – 29	30 – 69

IV. FACILITY CONTACT

C	A. NAME & TITLE *(last, first, & title)*	B. PHONE *(area code & no.)*
2	Jack Crider, Executive Director, HBHRCD	(707) 443-0801
15	16 – 45	46 – 48 49 – 51 52- 55

V. FACILTY MAILING ADDRESS

C	A. STREET OR P.O. BOX
3	P.O. Box 1030
15	16 – 45

C	B. CITY OR TOWN	C. STATE	D. ZIP CODE
4	Eureka	CA	95502
15	16 – 40	41 42	47 – 51

VI. FACILITY LOCATION

C	A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER
5	1 TCF Drive
15	16 – 45

B. COUNTY NAME
Humboldt
46 – 70

C	C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE *(if known)*
6	Samoa	CA	95564	023
15	16 – 40	41 42	47 – 51	52 -54

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CONTINUED FROM THE FRONT

VII. SIC CODES *(4-digit, in order of priority)*

A. FIRST		B. SECOND	
C 7 0273	*(specify)* ANIMAL AQUACULTURE	C 7	*(specify)*
C. THIRD		D. FOURTH	
C 7	*(specify)*	C 7	*(specify)*

VIII. OPERATOR INFORMATION

A. NAME

C 8 Humboldt Bay Harbor, Recreation, and Conservation District

B. Is the name listed in Item VIII-A also the owner? ☑ YES ☐ NO

C. STATUS OF OPERATOR *(Enter the appropriate letter into the answer box: if "Other," specify.)*

F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC *(other than federal or state)*
O = OTHER *(specify)*

M *(specify)*

D. PHONE *(area code & no.)*

C A (707) 443-0801

E. STREET OR P.O. BOX

P.O. Box 1030

F. CITY OR TOWN	G. STATE	H. ZIP CODE
C B Eureka	CA	95502

IX. INDIAN LAND

Is the facility located on Indian lands?
☐ YES ☑ NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES *(Discharges to Surface Water)*	D. PSD *(Air Emissions from Proposed Sources)*
C 9 T N I CA0005894	C 9 T P I
B. UIC *(Underground Injection of Fluids)*	E. OTHER *(specify)*
C 9 T U I	C 9 T I *(specify)*
C. RCRA *(Hazardous Wastes)*	E. OTHER *(specify)*
C 9 T R I	C 9 T I *(specify)*

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers, and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS *(provide a brief description)*

The Humboldt Bay Harbor and Recreation district oversees and promotes many port development projects and programs including dredging, retention and improvement of commercial fishing facilities, improvement of transportation and maritime facilities, pilotage licensing, Oil Spill Co-op coordination, erosion control, shoreline protection projects, port marketing, mariculture, aquaculture, and permitting for development.

XIII. CERTIFICATION *(see instructions)*

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE *(type or print)*	B. SIGNATURE	C. DATE SIGNED

COMMENTS FOR OFFICIAL USE ONLY

C C

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D

EPA Form 2B: NPDES Permit Application, Concentrated Animal Feeding Operations, and Aquatic Animal Production Facilities

DRAFT

Form Approved
OMB No. 2040-0250

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*
1B77005OHUM

FORM
2B
NPDES

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
APPLICATIONS FOR PERMIT TO DISCHARGE WASTEWATER
CONCENTRATED ANIMAL FEEDING OPERATIONS AND AQUATIC ANIMAL PRODUCTION FACILITIES

I. GENERAL INFORMATION

Applying for: Individual Permit ☐ Coverage Under General Permit ☒

A. TYPE OF BUSINESS	B. CONTACT INFORMATION	C. FACILITY OPERATION STATUS
☐ 1. Concentrated Animal Feeding Operation (complete items B, C, D, and section II) ☒ 2. Concentrated Aquatic Animal Production Facility (complete items B, C, and section III)	Owner/or Operator Name: Humboldt Bay Harbor, Recreation, and Conservation District Telephone: (707) 443-0801 Address: P.O. Box 1030 Facsimile: (707) 443-0800 City: Eureka State: CA Zip Code: 95502	☐ 1. Existing Facility ☒ 2. Proposed Facility

D. FACILITY INFORMATION

Name: Samoa Pulp Mill
Telephone: (707) 443-0801
Address: 1 TCF Drive
Facsimile: (707) 443-0800
City: Samoa
State: CA
Zip Code: 95564
County: Humboldt
Latitude: 40°, 48', 14.8" N
Longitude: 124°, 11', 44.5" W

If contract operation: Name of Integrator:____________________
Address of Integrator: ____________________

II. CONCENTRATED ANIMAL FEEDING OPERATION CHARACTERISTICS

A. TYPE AND NUMBER OF ANIMALS

1. TYPE	2. ANIMALS	
	NO. IN OPEN CONFINEMENT	NO. HOUSED UNDER ROOF
☐ Mature Dairy Cows		
☐ Dairy Heifers		
☐ Veal Calves		
☐ Cattle (not dairy or veal calves)		
☐ Swine (55 lbs. or over)		
☐ Swine (under 55 lbs.)		
☐ Horses		
☐ Sheep or Lambs		
☐ Turkeys		
☐ Chickens (Broilers)		
☐ Chickens (Layers)		
☐ Ducks		
☐ Other: Specify __________		
3. TOTAL ANIMALS		

B. MANURE, LITTER, AND/OR WASTEWATER PRODUCTION AND USE

1. How much manure, litter, and wastewater is generated annually by the facility? ________tons ________gallons
2. If land applied how many acres of land under the control of the applicant are available for applying the CAFOs manure/litter/wastewater? ____________________acres
3. How many tons of manure or litter, or gallons of wastewater produced by the CAFO will be transferred annually to other persons? ________tons ________gallons

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C. ☐ TOPOGRAPHIC MAP

D. TYPE OF CONTAINMENT, STORAGE AND CAPACITY

1. Type of Containment	Total Capacity (in gallons)
☐ Lagoon	
☐ Holding Pond	
☐ Evaporation Pond	
☐ Other: Specify ___________________	

2. Report the total number of acres contributing drainage: __________________ acres

3. Type of Storage	Total Number of Days	Total Capacity (gallons/tons)
☐ Anaerobic Lagoon		
☐ Storage Lagoon		
☐ Evaporation Pond		
☐ Aboveground Storage Tanks		
☐ Belowground Storage Tanks		
☐ Roofed Storage Shed		
☐ Concrete Pad		
☐ Impervious Soil Pad		
☐ Other: Specify ___________________		

E. NUTRIENT MANAGEMENT PLAN

Note: Effective February 27, 2009, a permit application is not complete until a nutrient management plan is submitted to the Permitting Authority.

1. Please indicate whether a nutrient management plan has been included with this permit application. ☐ Yes ☐ No

2. If no, please explain:

3. Is a nutrient management plan being implemented for the facility? ☐ Yes ☐ No

4. The date of the last review or revision of the nutrient management plan. Date: _________________

5. If not land applying, describe alternative use(s) of manure, litter, and/or wastewater:

F. LAND APPLICATION BEST MANAGEMENT PRACTICES

Please check any of the following best management practices that are being implemented at the facility to control runoff and protect water quality:

☐ Buffers ☐ Setbacks ☐ Conservation tillage ☐ Constructed wetlands ☐ Infiltration field ☐ Grass filter ☐ Terrace

DRAFT

Form Approved
OMB No. 2040-0250

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III. CONCENTRATED AQUATIC ANIMAL PRODUCTION FACILITY CHARACTERISTICS

A. For each outfall give the maximum daily flow, maximum 30-day flow, and the long-term average flow.

1. Outfall No.	2. Flow (*gallons per day*)		
	a. Maximum. Daily	b. Maximum 30 Day	c. Long Term Average
001	5,000,000.0	5,000,000.0	5,000,000.0
	[redacted]		

B. Indicate the total number of ponds, raceways, and similar structures in your facility.

1. Ponds	2. Raceways	3. Other
0	0	12

C. Provide the name of the receiving water and the source of water used by your facility.

1. Receiving Water	2. Water Source
Pacific Ocean	Groundwater Mad River Humboldt Bay Pacific Ocean

D. List the species of fish or aquatic animals held and fed at your facility. For each species, give the total weight produced by your facility per year in pounds of harvestable weight, and also give the maximum weight present at any one time.

1. Cold Water Species			2. Warm Water Species		
a. Species	b. Harvestable Weight *(pounds)*		a. Species	b. Harvestable Weight *(pounds)*	
	(1) Total Yearly	(2) Maximum		(1) Total Yearly	(2) Maximum
Steelhead Trout (Onchorhynchus mykiss)	99,208	30,000			

E. Report the total pounds of food during the calendar month of maximum feeding.	1. Month	2. Pounds of Food
	All	20,000

IV. CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. Name and Official Title (*print or type*)

B. Telephone (_______) ____________________

C. Signature

D. Date Signed

E

Notice of Intent to Comply with the Terms of Order No. R1-2015-0009

DRAFT

ATTACHMENT B – NOTICE OF INTENT

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
NORTH COAST REGION

NOTICE OF INTENT

TO COMPLY WITH THE TERMS OF
ORDER NO. R1-2015-0009
GENERAL NPDES NO. CAG131015

WASTE DISCHARGE REQUIREMENTS
FOR
COLD WATER CONCENTRATED AQUATIC ANIMAL PRODUCTION FACILITY DISCHARGES TO SURFACE WATERS

DRAFT

I. OWNER

Name: Humboldt Bay Harbor, Recreation, and Conservation District		
Mailing Address: P.O. Box 1030		
City: Eureka	State: California	ZIP: 95502
Contact Person: Jack Crider		
Phone: (707) 834-1108	Fax: (707) 443-0800	E-mail: jcrider@humboldtbay.org
Signature:		Date:

II. OPERATOR (*if different from owner*)

Name: same as owner		
Mailing Address:		
City:	State:	ZIP:
Contact Person:		
Phone:	Fax:	E-mail:
Signature:		Date:

III. PROPERTY OWNER

Name: same as owner		
Mailing Address:		
City:	State:	ZIP:
Contact Person:		
Phone:	Fax:	E-mail:
Signature:		Date:

IV. BILLING ADDRESS

Name: same as owner

Mailing Address:

City:	State:	ZIP:

Contact Person:

Phone:	Fax:	E-mail:

V. FACILITY INFORMATION

Name: Redwood Marine Terminal II

Location Address: 1 TCF Drive

City: Samoa	State: California	ZIP: 95564

County: Humboldt

Mailing Address: same as owner

City:	State:	ZIP:

Contact Person:

Phone:	Fax:	E-mail:

Active Orders or Permits adopted by the Regional Water Board, including effective dates:

None.

☒ *Attach a map at least 1:24000 (1" = 2000') showing the location of the discharge (e.g., USGS 7.5" topographic map). The map should show the facility location, discharge point(s), and surface waters.*

VI. OPERATIONS AND PRODUCTION INFORMATION

Is the production system best described as a *flow-through*, a *recirculating*, or a *pond system*?

Flow-through or recirculating

Number and type (e.g., concrete raceways, earthen ponds, etc.) of rearing units:

Dependent on equipment purchased by leasing aquaculture company. Example: 4, 40-foot diameter grow-out tanks and 8, 20-foot diameter hatchery tanks.

Total number of rearing units:

Dependent on equipment purchased by leasing aquaculture company. Example:12

Number and type of treatment units (full-flow settling basins, off-line settling basins, quiescent zones, etc.):

Dependent on equipment purchased by leasing aquaculture company. Example: 6

Does the facility operate year-round? If not, project the number of operating days on a monthly basis throughout the calendar year.

Yes.

☒ *Attach a flow diagram of the production operations, wastewater collection and treatment, and location of monitoring locations.*

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In the table below, list the species grown or held at your facility and estimate the annual production of each in gross harvestable weight (if fish are released rather than harvested, production is the estimated weight at the time of release) for the 5-year term of the permit, based on historical operations, planned changes, and/or design capacity.

Species	**Gross Harvestable Weight (lbs)**				
	Year One	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Example: Onchorhynchus mykiss (steelhead)	0	99,208	99,208	99,208	99,208

VII. WATER SOURCES

For each water source, indicate the minimum and maximum flow and the period in which that source contributes flow.

Source	**Minimum Flow (MGD)**	**Maximum Flow (MGD)**	**Period**
Mad River	TBD	40	year-round
Humboldt Bay	TBD	40	year-round

Does the facility alter the intake water chemically or physically? ☐Yes ☐No

If yes, describe how the Facility alters the intake water:

Alterations to intake water will be dependent on the installed system and is unknown until the facility is leased to an aquaculture company.

VIII. WASTEWATER CHARACTERIZATION

For each discharge point to surface waters, describe the facility process from which water is discharged through each discharge point.

Discharge Point	**Description of source, frequency, duration, and volume of discharge**
001	Concentrated Aquatic Animal Production Wastewater, continuous discharge, up to 40 MGD

Discharge Point	**Latitude**			**Longitude**		
	Degrees	**Minutes**	**Seconds**	**Degrees**	**Minutes**	**Seconds**
001	40	49	10	124	13	32

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☐ For each discharge point to surface waters, attach the results of effluent monitoring for the priority pollutants identified by the California Toxics Rule at 40 C.F.R. section 131.38. The Permittee is not required to sample and analyze for asbestos. Effluent hardness shall be monitored concurrently with the priority pollutant sample. Analytical methods must achieve the lowest minimum level (ML) specified in Attachment 4 of the SIP; and in accordance with Section 2.4 of the SIP, the Permittee shall report the ML and MDL for each sample result.

☐ For chemical or drug applied in solution for immersive treatment attach chronic toxicity test information in accordance with methods specified in the U.S. EPA *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms* (EPA-821-R-02-014) using *Ceriodaphnia dubia* and apply the Test of Significant Toxicity (TST) described in *National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document* (EPA 833-R10-003, 2010). The submission may include previous, valid chronic toxicity test results.

IX. RECEIVING WATER CHARACTERIZATION

Receiving Water Name: Pacific Ocean

Hydrologic Unit: Eureka Plain Hydrologic Unit 110

Is the receiving water listed as impaired pursuant to Section 303(d) of the Clean Water Act? ☐Yes ☒No

If yes, for what pollutants?

Identify the applicable water quality objectives established by Table 3-1 of the Basin Plan, as listed in Attachment G of this General Order.

Constituent	**Objectives**			
	Minimum	**Maximum**	**90% Upper Limit**	**50% Upper Limit**
Specific Conductance (µmhos/cm)	NA	NA	NA	NA
Total Dissolved Solids (mg/L)	NA	NA	NA	NA
Dissolved Oxygen (mg/L)	90% of normal	NA	NA	NA
pH (pH units)	within 0.2 s.u. of normal	within 0.2 s.u. of normal	NA	NA
Hardness (mg/L)	NA	NA	NA	NA
Boron (mg/L)	NA	NA	NA	NA

X. FEED USE

Describe the facility's use of feed. This may be a range expected over the next 5 years.

Type of Feed	**Maximum Monthly (lbs)**	**Month of Maximum Use**	**Annual Average (lbs)**
TBD	20,000	TBD	TBD

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XI. AQUACULTURE DRUGS AND CHEMICALS

List all projected use of chemicals and therapeutic drugs, including cleaners and disinfectants, feed additives or other ingested drugs, immersion or injected treatments. (Use an attachment if necessary.)

Drug or Chemical	Maximum Daily Amount Used	Method of Application	Location of Application
TBD	TBD	TBD	TBD

XII. FEE REQUIREMENTS

☒ *Provide the applicable fees. Information concerning the applicable fees can be found at www.waterboards.ca.gov/resources/fees/. Checks must be made payable to the State Water Resources Control Board.*

XIII. CERTIFICATION AND SIGNATURE

"I hereby certify under penalty of perjury that the information provided in this application and in any attachments is true and accurate to the best of my knowledge. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. By signing this NOI, I agree to comply with the provisions of the General Order. The Regional Water Board will be immediately notified of any violation of the General Order."

Printed Name of Person Signing

Date

Signature

Title

DRAFT

F

CAAP Facility Permitting Applicability Matrix

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APPLICABILITY MATRIX

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System Type	Species Type (Water)	Discharge > than 30 Days Per Year?	Annual Production of Aquatic Animals	Maximum Feeding is > than 5,000 lb (2,272 kg)?	NPDES Applies?[1]	NPDES / ELGs Applies?
Flow-through or Recirculating	Cold	Yes	≥ 100,000 lb	N/A	**X**	**X**
			≥ 20,000 lb (9,090 kg)	Yes	**X**	
				No		
			< 20,000 lb (9,090 kg)			
		No				
	Warm	Yes	≥ 100,000 lb	N/A	**X**	**X**
			≥ 100,000 lb (45,454 kg)	Yes	**X**	**X**
				No		
			< 100,000 lb (45,454 kg)			
		No				
Net Pens	Cold	Yes	≥ 100,000 lb	N/A	**X**	**X**
			≥ 20,000 lb (9,090 kg)	Yes	**X**	
				No		
			< 20,000 lb (9,090 kg)			
		No				
	Warm	Yes	≥ 100,000 lb	N/A	**X**	**X**
			≥ 100,000 lb (45,454 kg)	Yes	**X**	**X**
				No		
			< 100,000 lb (45,454 kg)			
		No				
Ponds	Cold	Yes	≥ 20,000 lb (9,090 kg)	Yes	**X**	
				No		
			< 20,000 lb (9,090 kg)			
		No				
	Warm	Yes	≥ 20,000 lb (9,090 kg)	Yes	**X**	
				No		
			< 20,000 lb (9,090 kg)			
		No				
Alligator ponds, molluscan shellfish, lobster cages and pounds, crawfish, indirect dischargers, or Alaskan flow-through[2]					See footnote[2]	

[1] The Director may designate a facility as a CAAP facility on a case-by-case basis, even if the facility does not meet the discharge, annual production, and feed requirements of the NPDES regulations.

[2] These types of systems are exempt from the CAAP ELGs. They may be regulated by the NPDES regulations if they meet the discharge, annual production, and feed requirements of the NPDES regulations, or if the Director designates them (on a case-by-case basis) as CAAP facilities or other types of facilities requiring an NPDES permit.

G

Infrastructure Needs and Reuse on the Samoa Peninsula: Redwood Marine Terminal II

DRAFT

Infrastructure Needs and Reuse on the Samoa Peninsula

Redwood Marine Terminal II

DRAFT

Prepared for:

County of Humboldt and
Humboldt Bay Harbor, Recreation and Conservation District

Project Funding Provided by:

The HUD Community Development Block Grant No. 14-CDBG-9890

Prepared by:

SHN
Engineers & Geologists

ch2m

HEMPHILL
water
engineering

February 2016

015147

SHN CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash • Eureka, CA 95501-2138 • 707-441-8855 • FAX: 707-441-8877 •shninfo@shn-engr.com

Reference: 015147

February 25, 2016

Ms. Paula Mushrush
Humboldt County Community Development
520 E St.
Eureka, CA 95501

Subject: **Infrastructure Needs and Reuse on the Samoa Peninsula, Redwood Marine Terminal II**

Dear Ms. Mushrush:

Attached is the reuse evaluation of water and wastewater infrastructure at the Redwood Marine Terminal II, in Samoa, California. Water and wastewater infrastructure on the peninsula is a vital part of future improvements that will provide housing and economic growth to the nearby communities. This evaluation considered several onsite and offsite alternatives that could potentially be used with the existing infrastructure at RMT II. In addition, we evaluated improvements that may be required for the potential alternatives examined and associated planning-level costs associated with those improvements.

This document is intended to be used a guide for Humboldt County and the Humboldt Bay Harbor, Recreation and Conservation District on the potential future uses identified in this report.

DRAFT

Sincerely,

SHN Engineers & Geologists

Mike Foget, PE
Principal Engineer
707-441-8855

MKF/BGH:lms

Enclosures: Report

Reference: 015147

Infrastructure Needs and Reuse on the Samoa Peninsula

Redwood Marine Terminal II

Prepared for:

County of Humboldt and Humboldt Bay Harbor, Recreation and Conservation District
Eureka, California

Project Funding Provided by:

The HUD Community Development Block Grant No. 14-CDBG-9890

DRAFT

Exp. 12/31/17

Prepared by:

SHN
Engineers & Geologists
812 W. Wabash Ave.
Eureka, CA 95501-2138
707-441-8855

February 2016

QA/QC:MKF___

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Table of Contents, Continued

Appendices

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List of Illustrations

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Abbreviations and Acronyms

CY	cubic yards
ft	foot
gpd	gallons per day
gpm	gallons per minute
hp	horsepower
kg	kilogram
kva	kilovolt ampere
lbs/day	pounds per day
LF	linear feet
MG	million gallon
mg/L	milligrams per liter
MGD	million gallons per day
ml/L	milliliter per liter
NTU	nephelometric turbidity units
psu	practical salinity units
SF	square foot
SY	square yard
ug/L	microgram per liter

AAF	average annual flow
ACOE	U.S. Army Corps of Engineers
BMPs	best management practices
BOD	biochemical oxygen demand
BOD$_5$	five-day biochemical oxygen demand
CCC	California Coastal Commission
CDFW	California Department of Fish & Wildlife
CDP	coastal development permit
CDWR	California Department of Water Resources
CEQA	California Environmental Quality Act
City	City of Eureka
County	County of Humboldt
CSLC	California State Lands Commission
DW	dissolved waste
EA	each
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
GHG	greenhouse gas
HBHRCD	Humboldt Bay Harbor, Recreation and Conservation District
HDD	horizontal directional drilling
HDPE	high density polyethylene
HWE	Hemphill Water Engineering
LS	lump sum
LSA	lake and streambed alteration
MH-#	manhole-number
MMWWF$_5$	maximum monthly average wet weather flow (with a 5-year recurrence level)
N	nitrogen
NA	not available
NAVD88	North American Vertical Datum, 1988
NH$_4$	ammonia
NMFS	National Marine Fisheries Service
NOAA	National Oceanic & Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NR	no reference
P	phosphorus
PDAF$_5$	peak daily average flow (for a 5-year, 24-hour storm)
PIF$_5$	peak instantaneous flow (attained during 5-year 24-hour storm)
RMT II	Redwood Marine Terminal II
RWQCB	North Coast Regional Water Quality Control Board
SHN	SHN Engineers & Geologists
SLR	sea level rise
SW	solid waste
SWRCB	State Water Resources Control Board
TSS	total suspended solids
TW	total waste
USFWS	United States Fish and Wildlife Service
WDR	Waste Discharge Requirement
WQS	water quality standard
WWTF	wastewater treatment facility

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1.0 Introduction

This planning- and feasibility-level report analyzes potential reuse of existing water and wastewater infrastructure located at the Redwood Marine Terminal II (RMT II) site (Figure 1). Reuse of the existing infrastructure at RMT II can benefit communities on the Samoa Peninsula and Humboldt Bay through economic development (aquaculture and a cost-effective method for processing dredge spoils), and environmental health (disposal of treated effluent through the ocean outfall limits impacts to groundwater from existing on site disposal activities).

RMT II is the site of the Former Louisiana Pacific Pulp Mill located at 1 TCF Drive, Samoa, California. The site is a 72-acre parcel (Assessor's parcel number 401-112-021) acquired by the Humboldt Bay Harbor, Recreation and Conservation District (HBHRCD) in 2013. This report was prepared by SHN Engineers & Geologists for the HBHRCD and the County of Humboldt (County). Additional support was provided by CH2M and Hemphill Water Engineering (HWE) to conduct engineering analyses for proposed upgrades. Individual engineering reports are included as appendices.

This report evaluates several key assets at the RMT II site for reuse or repurposing:

- An industrial water filtration system with a 30-million gallon per day (MGD) capacity, including two 1.5-million gallon (MG) clarifier ponds, fourteen 17,000-gallon water filters, four 150-horsepower (hp) pumps, a MicroFloc water filter system, and a 1,000-kilovolt amperes (kva) electrical substation
- An ocean outfall that is 1.5 miles in length, with a 48-inch diameter steel pipe and anchoring system with a 32-inch diameter high density polyethylene (HDPE) sleeve with an 800-foot long diffuser system at the ocean floor
- A large domestic wastewater treatment system that includes a collection system, septic tank, and leachfield

This study also evaluates several possible future uses and presents planning-level cost estimates for these reuse options:

- Use of the existing water treatment facility and ocean outfall pipe for treatment and discharge of water used for aquaculture operations
- Use of the existing ocean outfall pipe for discharge of wastewater collected from nearby areas, including the Samoa Peninsula and possibly the City of Eureka
- Use of the existing MicroFloc industrial water treatment facility for the dewatering and discharge of dredge slurry from a projected 30,000 to 50,000 cubic yards of dredge materials generated annually from HBHRCD dredging operations and piped to the site from the bay channel.

Challenges for reuse of the existing infrastructure include potential impacts from sea level rise.

Based on available models for the rate and magnitude of projected global sea level rise (SLR), and inundation models for the Samoa Peninsula, it appears that the former pulp mill site is not subject to impacts related to potential rise in sea level. This conclusion is based on review of the California Coastal Commission's sea level rise policy guidance manual and Humboldt Bay Sea Level Rise Adaptation Planning Project's final Humboldt Bay sea level rise modeling inundation mapping report. (Northern Hydrology, 2015). The Coastal Commission's guidance document includes a

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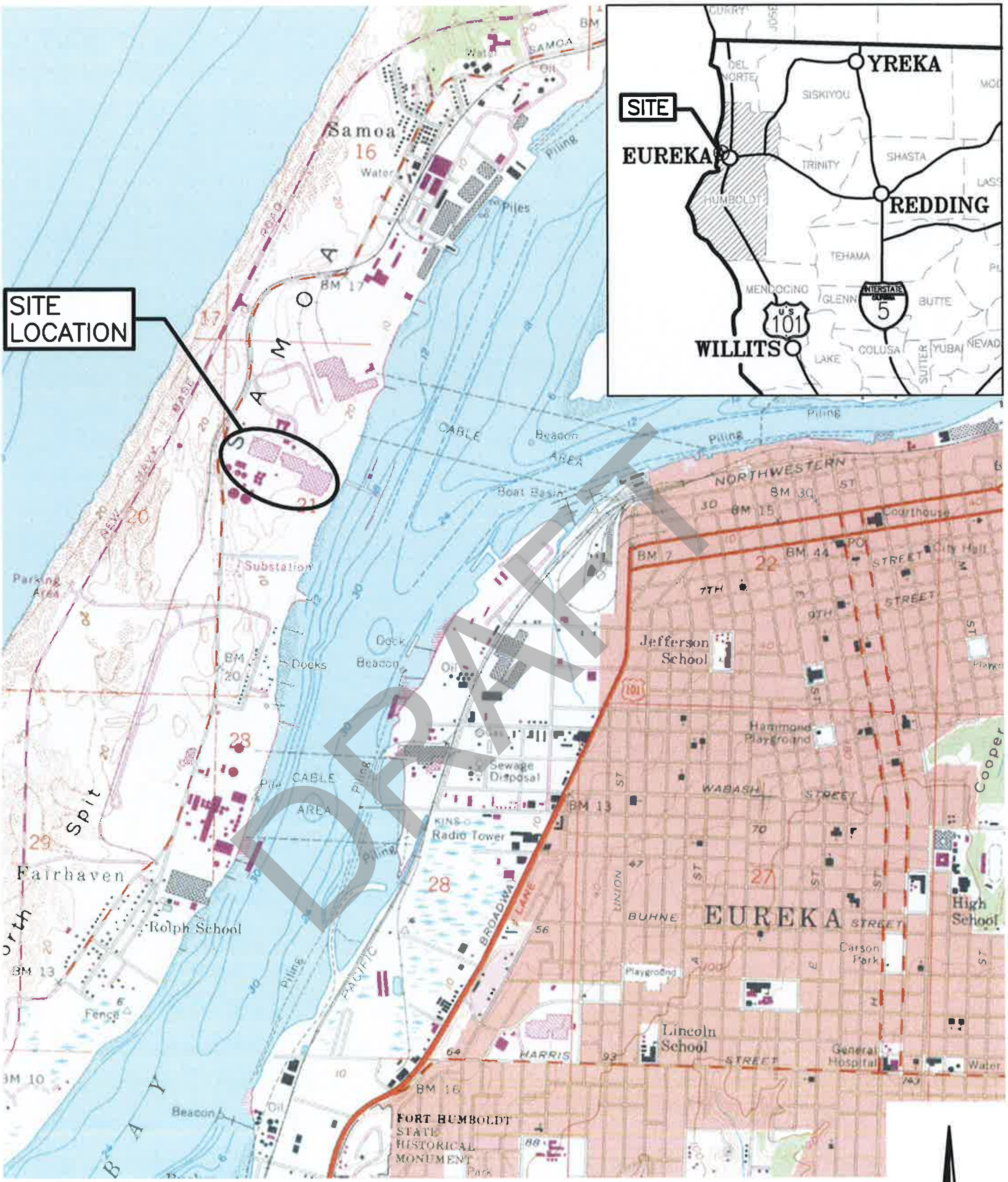

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SOURCE: EUREKA USGS 7.5 MINUTE QUADRANGLE

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1"=2000'±

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SHN
Consulting Engineers
& Geologists, Inc.

The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Site Location Map

SHN 015147

January 2016

015147-SITE-LCTN

Figure 1

table that outlines the projected magnitude of SLR for the region. For areas north of Cape Mendocino (including the subject site), the projected SLR ranges from 4 inches to as much as 56 inches. Because the site is at an elevation of between 23 and 25 feet, it would appear that even the largest projected amount of SLR along the north coast would not result in inundation at the former pulp mill, even under extreme situations (during a king tide coincident with a storm surge, for example). This interpretation is supported by mapping within the final Humboldt Bay sea level rise modeling inundation mapping report, which includes an image (Figure 6.4) that shows areas around Humboldt Bay vulnerable to inundation from a 2-meter SLR scenario (which is a greater rise in sea level than endorsed by the California Coastal Commission); the former pulp mill site is shown outside the areas vulnerable to SLR. Due to the extensive SLR modeling completed to date for Humboldt Bay, it does not appear that additional studies would be required to verify the absence of SLR-related impacts at the site.

2.0 Existing Infrastructure

Existing infrastructure at the site includes a septic tank and leachfield designed to treat flows from the RMT II site's sanitary sewer system, a MicroFloc industrial water treatment system, and manhole-5 (MH-5) which discharges into the 1.5 mile long ocean outfall with diffuser system (Figure 2).

Currently, DG Fairhaven Power, located in Fairhaven, California, discharges approximately 170,000 gallons per day (gpd) of process water, following treatment, through the RMT II ocean outfall. Discharges from DG Fairhaven Power are regulated by a National Pollutant Discharge Elimination System (NPDES) permit under North Coast Regional Water Quality Control Board (RWQCB) Order No. R1-2012-0027.

2.1 Septic Tank and Leachfield

The sanitary sewer system collects wastewater from facility restrooms and sinks in 6- to 10-inch vitrified clay pipe, and conveys it to a 10,000-gallon septic tank. The septic tank size has been calculated as 16,000 gallons. The cause of the discrepancy is unknown. Prior to 1988, the wastewater from the septic tank was discharged through the site's ocean outfall. The design drawing for a proposed leachfield (dated April 1988) is included in Appendix A, and indicates a dual leachfield system wherein discharge from the septic tank would be split and then distributed to 34, 4-inch diameter, 90-foot long perforated leachlines. The leachlines would be spaced 10 feet apart by way of two separate distribution boxes. The footprint of the leachfield was to be approximately 170 by 180 feet. It is believed that the leachfield was constructed shortly after the date of the design drawings (Figure 2). Measured daily flow of wastewater to the septic tank was 14,700 gpd (Integral, 2014). The existing leachfield is designed to handle effluent flows up to 17,000 gpd. In 2014, the leachfield was split so that half of the leachfield takes mariculture waste (up to 8,500 gpd) and the remainder is dedicated to disposal of domestic waste. Existing aquaculture effluent flows are approximately 2,400 gpd.

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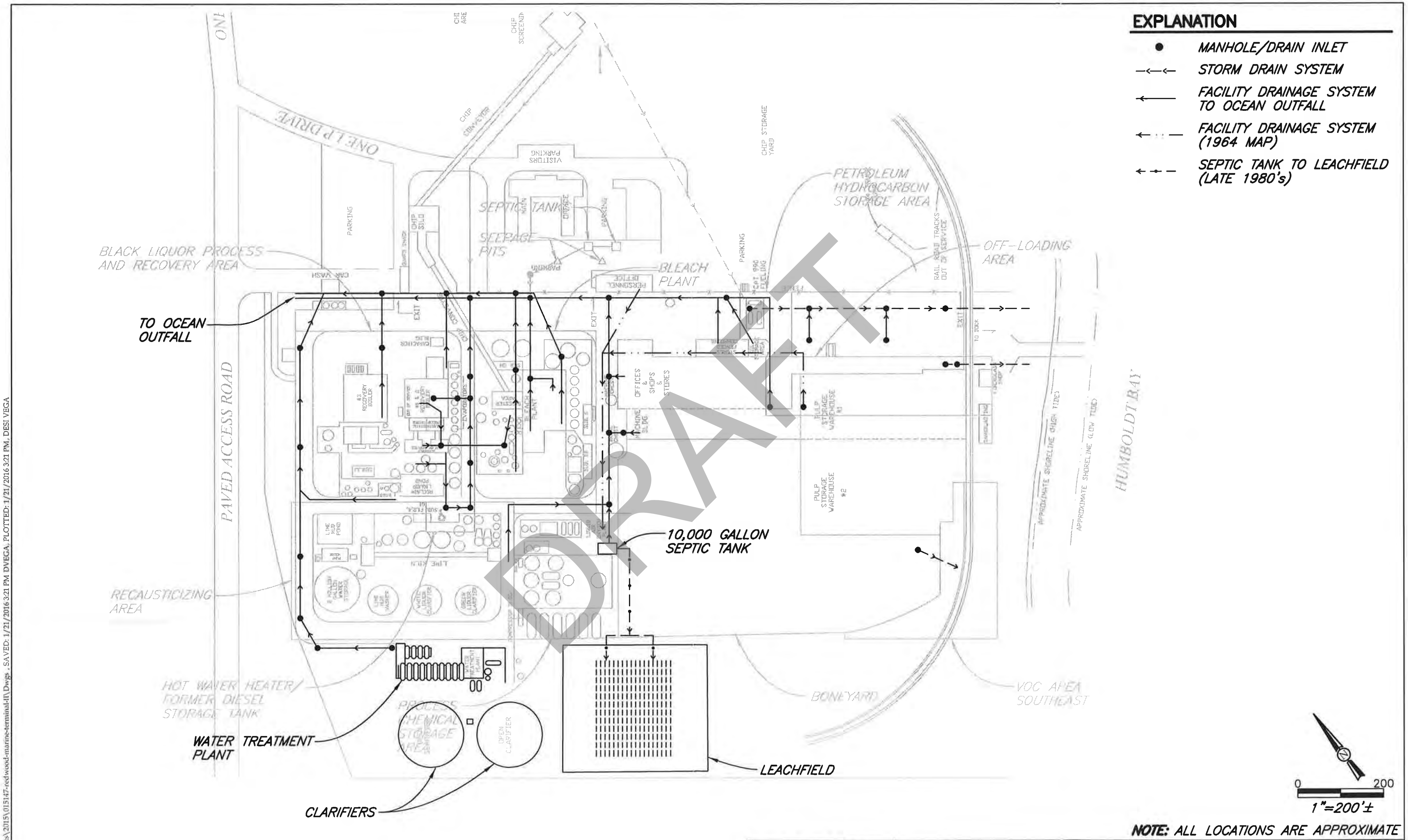

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SHN Consulting Engineers & Geologists, Inc.

The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Facility Drainage Schematic

SHN 015147

January 2016

015147-FCLTY-DRAIN

Figure 2

\EUREKA\projects\2015\015147-redwood-marine-terminal-II\Dwgs , SAVED: 1/21/2016 3:21 PM DVEGA, PLOTTED: 1/21/2016 3:21 PM, DESI VEGA

2.2 MicroFloc Water Treatment System

A preliminary inspection of the MicroFloc industrial water treatment system was conducted at the RMT II site on September 28, 2015, as a part of the overall assessment of infrastructure at the site. No internal inspections of the filters were conducted at this time, but will be required if the filters are to be placed back in service. The full inspection report is included in Appendix B.

The system includes a chemical feed system, two 1.5 MG clarifiers, ten horizontal pressure filters, four softeners, and a seawater filter. The system was designed for a nominal capacity of 30 MGD (20,800 gallons per minute [gpm]) with a peak flow capacity of 25,000 gpm. The design documentation states that the design influent loading for the filters was 100 nephelometric turbidity units (NTU), which would typically correspond to approximately 100 milligrams per liter (mg/L) suspended solids.

The condition of various components was assessed by means of a walk through. Piping galleries, valves, and related equipment appear to be in reasonably good condition. The control system is as supplied in the 1960s, and the panels appear to be significantly corroded and are outdated. It should be assumed that replacement of controls and field instruments with modern digital devices would be required for any future uses. Although the internals of the pressure filters could not be inspected, it is reasonable to assume that they are in operable condition, based on reports that they were in normal service when the plant was shut down in 2008. This would need to be confirmed by conducting internal inspections of the tanks and filter media. It is also reasonable to assume that most valves would be operational following a minor rebuild. The condition of the softening system could not be assessed, and it should be assumed that the resin would need to be replaced prior to use.

2.3 Ocean Outfall and Diffuser System

Photo 1: MH-5 Ocean Outfall

The existing ocean outfall is an approximately 1.5 mile long, 48-inch diameter pipe with 144 diffuser ports.

The capacity of the outfall is defined by pipe diameter, number of available diffuser ports, and port diameter. Available dilution capacity is controlled by effluent flow rate and density. Detailed modeling was performed by CH2M to assess dilution performance based on varying effluent flow, salinity, and temperature. Key findings include:

- Hydraulic assessment indicates the outfall can discharge up to 40 MGD based on 144, 2.4-inch ports. However, effluent with higher salinity content would reduce dilution.
- Dilution decreases with increase in flow, but target dilution of greater than 100:1 was easily achieved for flows up to 40 MGD for all conditions evaluated with the exception of effluent salinity of 30 practical salinity units (psu).

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- Dilution increases with increased effluent temperature. Effluent temperatures approximating receiving water temperatures provided significantly lower dilution than temperatures above that of the receiving water when salinities were greater than 10 psu.
- Dilution decreases with increased salinity. The target dilution of 100:1 may not be met when effluent salinity is greater than 30 psu.

The complete diffuser performance assessment report is included in Appendix C.

Historically, all onsite industrial process water discharges to MH-5, which discharges into the ocean outfall. The effluent pumps at MH-5 consist of two 350-hp sump pumps.

Photo 2: Effluent Pumps

3.0 Onsite Wastewater Sources

3.1 Aquaculture

Aquaculture has been identified as an industry with opportunities for growth in Humboldt County. The existing facilities at the RMT II could be reused to provide critical infrastructure for aquaculture operations. These facilities include access to both seawater and fresh water, marine dock access, an existing onsite water treatment/disposal facility, and a permitted ocean outfall for discharge of treated water.

Aquaculture operations currently exist at the RMT II facility with the operation of a small scale oyster hatchery. Waste flows from the current operation go to the existing leachfield.

Treatment of aquaculture wastes is a primary concern in planning for the reuse of RMT II infrastructure. A preliminary conceptual level estimation of waste loads was performed for use in planning and scaling of aquaculture facilities. The complete aquaculture waste load analysis is presented in Appendix D, and summarized below.

Waste loads and water requirements are species dependent, particularly when different taxa (such as, finfish and bivalves) are considered. A bivalve hatchery mariculture operation at RMT II would generate only a minimal amount of waste and would in all likelihood qualify for an exemption to NPDES permitting requirements under the Environmental Protection Agency's (EPA) regulation of the Clean Water Act. The EPA requires NPDES permitting only for cold-water operations that produce more than 20,000 pounds of organisms per year and use 5,000 pounds of feed per month. Because algae feed for oyster hatcheries is most often grown onsite by culturing algae cells already present in the source water, trace nutrients, and solar energy, hatcheries are normally exempt from

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these requirements. For example, the private oyster mariculture hatchery operation currently being developed in Humboldt Bay by Coast Seafood will be exempt from NPDES reporting requirements under this criterion.

On the other hand, finfish operations require daily feed to grow fish. The waste loads from a finfish operation would also be higher than bivalve mariculture. As a result, to develop a conservative estimate of aquaculture waste loads, steelhead (*Onchorhynchus mykiss*) was selected as the target species.

Steelhead are essentially anadromous rainbow trout that yield medium-to-high market value and would minimize the use of freshwater at the RMT II site, where previous studies have documented that available freshwater sources are prohibitively expensive for profitable aquaculture use. Steelhead fingerlings are readily available in the area, as are established purchasers for recreational use.

Estimated waste loads based on quantity of fish produced over a 30-week production period are summarized in Table 1.

Table 1
Estimated Waste Production for Steelhead
RMT II Infrastructure Reuse Evaluation, Eureka, California

	Total Fish Production							
	5,000		**50,000**		**250,000**		**500,000**	
Waste Load[1]	**kg[2]**	**lbs/day[3]**	**kg**	**lbs/day**	**kg**	**lbs/day**	**kg**	**lbs/day**
Total Solid Waste (SW)	1,532	16.08	15,324	161	76,622	804	153,244	1,609
Solid N Waste (SW_N)	68	0.71	679	7.13	3,396	35.7	6,792	71.3
Solid P Waste (SW_P)	28	0.29	280	2.94	1,399	14.7	2,799	29.4
Dissolved N Waste (DW_N)	211	2.22	2,108	22.1	10,542	111	21,084	221
NH_4-N Waste ($DW_{NH4\text{-}N}$)	169	1.77	1,687	17.7	8,433	88.5	16,867	177
Dissolved P Waste (DW_P)	17	0.18	167	1.75	833	8.74	1,666	17.5
Total N Waste (TW_N)	279	2.93	2788	29.3	13,938	146	27,876	293
Total P Waste (TW_P)	45	0.47	446	4.68	2,232	23.4	4,464	46.9

1. Waste loads estimated for a 30-week production period
2. kg: kilogram
3. lbs/day: pounds per day, estimate is an average for a 30-week production period.

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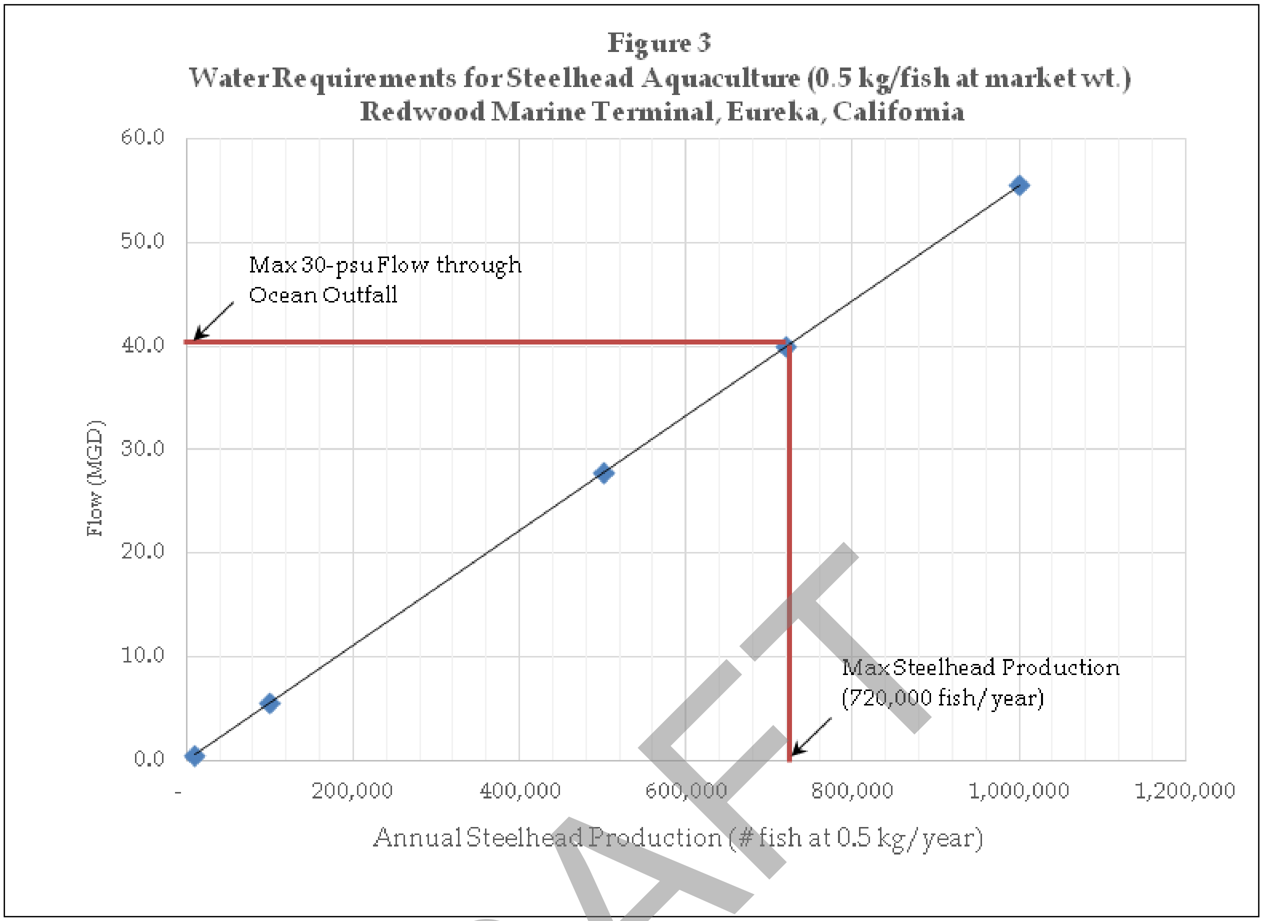
Based on the results of the ocean outfall diffuser modeling summarized in Section 2.3 and presented in detail in Appendix C, the diffuser would have sufficient capacity to hydraulically discharge up to 40 MGD of 30 psu wastewater from a potential finfish aquaculture facility in the absence of any other contributors to the ocean outfall. The quantity of flow-through water available for use at the aquaculture facility would serve as an important constraint on the potential size of the production operation. For an un-aerated steelhead raceway, a conservative estimate of the required water flow rate is approximately one liter per minute per kilogram (kg) of fish. Because a maximum of 40 MGD is available, a total of 360,000 kg of fish could be supported per year. Assuming that the market weight of steelhead is 500 grams, there would be an annual production capacity of 720,000 steelhead per year. Figure 3 illustrates the relationship between water flow rate to the aquaculture facility and the annual production capacity for steelhead.



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Using the mass loading rates developed in detail Appendix C and the flow and finfish production rates developed above, the concentrations of total solids, nitrogen, and phosphorus wastes of the aquaculture effluent can be estimated. Figure 4 summarizes the waste loading rates per kilogram of fish produced, and Table 2 presents the estimated concentrations of total solids, nitrogen, and phosphorus in the aquaculture effluent prior to discharge to the ocean outfall.

Figure 4
Annual Waste Loads
Redwood Marine Terminal, Eureka, California

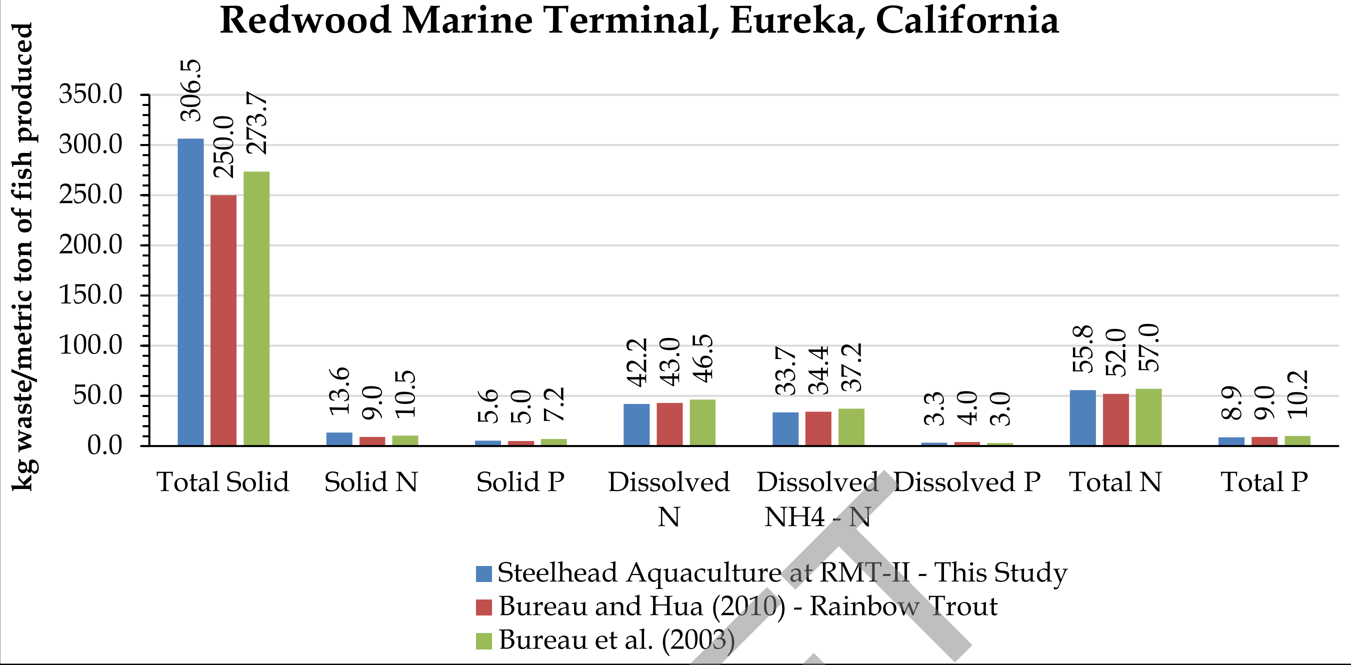

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Table 2
Estimated Waste Concentration of Steelhead Effluent
RMT II Infrastructure Reuse Evaluation, Eureka, California
(in mg/L)[1]

Total Solids Concentration	Total N[2] Concentration	Total P[3] Concentration
1.99	0.36	0.06

1. mg/L: milligrams per liter
2. N: nitrogen
3. P: phosphorous

As described in detail in Appendix B, the minimum dilution factor applicable to the maximum flow and salinity, and the minimum water temperature was estimated to be at least 75. This would result in post-dilution concentrations of 26 micrograms per liter (ug/L) of total solids, 5 ug/L of total nitrogen, and less than 1 ug/L of total phosphorus in the receiving water, far below the maximum levels allowed in the Ocean Plan.

3.2 Dredge Slurry

Disposal of approximately 30,000 cubic yards of dredge solids is required as part of annual maintenance dredging operations in Humboldt Bay. Dredge spoils have a low solids content and require dewatering prior to final disposition. For potential discharge through the ocean outfall at RMT II, dredge slurry effluent turbidity must be reduced to less than 75 NTU (approximately 75 mg/L suspended solids) (SWRCB, 2012).

3.2.1 MicroFloc Water Treatment System

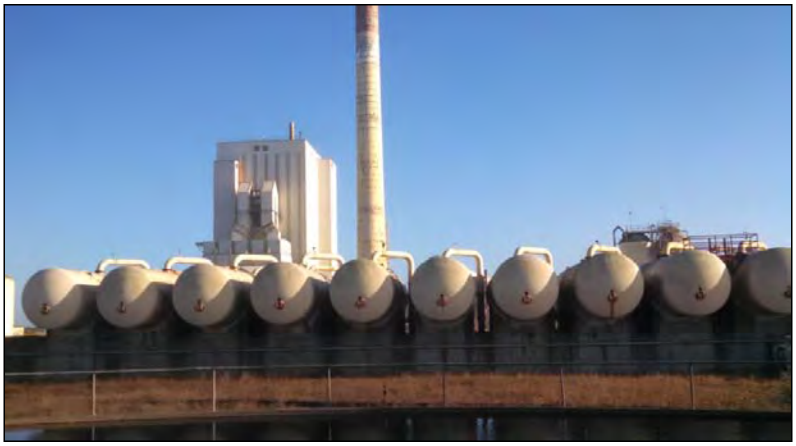

Photo 3: MicroFloc Filters

A preliminary analysis of dredge spoils processing using the existing MicroFloc system at the RMT II site has been developed by HWE. The full dredge spoils processing report is included in Appendix E.

Under this concept, the dredge slurry would pump directly to the existing water treatment system and be directed to one of the two clarifiers. The clarifier basins would be modified by removing the existing rake arms and installing a porous base/underdrain system covering the existing floor to prevent dredged solids from entering the hoppers in the floor, while allowing drainage of water. The drained water would be pumped away using the existing waste pumps, supplemented with new vertical can pumps installed near the center of each clarifier. Free water would also be allowed to overflow the clarifiers by means of existing weirs. The overflowed water would be combined with the pumped drain water in the clarifier effluent sump in the filter building.

Water quality standards for the outfall require turbidity to be below 75 NTU. It is unknown whether the discharge would meet this standard without filtering, and it should be assumed that three of the existing filters, possibly with coagulant, would be needed. If coagulant is required, an NPDES permit for the discharge may also be required.

Pumping would be alternated between the two clarifiers weekly. One clarifier would be receiving dredge slurry, while the other would be allowed to drain free water and excavate/remove solids using traditional mobile machinery.

In addition to renovations to the clarifier, described above, and improvements needed to get the filters into operable condition, a new system to provide backwash water will be required. The existing filtration system requires at least four filters in operation to provide sufficient backwash water for a single filter. The backwash requirement for each filter is approximately 5,700 gpm and a total volume of approximately 56,000 gallons. It is proposed that the existing seawater filtration storage tank, with a capacity of 100,000 gallons, be used to store

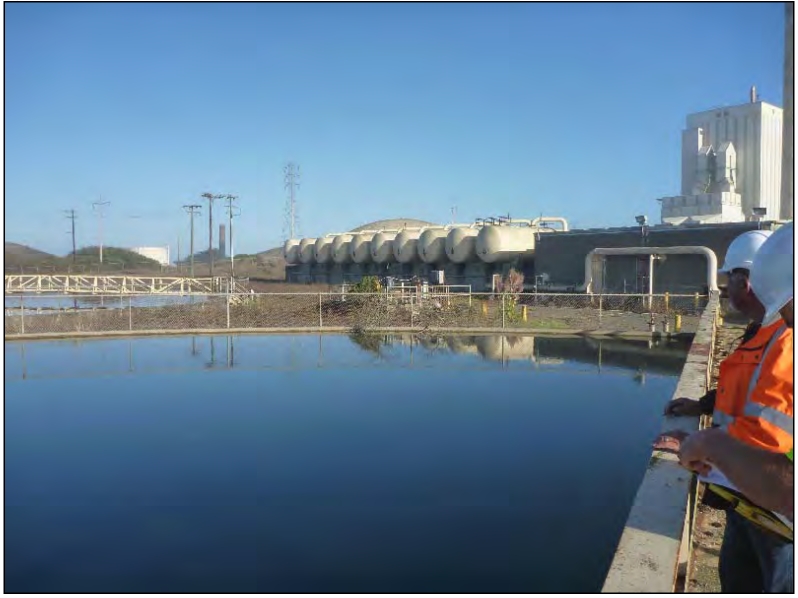

Photo 4: Existing Clarifier

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water for backwash. This will require additional infrastructure, including new 75-100 hp pumps, new piping and valves, and modifications to the piping manifold serving the filters. See Appendix E for a detailed description of recommended infrastructure additions.

3.2.2 Geotubes

Dewatering of dredge spoils using geotextile tubes, or geotubes, is proposed as an alternative to retrofitting and using the existing water treatment system. Dewatering using geotubes is accomplished by injecting a polymer into the dredge slurry and pumping it into the geotubes. Water filters through the wall of the tubes during multiple fill cycles. Tubes are then allowed to drain, and are cut open to remove solids.

Assuming a total volume of 30,000 cubic yards of dredge solids and a geotube width of approximately 16 feet and a height of approximately 5 feet, approximately 4 acres will be required for geotubes and related drainage structures, and equipment access. The 4-acre field would be graded to drain to a single location and lined with an impervious material with a sand cover. Geotubes would be placed on top of the sand layer. The shape of the required area is flexible; geotubes can be ordered in varying lengths, and arranged as needed. A proposed geotube area is shown on Figure 5. A reduction in acreage may be achieved by stacking the geotubes. Water from the drainage structures will be piped to the ocean outfall by way of MH-5. It is assumed that geotube effluent will meet the California Ocean Plan turbidity limit of 75 NTU (SWRCB, 2012). Additional testing will be required to ensure that all permit limits are met. If turbidity does not meet the limit, standard stormwater best management practices (BMPs) or the existing clarifiers may be used for additional turbidity reduction.

Using polymer to process dredge slurry would increase permitting requirements. Water decanted from dredging activities is eligible for discharge under Section 404 of the Clean Water Act and the discharger may apply for coverage under the United States Army Corps of Engineers (ACOE) Nationwide Permit No. 16. However, whether polymer is added to the dredged material or is processed for offsite use, the discharge would no longer qualify under Section 404, and would not be eligible for Nationwide Permit No. 16. Instead, it would need to be covered under an individual NPDES permit.

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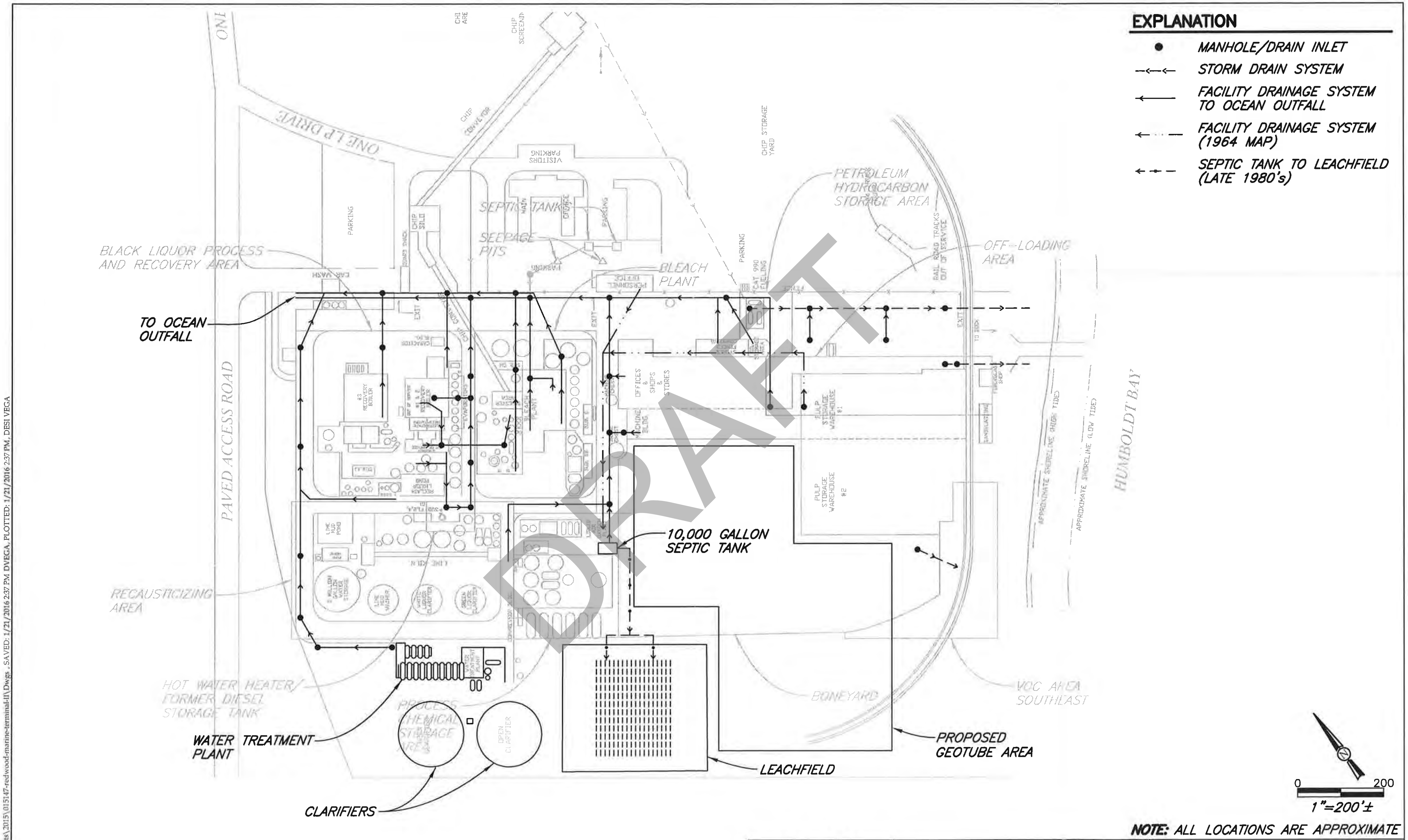
4.0 Offsite Wastewater Sources

Three potential offsite wastewater sources were evaluated for disposal at the existing Redwood Marine Terminal permitted ocean outfall. These include the City of Eureka (City), and the communities of Samoa and Fairhaven.

Future residential, commercial, or industrial development in the communities of Fairhaven and Samoa require improved wastewater treatment and disposal facilities. Both communities are listed as severely economically disadvantaged communities, which are communities having an annual median household income less than 60 percent of the statewide average (CDWR, 2016). Improved infrastructure will promote both affordable housing and job opportunities in these communities, and improve the environmental health of these communities.



NOTE: ALL LOCATIONS ARE APPROXIMATE

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SHN Consulting Engineers & Geologists, Inc.

The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Proposed Geotube Area

SHN 015147

January 2016

015147-PROP-GEOTUBE-AREA

Figure 5

4.1 City of Eureka

The City of Eureka currently disposes of treated wastewater from the Elk River wastewater treatment facility (WWTF) pursuant to RWQCB Order No. R1-2009-0033. The facility serves approximately 45,000 people from the city and unincorporated areas within the Humboldt Community Services District (RWQCB, 2009).

Currently, the Elk River WWTF discharges treated wastewater to Humboldt Bay through a 3,000-foot outfall line that terminates on the east side of the shipping channel at a depth of 30 feet (RWQCB, 2009) Discharge is only permitted on an ebb tide to ensure that effluent is conveyed to the Pacific Ocean. Treated wastewater is stored in an 8-MG equalization basin at Elk River WWTF, to be discharged during an ebb tide.

4.1.1 Wastewater Flows

The average annual flow (AAF), the maximum monthly average wet weather flow with a 20% probability of occurrence (MMWWF$_5$), the peak daily average flow associated with a 5-year, 24-hour storm (PDAF$_5$), and peak instantaneous flow attained during a 5-year PDAF (PIF$_5$) were estimated using daily effluent data provided by the treatment plant for January 2010 through October 2015.

The AAF was estimated using data from the calendar year 2010. The years 2011 through 2015 were not used in this estimation, because of unusually dry conditions during that period. The AAF for the Elk River WWTF is 5.91 MGD.

The MMWWF$_5$ represents the wettest wet season monthly average flow that is anticipated to have a five-year recurrence interval.

Based on monthly total precipitation data from the Eureka Rainfall Station, the rainfall with a 1-in-5 year recurrence interval in January is 8.73 inches. On Figure 6, this corresponds to a MMWWF$_5$ of 8.07 MGD.

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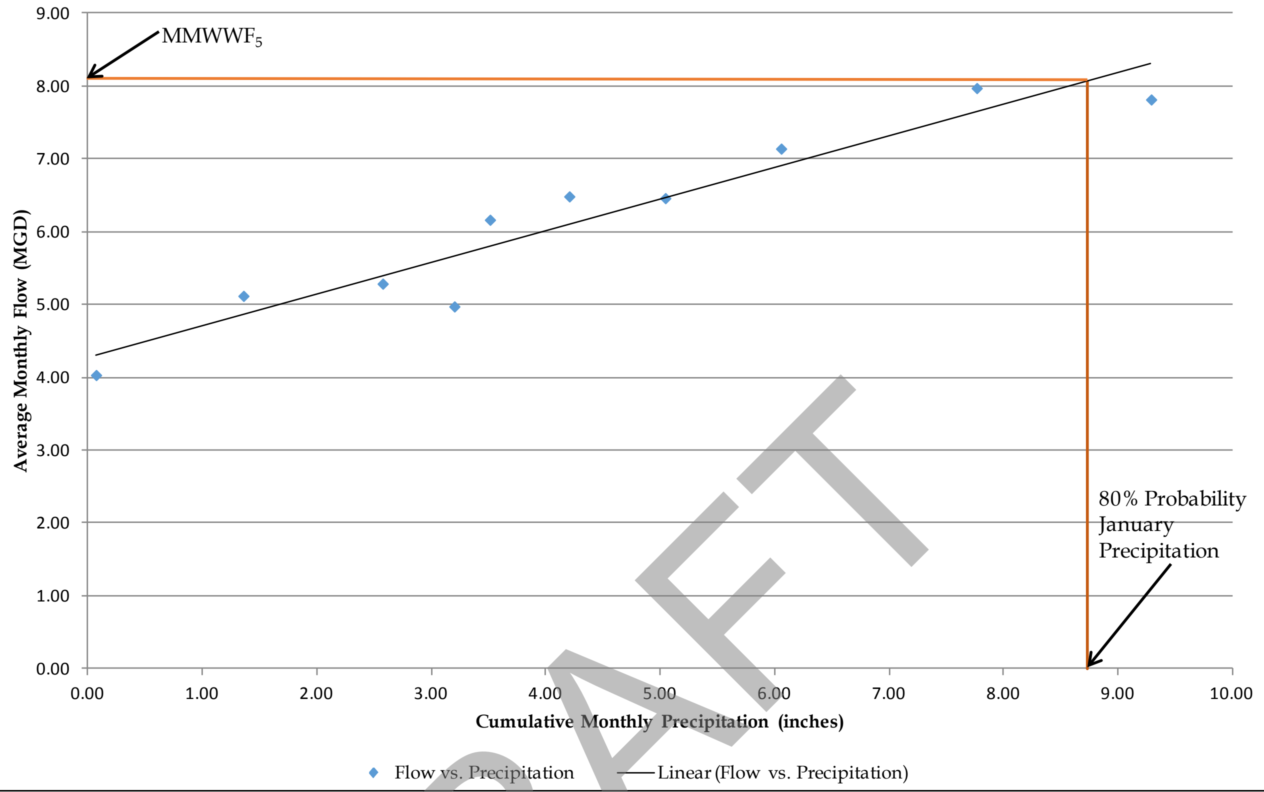
Figure 6
Elk River WWTF Flow vs. Precipitation
Redwood Marine Terminal, Eureka, California



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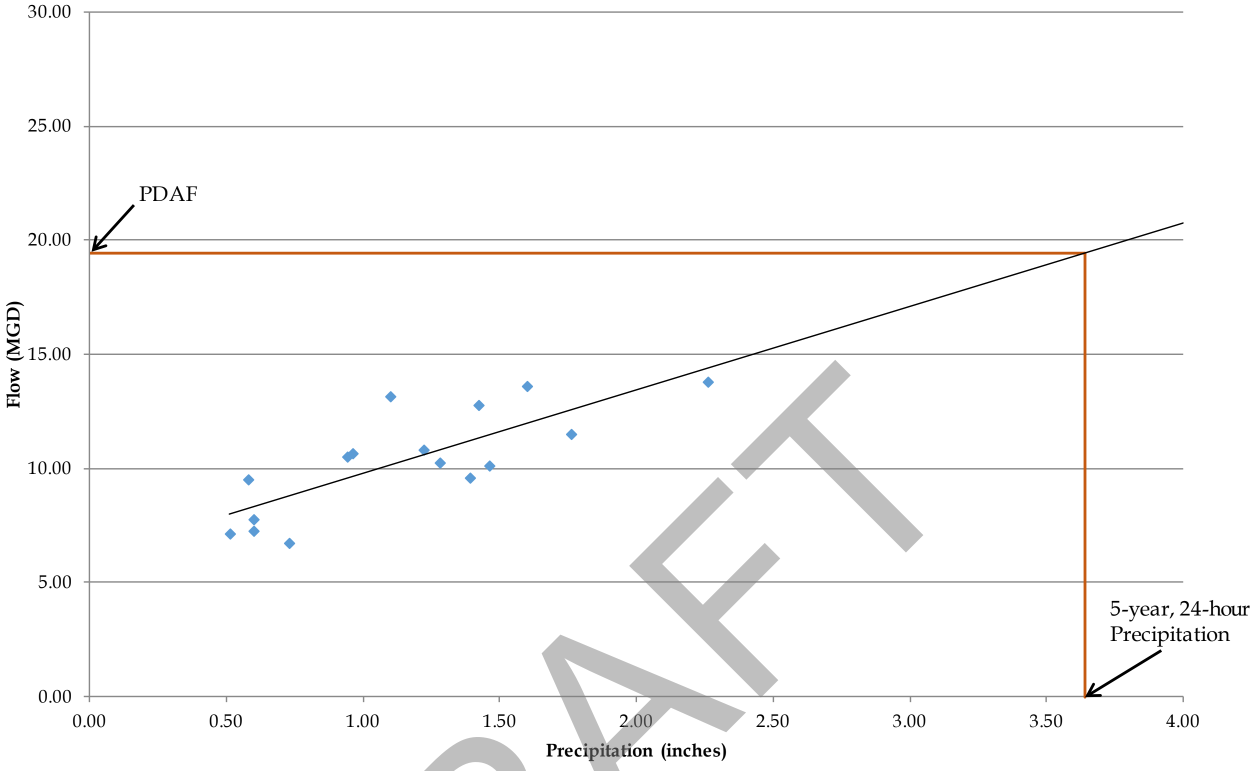
The $PDAF_5$ is the largest daily flow associated with a 5-year, 24-hour precipitation event. The peak day average flow has a 0.27% probability of occurrence or 1 day in 365 days of any given year. Estimation of peak day flow is based on a regression analysis of daily plant flows during or immediately following wet season significant rainfall events. $PDAF_5$ is shown on Figure 7.

Because the increased influent flow to the WWTF during wet weather is highly correlated with rainfall, evaluation of this regression can be used to define peak day flow associated with a specific rainfall event. The $PDAF_5$ event is determined from a plot of the recorded daily flow that occurred during, or 24 hours after, a significant rainfall event (Figure 7).

Figure 7
Elk River WWTF $PDAF_5$
Redwood Marine Terminal, Eureka, California



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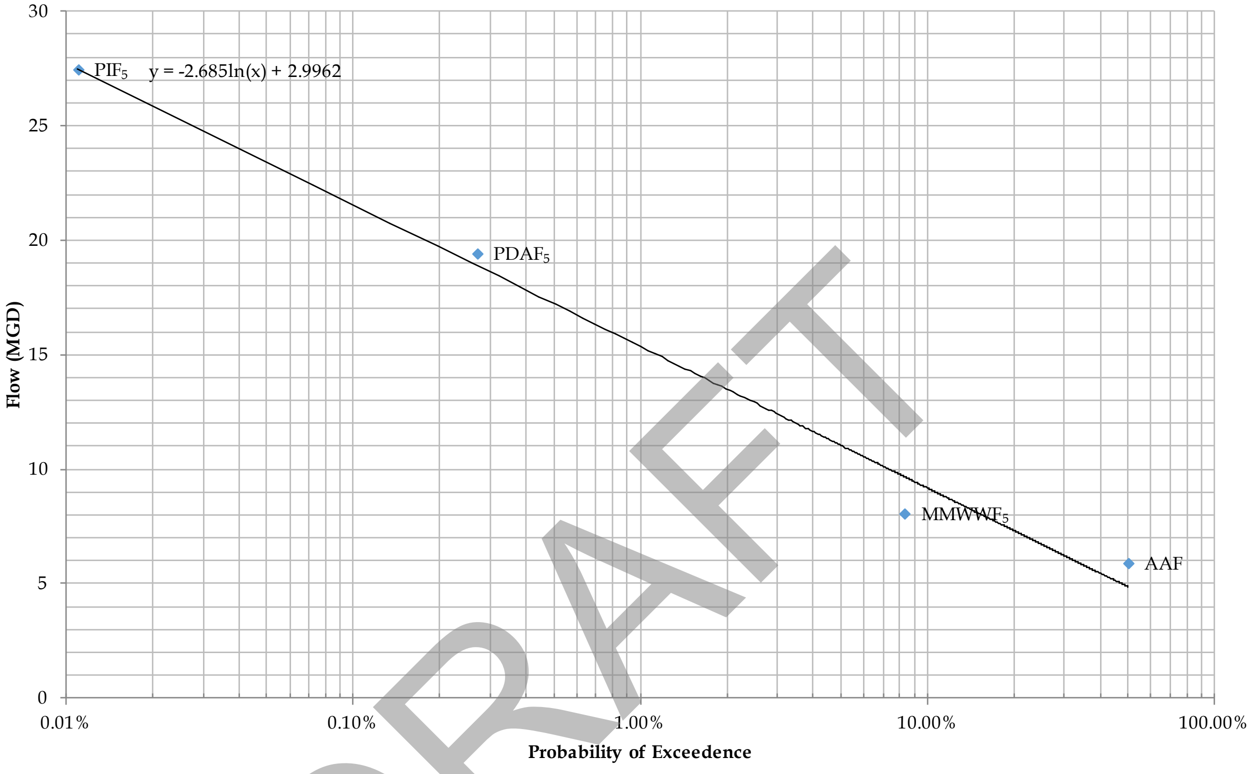
By performing a regression analysis of data, a linear relationship is established, as shown in Figure 7. The $PDAF_5$ is based on the intercept of this line with the 5-year, 24-hour precipitation event. To calculate the estimated $PDAF_5$, the 5-year, 24-hour precipitation event for the Eureka area was set equal to 3.64 inches (NOAA, 2015). Based on the regression analysis shown in Figure 7, the resulting $PDAF_5$ for a 3.64-inch event is equal to approximately 19.43 MGD.

The PIF_5 is the highest sustained hourly flow rate during wet weather. The PIF_5 has 0.011% probability of occurrence (1 hour in 8,760 hours of the year). Hydraulic design of channels and pumps at a treatment facility is usually based on this flow.

The PIF_5 attained during a 5-year, 24-hour storm event is determined from a probability projection of the AAF, $MMWWF_5$, and the $PDAF_5$ parameters. The projection plot shown in Figure 8 shows that the PIF_5 for the Elk River WWTF is estimated to be 27.47 MGD.

Figure 8
Elk River WWTF Peak Instantaneous Flow
Redwood Marine Terminal, Eureka, California



Although the PIF_5 is typically used to design channels and pumps, the $PDAF_5$ (19.43 MGD) was considered more appropriate for this project. Instantaneous and hourly peaks will be equalized using the existing 8-MG equalization basin.

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4.1.2 Wastewater Characterization

Effluent biochemical oxygen demand (BOD) and total suspended solids (TSS) for the Elk River WWTF were obtained from the facilities 2013 Annual Report (City of Eureka, 2014). Maximum and average concentrations are summarized in Table 3.

Table 3
Flow and Loading Estimates
RMT II Infrastructure Reuse Evaluation, Eureka, California

Location	Flow Description	Flow (MGD)[1]	BOD_5[2] (mg/L)[3]	BOD_5 (lb/day)[4]	TSS[5] (mg/L)	TSS (lb/day)	Settleable Solids (ml/L)[6]
Fairhaven[7,8]	Avg.	0.027	30	6.8	30	6.8	NA[9]
Samoa	Avg.[10]	0.061	30[11]	7.6	30	30	0.1[11]
	Peak[10]	0.131	30[11]	22	30	30	0.2[11]
Eureka[12]	AAF[13]	5.91	11.7[14]	353[14]	11[14]	345[14]	NA
	$PDAF_5$[15]	19.43	24[16]	599[16]	28[16]	765[16]	NA

1. MGD: million gallons per day
2. BOD_5: five day biochemical oxygen demand as milligrams oxygen consumed per liter
3. mg/L: milligrams per liter
4. lb/day: pounds per day
5. TSS: total suspended solids
6. ml/L: milliliter per liter
7. The flow rate for Fairhaven was determined by adding estimated flows from businesses, residents, and apartments. Flow rates for businesses were determined on a per employee basis using typical commercial flow rates from Davis, M. L. (2011). Flow rates for residents were determined using an average domestic daily flow rate of 380 liters per day (Davis, M. L. 2011). The number of houses in Fairhaven was estimated using Google Earth, and a conservative value of 2.94 people/household from the US Census Bureau (2015) was used to determine the total number of residents.
8. BOD_5 and TSS based on typical regulatory limits
9. NA: not available
10. Full build out for proposed wastewater treatment facility that serves existing town and post development (SHN, 2015)
11. Discharge limitations for treated effluent from proposed Samoa WWTF, Order No. R1-2014-0031–would not need to meet if we met ocean outfall plan and secondary treat standards.
12. Effluent BOD_5 and TSS from City of Eureka 2013 Annual Report (City of Eureka, 2014)
13. AAF: average annual flow, based on plant flow data from 2010
14. Average effluent BOD and TSS for 2013 (City of Eureka, 2014)
15. $PDAF_5$: peak daily average flow attained during the 5-year, 24-hour storm; estimated using plant data from January 2010 to April 2015
16. Peak effluent BOD and TSS based on maximum daily values in 2013

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4.2 Samoa

The Town of Samoa is located northeast of the RMT II on the Samoa peninsula (Figure 9). The population during the 2010 census was 258 people (U.S. Census Bureau, 2015). The town of Samoa is identified as a severely economically disadvantaged community, which is defined as having an annual median household income less than 60 percent of the statewide average (CDWR, 2016). The Town of Samoa has a master plan to subdivide and redevelop the town in two phases. Phase 1 will include rehabilitation of existing homes and an 80-unit affordable housing complex. Funding for the affordable housing project is contingent on construction beginning in 2016. Phase 2 will include construction of additional new homes, as well as new commercial and industrial business parks. Phase 1 will require the construction of a new WWTF to provide services for the new and existing homes and businesses.

4.2.1 Wastewater Flows

The Town of Samoa is served by two disposal systems. The eastern system serves approximately 75 homes, the downtown retail area, and the Samoa Cookhouse, and has an average dry weather flow of 17,000 gpd, and an average wet weather flow of 32,000 gpd. The western system serves approximately 25 homes and has an average flow of 7,500 gpd (RWQCB, 2014).

Following implementation of Phase 1 and Phase 2, development average influent flows are anticipated to be 61,000 gpd, with peak flows of approximately 131,000 gpd (SHN, 2015).

4.2.2 Wastewater Characterization

A WWTF is proposed to replace the eastern and western systems and treat the additional wastewater from Phase 1 and Phase 2 developments. The proposed Samoa WWTF is subject to permit requirements under Draft Waste Discharge Requirements (WDR) Order No. R1-2014-0031. Concentration limits[1] for BOD and settleable solids are included in the existing permit, and summarized in Table 3.

Wastewater discharged through the RMT II ocean outfall would be subject to the Ocean Plan, and would be required to meet EPA secondary effluent standards.

4.3 Fairhaven

Fairhaven is an unincorporated community located on Samoa Peninsula, southwest of the RMT II (see Figure 9). The community consists of approximately 83 single-family residences (Google Earth) and the Fairhaven Business Park. The community of Fairhaven is identified as a severely economically disadvantaged community, which is defined as having an annual median household income less than 60 percent of the statewide average (CDWR, 2016)

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[1] Discharge limitations for treated effluent from proposed Samoa WWTF, Order No. R1-2014-0031.

4.3.1 Wastewater Flows

Currently, no wastewater collection infrastructure exists within the community of Fairhaven. Individual properties maintain onsite septic tanks, leachfields, or other individual wastewater treatment and disposal systems. Costs for maintenance and repair of aging septic and leachfield systems are currently the responsibility of individual property owners within the community.

An approximate wastewater flow of 27,000 gpd was estimated using literature values for typical wastewater production from residential and commercial sources. Existing businesses include offices, a dive shop, a boat yard, and a water bottling facility. Residential population was estimated to be 244 people based on an estimated 83 houses and an estimated 2.94 persons per household (U.S. Census Bureau, 2015).

4.3.2 Wastewater Characterization

Wastewater effluent strength for the community of Fairhaven was estimated based on typical regulatory standards. It is assumed that wastewater effluent will be treated so that concentrations of BOD and TSS will be less than 30 mg/L. Estimated BOD and TSS values are included in Table 3.

4.4 Projected Growth

Humboldt County has a projected annual growth rate of 0.44%, based on the Department of Finance population database. The City of Eureka uses a 0.5% growth rate for planning purposes (City of Eureka, 2011). Using a 0.5% growth rate, the total population increase expected from the combined communities of Fairhaven, Samoa, and the City of Eureka is approximately 5,000 people by 2030. Using a standard literature value for domestic wastewater of 100 gallons per capita per day, this population equates to an increase in wastewater flows of approximately 0.5 MGD.

5.0 Conceptual Plan for Treatment of Onsite Industrial Wastewater

Photo 5: Clarifier

The existing leachfield has been modified for disposal of effluent flows from aquaculture. The maximum daily flow is 8,500 gpd. Any aquaculture flows in excess of 8,500 gpd would need to be routed to the ocean outfall.

Section 3.0 indicates that wastewater from onsite users could include aquaculture wastes and free water from dredge slurry decanted in the onsite clarifiers. Depending on the configuration of the onsite finfish aquaculture facility, the accumulation of solid wastes in the basins could be managed either by the removal of settled wastes directly from the aquaculture raceways or by settling in separate basins. Whichever method the aquaculture facility were to employ to collect settled solids, a post-

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equalization/settled solids storage tank could be provided by the HBHRCD to facilitate the continuous discharge of settled aquaculture waste to the ocean outfall, rather than the high-strength batch loading that would occur when the aquaculture facility would periodically harvest the solids. Such a solids storage system could be as simple as an HDPE tank and a small centrifugal pump.

The storage volume of the tank and the capacity of the pump would depend on the design of the aquaculture facility. However, the settling zone volume required to accommodate 660 pounds of daily total solid waste produced by steelhead at the facility's maximum annual production capacity was estimated to be 440 gallons, assuming that solids in the settling zones are 18 percent dry solids. If the facility were to discharge solids to the storage tank weekly, the required useable HDPE tank volume would be roughly 3,080 gallons and the pumping rate to discharge that volume over a continuous interval would be 18 gallons per hour. This system could, therefore, be comprised of a 4,000-gallon HDPE tank and a small positive displacement pump designed for high solids. At a conceptual-level, this equipment might be estimated to cost from $30,000 to $50,000 to purchase, install, and integrate.

Installation of a new drainage line from the proposed solids settling tank to the discharge line to the ocean outfall would be required. A proposed alignment for this line is shown on Figure 10.

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6.0 Conceptual Plan for Disposal of Offsite Wastewater

The proposed infrastructure consists of approximately 18,000 linear feet of 30-inch diameter sewer line from the outfall of the existing equalization basin at the Elk River WWTF to MH-5 located at the RMT II (Figure 9). This line would transport treated wastewater from the Elk River WWTF and the community of Fairhaven to the RMT II for discharge at the RMT II permitted ocean outfall. Installation would be performed in three sections:

1. The City of Eureka line–from the Elk River WWTF equalization basin to the eastern shore of Humboldt Bay (Figure 11)
2. The horizontal directional drill (HDD) line–approximately 3,200 feet from the eastern shore of Humboldt Bay to the community of Fairhaven on the western side of Humboldt Bay (Figure 12)
3. The Fairhaven line–from the western shore of Humboldt Bay, through the community of Fairhaven, to MH-5 on the RMT II property (Figure 13)

An additional 4,000 linear feet of 4-inch diameter sewer line also would be installed from the future site of the Samoa WWTF to MH-5 (Figure 14).

The installation of pump stations would be required in all three communities.

6.1 City of Eureka Line

Effluent flows from the Elk River WWTF range from a minimum of 2.2 MGD to an estimated peak hour flow of 27.5 MGD, with an average of approximately 5.91 MGD. From January 2010 through October 2015, the maximum daily flow coinciding with a rainfall event was 18.77 MG, and flows exceeding 15 MGD typically occurred on two to three days per year. To achieve appropriate minimum and maximum pipe velocities, it is assumed that the existing 8-MG equalization basin would be used to regulate flows to between 5 and 19 MGD. A pump station with a minimum pumping capacity of 5,500 gpm will be required to ensure minimum velocities are great enough to prevent solids settling in the pipes.

The proposed alignment for the City of Eureka force main begins at the outfall of the existing 8 MG equalization basin and extends approximately 4,500 feet to the proposed location to the entry pit for the HDD line (Figure 11). A pump station would also be required with a capacity to pump 5 to 19 MGD.

6.2 Horizontal Directional Drill

The potential alignment for the HDD line is shown on Figure 12. Based on information obtained from the ACOE, the dredge depth in Humboldt Bay is approximately 48 feet below the mean lower low water elevation of 0 feet North American Vertical Datum, 1988 (NAVD88). The HDD line would be installed approximately 20 feet below the minimum dredge elevation. The estimated length of pipe required from the entry pit to the exit location reaching the required depth is approximately 3,200 feet.

6.3 Fairhaven Line

6.3.1 With City of Eureka

The Fairhaven line would convey flows from the HDD line approximately 10,000 feet to the connection point with the ocean outfall pipe on RMT II property. The 30-inch line would also collect flows from the community of Fairhaven.

A pump station to pump effluent from the community of Fairhaven into the 30-inch line from Eureka would be required. This would consist of a manhole/wet well with duplex pumps capable of pumping approximately 100 gpm.

6.3.2 Fairhaven Only Alternative

In the event that disposal is required for the community of Fairhaven, but no effluent from the City of Eureka will be routed to the RMT II, a 4-inch diameter line would be installed from an assumed small community wastewater treatment facility, located on the northern side of the community, to MH-5 (Figure 15). Treated effluent would be pumped approximately 1.25 miles from the WWTF to MH-5 for disposal. A pump station consisting of a manhole/wet well with duplex pumps capable of pumping approximately 100 gpm would be required.

6.4 Samoa Line

Effluent from the proposed Samoa WWTF would be routed to the connection point with the ocean outfall at RMT II by approximately 5,200 feet of 4-inch diameter line. A pump station consisting of a manhole/wet well with duplex pumps capable of pumping approximately 150 gpm would be required.

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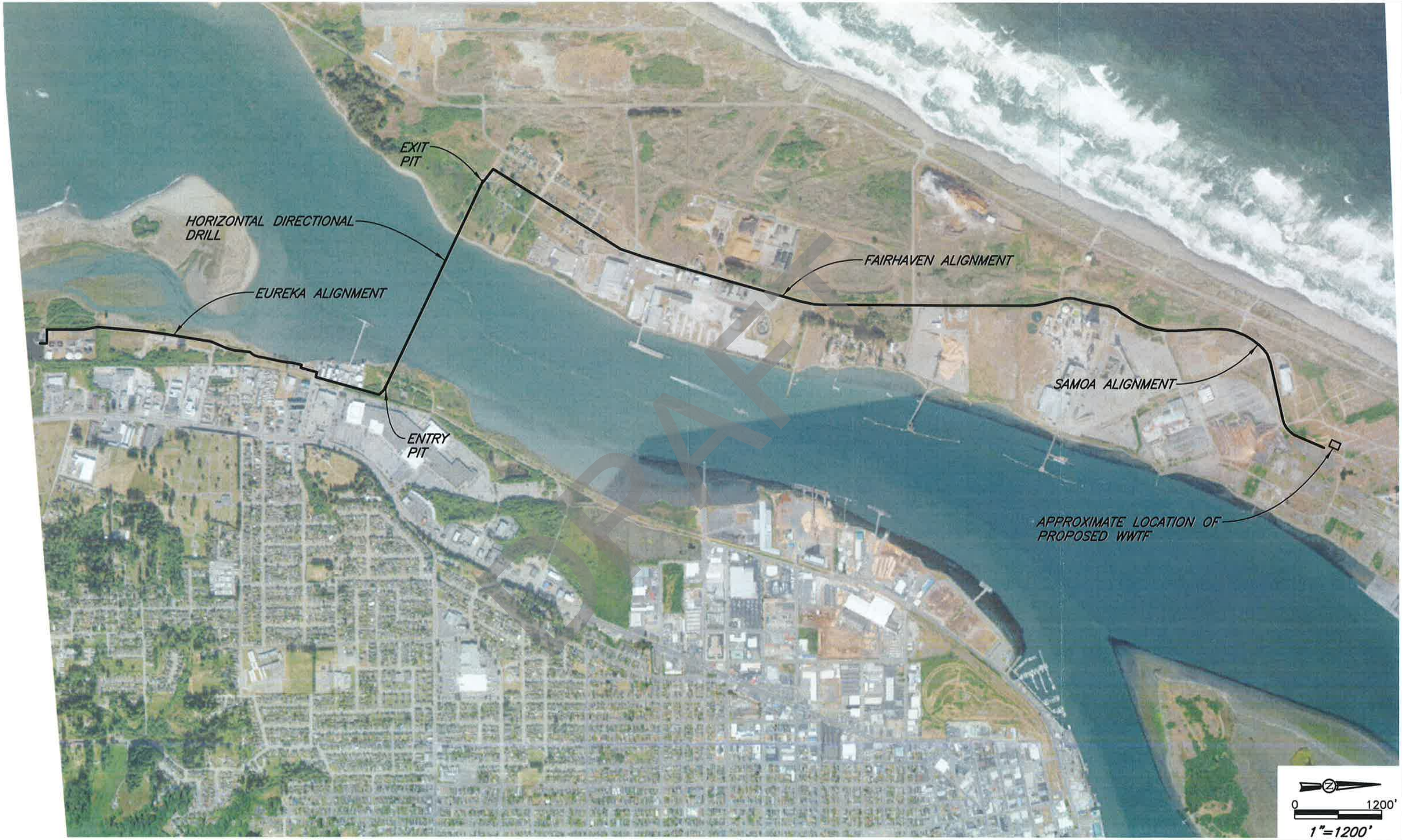

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SHN
Consulting Engineers
& Geologists, Inc.

The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Project Overview

SHN 015147

January 2016

015147-OVERVIEW

Figure 9

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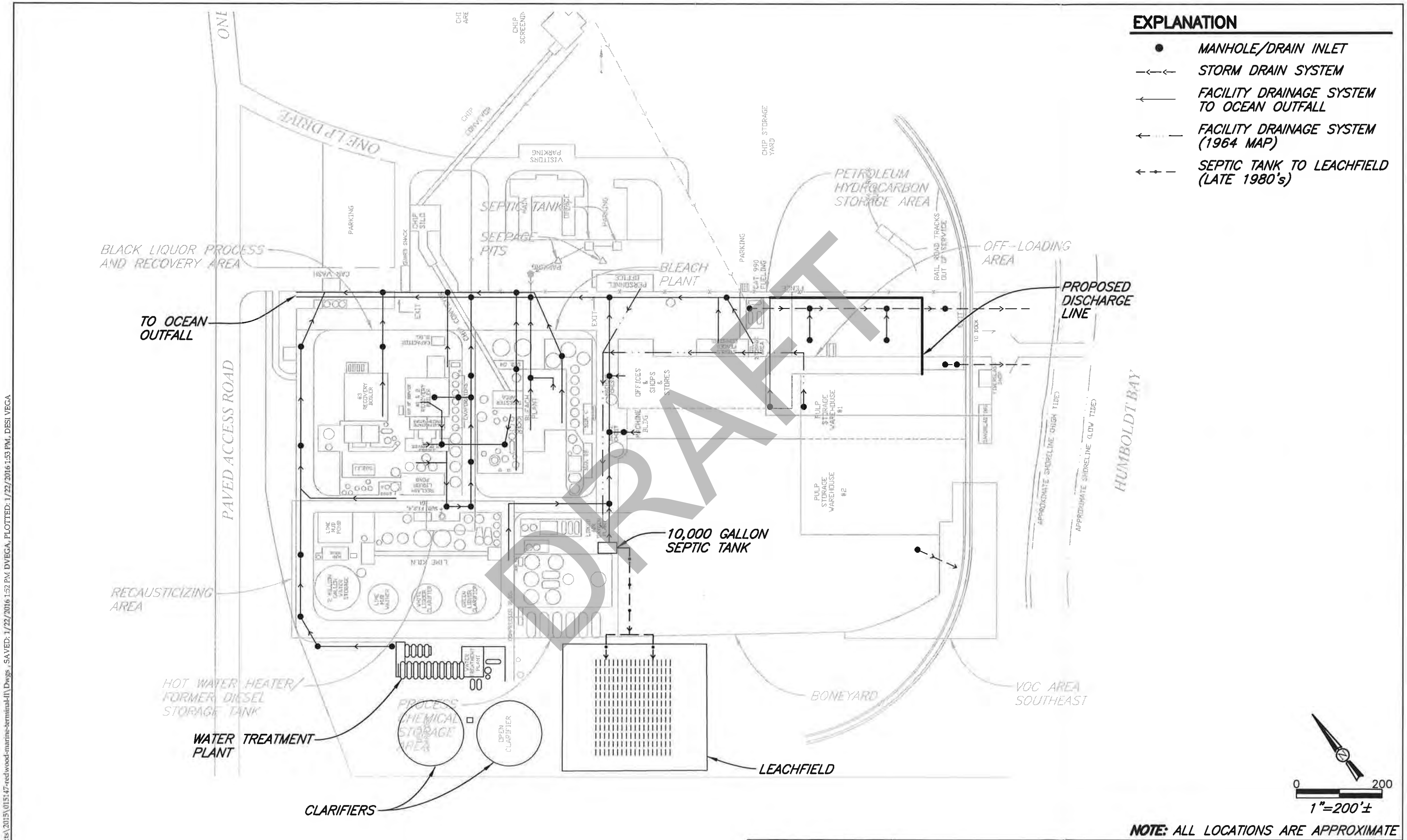

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SHN
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The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Aquaculture Discharge Line

SHN 015147

January 2016

015147-AQACLTR-DISCRG-LINE

Figure 10

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The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Eureka Alignment

SHN 015147

January 2016

015147-EKA-ALIGN

Figure 11

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The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Horizontal Directional Drill

SHN 015147

January 2016

015147-HDD-ALIGN

Figure 12

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SHN Consulting Engineers & Geologists, Inc.	The County of Humboldt Redwood Marine Terminal II Samoa, California		Fairhaven Alignment SHN 015147
	January 2016	015147-FRHVN-LONG-ALIGN	Figure 13

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SHN Consulting Engineers & Geologists, Inc.

The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Samoa Alignment

SHN 015147

January 2016

015147-SAMOA-ALIGN

Figure 14

SHN Consulting Engineers & Geologists, Inc.

The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Fairhaven Only Alignment

SHN 015147

January 2016

015147-FRHVN-ONLY-ALIGN

Figure 15

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7.0 Cost Analysis

Cost estimates presented in the following sections are for planning and feasibility assessment purposes only.

7.1 Permitting

This section addresses special studies, California Environmental Quality Act (CEQA) compliance, and permits anticipated to be needed for three potential project options: 1) the entire wastewater conveyance and ocean outfall disposal project discussed previously in this document 2) wastewater conveyance from Fairhaven and Samoa to RMT II including maintenance and repair of (and disposal through) the ocean outfall; and 3) maintenance and repair of the ocean outfall only.

7.1.1 Special Studies

A variety of special studies would be needed in support of the project engineering design, permit applications, and CEQA compliance. Necessary special studies would likely include many of the following, although the full range of required documentation would depend upon specific agency requirements following their review of detailed project applications. Not all of these studies may be required. Estimated cost ranges are very approximate given the current limitations on project definition and agency concerns. Estimated timeframes are provided per task; many timeframes would presumably overlap with the preparation of other special studies and the initiation of the permit processes. Table 4a presents anticipated special studies for the entire project. Table 4b presents anticipated special studies for wastewater conveyance from Fairhaven and Samoa to RMT II including maintenance and repair of (and disposal through) the ocean outfall. Table 4c presents anticipated special studies for maintenance and repair of the ocean outfall only.

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Table 4a
Anticipated Special Studies, Entire Project
RMT II Infrastructure Reuse Evaluation, Eureka, California

Special Study	Estimated Cost Range	Estimated Timeframe
Natural resources assessment	$6,000-$12,000	3-6 months
Biological assessment(s)	$6,000-$15,000	3-6 months
Wetland/riparian/other waters delineation	$6,000-$15,000	3-6 months
Biological mitigation, monitoring, and reporting plan	$5,000-$10,000	2-4 months
Cultural resources study	$6,000-$12,000	2-4 months
Greenhouse gas emissions analysis	$5,000-$10,000	2-4 months
Geotechnical report with hydraulic fracture analysis (Eureka effluent line only)	$40,000-$50,000	2-4 months
TOTAL	**$74,000-$124,000**	**3-9 months**

Table 4b Anticipated Special Studies, Wastewater Conveyance and Disposal from Fairhaven and Samoa to RMT II RMT II Infrastructure Reuse Evaluation, Eureka, California		
Special Study	**Estimated Cost Range**	**Estimated Timeframe**
Natural resources assessment	$6,000-$12,000	3-6 months
Biological assessment(s)	$6,000-$12,000	3-6 months
Wetland/riparian/other waters delineation	$6,000-$15,000	3-6 months
Biological mitigation, monitoring, and reporting plan	$5,000-$10,000	2-4 months
Cultural resources study	$6,000-$12,000	2-4 months
Greenhouse gas emissions analysis	$5,000-$10,000	2-4 months
TOTAL	**$34,000-$71,000**	**3-9 months**

Table 4c Anticipated Special Studies, Ocean Outfall Maintenance/Repair Only RMT II Infrastructure Reuse Evaluation, Eureka, California		
Special Study	**Estimated Cost Range**	**Estimated Timeframe**
Biological assessment(s)	$5,000-$10,000	2-4 months
TOTAL	**$5,000-$10,000**	**2-4 months**

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Natural Resources Assessment. The natural resources assessment would characterize the environmental setting and habitat at the site, query databases for special status species and habitats reported in the project vicinity, and assess the project's potential impacts to special status species and habitats. It would also include seasonally-appropriate floristic survey(s) if applicable, which need to occur during spring-summer, depending upon the species of concern. The 3- to 6-month timeframe assumes that the natural resources assessment fieldwork would be conducted during the appropriate time of year. The cost of the natural resources assessment would be higher the more variety of habitat types is involved and the larger the project footprint.

Biological Assessment(s). The U.S. Army Corps of Engineers (ACOE) typically consults with National Marine Fisheries Service (NMFS) and/or U.S. Fish & Wildlife Service (USFWS) regarding impacts to federally listed species and their habitats (such as, salmonids and certain whales). For actions that "may affect" federally listed species, these agencies require preparation of a biological assessment. Depending on which species are involved, biological assessments may need to be prepared for both NMFS and USFWS. Biological assessment(s) are anticipated to be needed regardless of which project element(s) go forward. The cost would be higher depending on how many federally listed species require Section 7 consultation and whether consultation with one or both the NMFS and USFWS are required.

Wetland/Riparian/Other Waters Delineation. A delineation of wetlands, riparian areas, and/or other jurisdictional waters will be needed if the project involves work in or near such features. The delineation would be used to quantify the project's impacts to jurisdictional waters pursuant to permitting and CEQA compliance. The cost would be higher with more potential wetlands/waters present.

Biological Mitigation, Monitoring, and Reporting Plan. Impacts to special status species, wetlands, and/or other jurisdictional waters may require mitigation to meet agency permit requirements. This may include revegetation efforts or other mitigation plantings, which would need to be monitored for a period of typically five years with annual reporting to the agencies. The biological mitigation, monitoring, and reporting plan would detail necessary mitigation efforts, and would be made a condition of approval of the various permits. A biological mitigation, monitoring, and reporting plan may be needed for any ground disturbing project element, depending on biological impacts. The cost would be higher with more biological impacts.

Cultural Resources Study. Agency requirements would likely include the preparation of a cultural resources study, which would investigate the project's potential to have an adverse effect on historical, archaeological, or paleontological resources. A cultural resources study would likely be required for any project involving ground disturbing activity, especially in previously undisturbed locations. The cost would be higher the more ground disturbance is included.

Greenhouse Gas Emissions Analysis. The CEQA lead agency may require an analysis of the project's contributions to greenhouse gas (GHG) emissions, pursuant to CEQA compliance. GHG emissions from both construction and operation would be considered. The cost of GHG analysis would be higher with inclusion of more project elements.

Geotechnical Report with Hydraulic Fracture Analysis. A geotechnical report with hydraulic fracture analysis would be needed for appropriate design of the HDD and identification of appropriate mitigation measures for potential hydraulic fracture. This study would only be needed for project elements involving HDD (at this time, limited to conveyance of Eureka's wastewater under Humboldt Bay).

7.1.2 California Environmental Quality Act

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CEQA compliance would occur concurrently with the permit processes, but permitting agencies will need a completed CEQA document prior to issuing permit approvals. The most likely CEQA lead agency for the entire project would be the HBHRCD, a state funding agency, or the RWQCB. For the wastewater conveyances from Fairhaven and Samoa to RMT II only or ocean outfall repair/maintenance only, the most likely CEQA lead agency would be the HBHRCD.

The most likely CEQA documentation for the entire project or for the wastewater conveyances from Fairhaven and Samoa to RMT II only would be an initial study/mitigated negative declaration, which could cost $10,000-$20,000 plus necessary special studies (described above). If the lead agency determines that an environmental impact report (EIR) is required, the cost would be substantially higher. The most likely CEQA documentation for the ocean outfall repair/maintenance only would be a categorical exemption (class 1 existing facilities, Class 2 replacement or reconstruction, and/or Class 4 minor alterations to land) which could cost $1,000-$2,000 plus any necessary special study (described above).

The CEQA cost would be higher with the full project and lower with a reduced scope project. The CEQA cost is subject to numerous uncertainties at this stage given the current limitations on project definition, site-specific conditions, and agency concerns.

It is noted that the CEQA documentation and associated costs discussed here are understood to be for the wastewater conveyance and ocean outfall disposal project discussed previously in this document (the entire project or portions thereof). CEQA compliance for potential aquaculture project(s), dredging project(s), and/or other development project(s) would likely require additional or separate CEQA compliance.

7.1.3 Permitting

Permits or approvals required for the project are expected to include, but are not necessarily limited to, the following: Table 5a presents anticipated permits and authorizations for the entire project. Table 5b presents anticipated permits and authorizations for wastewater conveyance from Fairhaven and Samoa to RMT II including maintenance and repair of (and disposal through) the ocean outfall. Table 5c presents anticipated permits and authorizations for maintenance and repair of the ocean outfall only.

Table 5a
Anticipated Permits and Authorizations, Entire Project
RMT II Infrastructure Reuse Evaluation, Eureka, California

Agency	Permit/Authorization	Estimated Cost Range[1]	Estimated Timeframe[2]
US Army Corps of Engineers	Section 404/Section 10 Permit	\$5,000-\$10,000	6-12 months
USFWS[3]	Biological Opinion	\$3,000-\$9,000	3-9 months
NMFS[4]	Biological Opinion	\$3,000-\$9,000	3-9 months
RWQCB[5]	Section 401 Water Quality Certification	\$8,000-\$16,000	3-6 months
RWQCB	NPDES[6] Permit(s)	\$30,000-\$60,000	6-12 months
SWRCB[7]	Construction General Permit	\$5,000-\$8,000	1-2 months
CDFW[8]	Streambed Alteration Agreement	\$6,000-\$12,000	3-6 months
CA Coastal Commission	Coastal Development Permit (consolidated[9])	\$15,000-\$50,000	6-12 months
CA State Lands Commission	CSLC[10] Lease	\$6,000-\$9,000	3-6 months
HBHRCD[11]	Harbor District Development Permit	\$3,000-\$6,000	3-6 months
City of Eureka	Conditional Use Permit	\$8,000-\$13,000	3-6 months
County of Humboldt	Conditional Use Permit	\$8,000-\$13,000	3-6 months
TOTAL		**\$100,000-\$215,000**	**9-18 months**

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Table 5a
Anticipated Permits and Authorizations, Entire Project
RMT II Infrastructure Reuse Evaluation, Eureka, California

Agency	Permit/Authorization	Estimated Cost Range[1]	Estimated Timeframe[2]

1. Estimated cost ranges include estimated agency permit fees (ACOE-$100 fee; RWQCB 401-$3,000 fee; RWQCB NPDES-$2,000 fee; SWRCB-$700 fee; CDFW-$1,500 fee; California Coastal Commission-$6,000 fee; CSLC-$3,000 fee; HBHRCD-$100 fee; City-$3,000 fee; County-$3,000 fee)
2. Timeframes provided are following submission of a complete permit application.
3. USFWS: United States Fish and Wildlife Service
4. NMFS: National Marine Fisheries Service
5. RWQCB: North Coast Regional Water Quality Control Board
6. NPDES: National Pollutant Discharge Elimination System
7. SWRCB: State Water Resources Control Board
8. CDFW: California Department of Fish & Wildlife
9. Coastal development permits from California Coastal Commission, City of Eureka, and/or County of Humboldt would be consolidated to the California Coastal Commission
10. CSLC: California State Lands Commission
11. HBHRCD: Humboldt Bay Harbor, Recreation and Conservation District

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Table 5b
Anticipated Permits and Authorizations, Wastewater Conveyance and Disposal from Fairhaven and Samoa to RMT II
RMT II Infrastructure Reuse Evaluation, Eureka, California

Agency	Permit/Authorization	Estimated Cost Range[1]	Estimated Timeframe[2]
US Army Corps of Engineers	Section 404/Section 10 Permit	$4,000-$8,000	6-12 months
USFWS[3]	Biological Opinion	$3,000-$6,000	3-9 months
NMFS[4]	Biological Opinion	$3,000-$6,000	3-9 months
RWQCB[5]	Section 401 Water Quality Certification	$8,000-$14,000	3-6 months
RWQCB	NPDES[6] Permit(s)	$30,000-$60,000	6-12 months
SWRCB[7]	Construction General Permit	$5,000-$8,000	1-2 months
CDFW[8]	Streambed Alteration Agreement	$6,000-$12,000	3-6 months
CA Coastal Commission	Coastal Development Permit (consolidated[9])	$15,000-$40,000	6-12 months
CA State Lands Commission	CSLC[10] Lease	$6,000-$9,000	3-6 months
County of Humboldt	Conditional Use Permit	$8,000-$13,000	3-6 months
	TOTAL	**$88,000-$176,000**	**9-18 months**

Table 5b
Anticipated Permits and Authorizations, Wastewater Conveyance and Disposal from Fairhaven and Samoa to RMT II
RMT II Infrastructure Reuse Evaluation, Eureka, California

Agency	Permit/Authorization	Estimated Cost Range[1]	Estimated Timeframe[2]

1. Estimated cost ranges include estimated agency permit fees (ACOE-$100 fee; RWQCB 401-$3,000 fee; RWQCB NPDES-$2,000 fee; SWRCB-$700 fee; CDFW-$1,500 fee; California Coastal Commission-$6,000 fee; County-$3,000 fee)
2. Timeframes provided are following submission of a complete permit application.
3. USFWS: United States Fish and Wildlife Service
4. NMFS: National Marine Fisheries Service
5. RWQCB: North Coast Regional Water Quality Control Board
6. NPDES: National Pollutant Discharge Elimination System
7. SWRCB: State Water Resources Control Board
8. CDFW: California Department of Fish & Wildlife
9. Coastal development permits from California Coastal Commission and County of Humboldt would be consolidated to the California Coastal Commission
10. CSLC: California State Lands Commission

Table 5c
Anticipated Permits and Authorizations, Ocean Outfall Maintenance/Repair Only
RMT II Infrastructure Reuse Evaluation, Eureka, California

Agency	Permit/Authorization	Estimated Cost Range[1]	Estimated Timeframe[2]
US Army Corps of Engineers	Section 404/Section 10 Permit	$4,000-$8,000	6-12 months
USFWS[3]	Biological Opinion	$3,000-$6,000	3-9 months
NMFS[4]	Biological Opinion	$3,000-$6,000	3-9 months
RWQCB[5]	Section 401 Water Quality Certification	$8,000-$12,000	3-6 months
RWQCB	NPDES[6] Permit(s)	$30,000-$60,000	6-12 months
CA Coastal Commission	Coastal Development Permit (or waiver)	$10,000-$35,000	4-12 months
CA State Lands Commission	CSLC[7] Lease	$6,000-$9,000	3-6 months
	TOTAL	**$64,000-$136,000**	**9-18 months**

1. Estimated cost ranges include estimated agency permit fees (ACOE-$100 fee; RWQCB 401-$3,000 fee; RWQCB NPDES-$2,000 fee; California Coastal Commission-$1,000-$6,000 fee)
2. Timeframes provided are following submission of a complete permit application.
3. USFWS: United States Fish and Wildlife Service
4. NMFS: National Marine Fisheries Service
5. RWQCB: North Coast Regional Water Quality Control Board
6. NPDES: National Pollutant Discharge Elimination System
7. CSLC: California State Lands Commission

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Actual permitting requirements will depend upon detailed project information and additional coordination with the various agencies. Estimated cost ranges are very approximate given the current limitations on project definition and agency concerns. Estimated timeframes would presumably overlap during the permitting processes.

ACOE Section 404/Section 10 Permit. An ACOE Clean Water Act Section 404/Section 10 permit would be required if the project were to involve filling of or work in Waters of the U.S. As part of its permit process, the ACOE typically consults with NMFS and/or USFWS regarding impacts to federally listed species and their habitats (such as, salmonids and certain whales). For this project, an ACOE permit is anticipated to be needed regardless of which project element(s) go forward. Work at the ocean outfall, HDD under Humboldt Bay, and/or impacts to other jurisdictional surface waters or wetlands would all trigger the need for an ACOE permit. The cost would be affected by how many federally listed species require Section 7 consultation, whether one or both the NMFS and USFWS require consultations, and whether Section 7 consultation is informal or formal.

USFWS Biological Opinion. A biological opinion would be required from USFWS if the ACOE/ USFWS's Section 7 Endangered Species Act consultation proceeds to formal consultation. The cost would be affected by how many federally listed species require Section 7 consultation with USFWS.

NMFS Biological Opinion. A biological opinion would be required from NMFS if the ACOE/ NMFS's Section 7 Endangered Species Act consultation proceeds to formal consultation. The cost would be affected by how many federally listed species require Section 7 consultation with NMFS.

RWQCB Section 401 Water Quality Certification. An RWQCB Clean Water Act Section 401 water quality certification would be required if an ACOE permit were required or if the project were to involve filling of or work in Waters of the State. For this project, a water quality certification is anticipated to be needed regardless of which project element(s) go forward. The cost would be affected by the magnitude of the permit fee, which is impact-dependant.

RWQCB NPDES Permit(s). NPDES permits, also referred to as waste discharge requirements, are issued to regulate the discharge of municipal wastewater or industrial process, cleaning, or cooling, wastewaters; commercial wastewater; treated groundwater from cleanup projects; or other wastes to surface waters (in this case; the Pacific Ocean). It is anticipated that various potential users will provide appropriate treatment and discharge through the single (joint) ocean outfall owned and operated by HBHRCD.

There has been a variety of approaches by regulatory agencies to this type of situation. As is the case for this project, when one entity owns the outfall (and may discharge its own effluent), but the outfall is used for multiple discharges, each discharge would have a separate NPDES discharge permit. Each effluent would need to meet water quality standards (WQS) independently. In some cases, there may be a trade-off between discharges that allows one effluent to exceed WQS if the combined discharge meets WQS. However, because various discharges for this project are yet to be determined and may come online at different times, the actual permitting process is not clear. One approach would be to apply for permits for individual discharges as needed, and modifying existing permits as needed at the time the new discharger is permitted, with the objective being to synchronize the permit expiration dates. However, as each discharge is added, consultation with the RWQCB would be required to determine the process to be followed. For this project, NPDES permitting is anticipated to be needed regardless of which project element(s) go forward. The cost would be affected by the number of NPDES permits required and the extent of necessary effluent and receiving water characterization and specific calculations.

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SWRCB Construction General Permit. The project will require coverage under the SWRCB construction general permit (including preparation of a stormwater pollution prevention plan) if it involves one acre or more of ground disturbance.

California Department of Fish & Wildlife (CDFW) Streambed Alteration Agreement. Fish and Game Code Section 1602 requires an entity to notify the CDFW prior to commencing any activity that may do one or more of the following:

- substantially divert or obstruct the natural flow of any river, stream, or lake;
- substantially change or use any material from the bed, channel, or bank of any river, stream, or lake; and/or
- deposit debris, waste, or other materials that could pass into any river, stream, or lake.

CDFW requires a Lake and Streambed Alteration (LSA) Agreement when it determines that the activity, as described in a complete LSA Notification, may substantially adversely affect existing fish or wildlife resources. LSA Notification is anticipated to be required if any project element involves work in a CDFW-jurisdictional watercourse or ditch (or its associated riparian vegetation). However, there is a low probability that this project would require an LSA and streambed alteration agreement. The cost would be affected by the magnitude of the permit fee, which is project-cost-dependant.

CA Coastal Commission Coastal Development Permit. The full project includes components located within the coastal development permit (CDP) jurisdiction of the Coastal Commission, County of Humboldt, and City of Eureka. Regardless of which project element(s) may go forward, the CDP process is expected to be consolidated to the Coastal Commission resulting in a single CDP. The permit fee and level of effort required to demonstrate project consistency with the California Coastal Act are difficult to predict, resulting in the wide cost range.

California State Lands Commission (CSLC) Lease. The CSLC’s jurisdiction includes the beds of California's naturally navigable rivers, lakes, and streams, as well as the State's tide and submerged lands that extend from the shoreline out to three miles offshore. Therefore a CSLC lease is anticipated to be required for the HDD under Humboldt Bay and potentially for the use of the ocean outfall if a SLCS lease is not already in place for that. The $3,000 fee estimate is based on a public agency lease; however if CSLC determines the project is commercial or industrial, the fee could be $25,000.

HBHRCD Development Permit. A development permit from HBHRCD may be required depending on what entity is the project proponent and what project element(s) go forward. The cost also depends on what project element(s) go forward.

City of Eureka Conditional Use Permit. A conditional use permit from City of Eureka may be required for the pipeline section within the City limits. If the project did not include that element, this permit would be unnecessary.

County of Humboldt Conditional Use Permit. A County conditional use permit may be required for the pipeline sections within County jurisdiction. However, if the project is seen as exclusively a municipal/public project, this permit may not be required.

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7.2 Offsite Wastewater Sources

Offsite wastewater sources originate from several communities on the Samoa peninsula, and the City of Eureka. The HBHRCD would not be responsible for paying for the improvements (effluent lines and effluent pump stations) and associated permitting listed in this section for the offsite wastewater sources. In addition, the HBHRCD would receive fees from these communities for the use of the outfall structure. The rate the HBHRCD would assess each community would be based on the each community's proportional share of the total volume discharged (averaged over a year) and the HBHRCD's operation and maintenance costs of the ocean outfall and MH-5 effluent pump station, and reserves necessary for eventual replacement of the outfall and effluent pumps.

Infrastructure costs to dispose of treated effluent from offsite wastewater sources are detailed in Table 6.

Table 6
Infrastructure Estimated Costs, Offsite Water Users
RMT II Infrastructure Reuse Evaluation, Eureka, California

Name	Description	Unit	Quantity	Unit Cost	Total Cost
Eureka Line	30-inch line	ft(1)	4,800	$ 500	$ 2,400,000
Samoa Line	4-inch line	ft	4,000	$ 90	$ 360,000
Fairhaven Line	30-inch line	ft	10,000	$ 500	$ 5,000,000
Horizontal Direction Drill	30-inch line	ft	3,200	$ 700	$ 2,240,000
Samoa Pump Station	Site Work	LS2	1	$ 10,000	$ 10,000
	Wet well	LS	1	$ 20,000	$ 20,000
	Mechanical	LS	1	$ 20,000	$ 20,000
	Electrical	LS	1	$ 5,000	$ 5,000
Fairhaven Pump Station	Site Work	LS2	1	$ 10,000	$ 10,000
	Wet well	LS	1	$ 15,000	$ 15,000
	Mechanical	LS	1	$ 20,000	$ 20,000
	Electrical	LS	1	$ 5,000	$ 5,000
Eureka Pump Station	Site Work	LS	1	$ 25,000	$ 25,000
	Wet well	LS	1	$ 100,000	$ 100,000
	Mechanical	LS	1	$ 350,000	$ 350,000
	Electrical	LS	1	$ 75,000	$ 75,000
				Subtotal	$ 10,655,000
				Mobilization (10%)	$ 1,065,000
				Contingency (20%)	$ 2,130,000
				Engineering (20%)	$ 2,130,000
				Total Cost	**$ 15,980,000**

1. ft. feet
2. LS: lump sum

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Table 7 details costs to install infrastructure for the communities of Fairhaven and Samoa if the City of Eureka does not use the ocean outfall at RMT II.

Table 7
Infrastructure Costs, Fairhaven and Samoa
RMT II Infrastructure Reuse Evaluation, Eureka, California

Name	Description	Unit	Quantity	Unit Cost	Total Cost
Fairhaven Line	4-inch line	ft[1]	7,000	$ 90	$ 630,000
Fairhaven Pump Station	Site Work	LS[2]	1	$ 10,000	$ 10,000
	Wet well	LS	1	$ 15,000	$ 15,000
	Mechanical	LS	1	$ 20,000	$ 20,000
	Electrical	LS	1	$ 5,000	$ 5,000
Samoa Line	4-inch line	ft	4,000	$ 90	$ 360,000
Samoa Pump Station	Site Work	LS[2]	1	$ 10,000	$ 10,000
	Wet well	LS	1	$ 20,000	$ 20,000
	Mechanical	LS	1	$ 20,000	$ 20,000
	Electrical	LS	1	$ 5,000	$ 5,000
				Subtotal	**$ 1,095,000**
				Mobilization (10%)	$ 109,500
				Contingency (20%)	$ 219,000
				Engineering (20%)	$ 219,000
				Total Cost	**$ 1,642,500**

1. ft. feet
2. LS: lump sum

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7.3 Onsite Wastewater Sources

Cost estimates for various onsite wastewater sources of the existing infrastructure are presented in the following sections. All costs are for planning and feasibility purposes only.

7.3.1 Dredge Spoils

7.3.1.1 MicroFloc Water Treatment System

Estimated costs to dewater dredge spoils using the onsite wastewater treatment system are summarized in Tables 8 and 9. Table 8 summarizes full costs to rehabilitate the MicroFloc system, including clarifiers and filters. Table 9 lists the cost of components to rehabilitate the clarifiers only. This cost assumes that the clarifier effluent meets regulatory requirements for turbidity without filtration. Costs do not include permitting costs for discharge of supernatant or disposal of solids following dewatering. It is assumed that repairs to filters will be minor and existing media is in usable condition.

Table 8a
Dredge Spoils Processing, MicroFloc Rehabilitation Costs–Clarifiers and Filters
RMT II Infrastructure Reuse Evaluation, Eureka, California

Description	Units	Quantity	Unit Cost	Cost
Empty & clean clarifier tanks	LS[1]	1	$ 10,000	$ 10,000
Remove & store two bridge/collector mechanisms	LS	1	$ 20,000	$ 20,000
Perforated plate covers over sludge hoppers	EA[2]	2	$ 1,500	$ 3,000
18" layer rock on clarifier floors	CY[3]	1,960	$ 40	$ 78,400
Perforated pipe laterals; 6″ diameter	LF[4]	720	$ 20	$ 14,400
Geotextile fabric, installed	SY[5]	4,100	$ 5.00	$ 20,500
Dredge discharge pipe connections	LS	1	$ 15,000	$ 15,000
Excavator access ramps	LS	1	$ 8,000	$ 8,000
Supernatant pump systems, piping	EA	2	$ 10,000	$ 20,000
Pipe from waste sump to clarifier effluent sump; 6"	LF	60	$ 55	$ 3,300
Backwash pumps	EA	2	$ 8,000	$ 16,000
Refurbish two filter feed pumps	LS	2	$ 4,000	$ 8,000
Backwash supply piping; 18"	LF	200	$ 170	$ 34,000
Backwash valves	EA	3	$ 5,000	$ 15,000
Backwash waste piping to flash mix basin; 18"	LF	20	$ 170	$ 3,400
Filter controls package	LS	1	$ 30,000	$ 30,000
Filter valve overhaul	LS	1	$ 10,000	$ 10,000
Miscellaneous improvements filter system	LS	1	$ 40,000	$ 40,000
			Subtotal	$349,000
			Mobilization (10%)	$ 34,900
			Contingency (20%)	$ 69,800
			Engineering (20%)	$ 69,800
			Total Cost	**$ 523,500**

1. LS: lump sum
2. EA: each
3. CY: cubic yard
4. LF: linear foot
5. SY: square yard

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Table 8b
Dredge Spoils Processing, MicroFloc Rehabilitation Costs–No Filtration Required
RMT II Infrastructure Reuse Evaluation, Eureka, California

Description	Units	Quantity	Unit Cost	Cost
Empty & clean clarifier tanks	LS[1]	1	$ 10,000	$ 10,000
Remove & store two bridge/collector mechanisms	LS	1	$ 20,000	$ 20,000
Perforated plate covers over sludge hoppers	EA[2]	2	$ 1,500	$ 3,000
18" layer rock on clarifier floors	CY[3]	1,960	$ 40	$ 78,400
Perforated pipe laterals; 6″ diameter	LF[4]	720	$ 20	$ 14,400
Geotextile fabric, installed	SY[5]	4,100	$ 5.00	$ 20,500
Dredge discharge pipe connections	LS	1	$ 15,000	$ 15,000
Excavator access ramps	LS	1	$ 8,000	$ 8,000
Supernatant pump systems, piping	EA	2	$ 10,000	$ 20,000
Pipe from waste sump to clarifier effluent sump; 6"	LF	60	$ 55	$ 3,300
		Subtotal		$192,600
		Mobilization (10%)		$ 19,260
		Contingency (20%)		$ 38,520
		Engineering (20%)		$ 38,520
		Total Cost		**$ 288,900**

1. LS: lump sum
2. EA: each
3. CY: cubic yard
4. LF: linear foot
5. SY: square yard

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7.3.1.2 Geotubes

Estimated costs to dewater dredge spoils using geotubes are provided in Table 9. Costs do not include additional infrastructure that may be required to meet discharge limitations for turbidity, disposal of sediment following dewatering, or potential permitting costs. Polymer requirements vary significantly depending on the chemical makeup and solids content of the slurry, and require a bench test of dredge spoils to for a final estimate.

An NPDES permit will be required for the discharge of water from dredge spoils if polymer is used, or the dredge spoils are processed in any way for offsite use.

Table 9 Dredge Spoils Processing, Geotube Costs RMT II Infrastructure Reuse Evaluation, Eureka, California				
Description	**Units**	**Quantity**	**Unit Cost**	**Cost**
Geotubes (950 CY[1] capacity)	EA[2]	32	$ 11,200	$ 358,400
Polymer	tote	10	$ 6,500	$ 65,000
Geotube supervisor	days	60	$ 2,800	$ 168,000
Polymer Skid	month	2	$ 29,200	$ 58,400
Geosynthetic Liner	SF[3]	175,000	$ 0.85	$ 148,750
Earthwork	LS[4]	1	$ 150,000	$ 150,000
		Subtotal		$ 948,550
		Mobilization (10%)		$ 94,850
		Contingency (20%)		$ 189,700
		Engineering (5%)		$ 47,450
		Total Cost		**$1,280,550**

1. CY: cubic yard
2. EA: each
3. SF: square feet
4. LS: lump sum

7.3.2 Aquaculture

The existing leachfield can accept up to 8,500 gpd of aquaculture flows. Any flow in excess of 8,500 gpd would need to be routed to the ocean outfall.

Estimated costs associated with wastewater disposal for increased aquaculture operations at RMT II are summarized in Table 10. Necessary infrastructure will include the settling tank discussed in Section 5.0, a discharge line, and manhole and pumps in MH-5. Costs for the rehabilitation of the ocean outfall are discussed in Section 7.4.

Table 10 Aquaculture Wastewater Disposal Infrastructure Costs RMT II Infrastructure Reuse Evaluation, Eureka, California				
Description	**Units**	**Quantity**	**Unit Cost**	**Cost**
Settling Tank	LS[1]	1	$ 50,000	$ 50,000
Proposed Drain Line	LF[2]	500	$ 150	$ 75,000
New Manhole	LS	1	$ 10,000	$ 10,000
		Subtotal		$ 135,000
		Mobilization (10%)		$ 13,500
		Contingency (20%)		$ 27,000
		Engineering (20%)		$ 27,000
		Total Cost		**$ 202,500**

1. LS: lump sum
2. LF: linear feet

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7.4 Ocean Outfall

Table 11 presents the estimated costs for complete cleaning and rehabilitation of the ocean outfall. Costs are based on MMDiving's rate of $14,750 per 10-hour day, operating from the HBHRCD's Fire 1 vessel. This daily rate has been averaged to include the weekend rate, due to the uncertain nature of daily conditions. The estimate includes three days for exposing the diffuser section; ten days for clearing the diffuser internally; and five days to inspect, take a cathodic protection reading, and install anodes for cathodic protection. An additional 30-percent contingency for inclement weather delays has been applied in order to hedge against the frequent unstable operating weather.

Table 11
Ocean Outfall Rehabilitation Costs
RMT II Infrastructure Reuse Evaluation, Eureka, California

Description	Units	Quantity	Unit Cost	Cost
Expose Diffuser Section	Days(1)	3	$ 14,750	$ 44,250
Clear Diffuser Internally	Days	10	$ 14,750	$147,500
Inspect, Take CP Readings, Install Cathodic Protection	Days	5	$ 14,750	$ 73,750
Mobilization/Demobilization	LS(2)	1	$ 10,000	$ 10,000
Internal Jet Fabrication & Consumables	LS	1	$ 5,000	$ 5,000
Inclement Weather Contingency (30%)	LS	1	$ 84,000	$ 84,000
MH-5 Pumps[3]	LS	1	$ 220,000	$ 220,000
			Subtotal	$ 584,500
			Mobilization (10%)	$ 58,400
			Contingency (20%)	$ 116,800
			Engineering (20%)	$ 116,800
			Total Cost	$ 876,750

1. MM Diving Rate w/Harbor District's Fire 1 Vessel per 10 hr day
2. LS: lump sum
3. MH-5 pumps required only when flows to ocean outfall exceed 15 million gallons per day.

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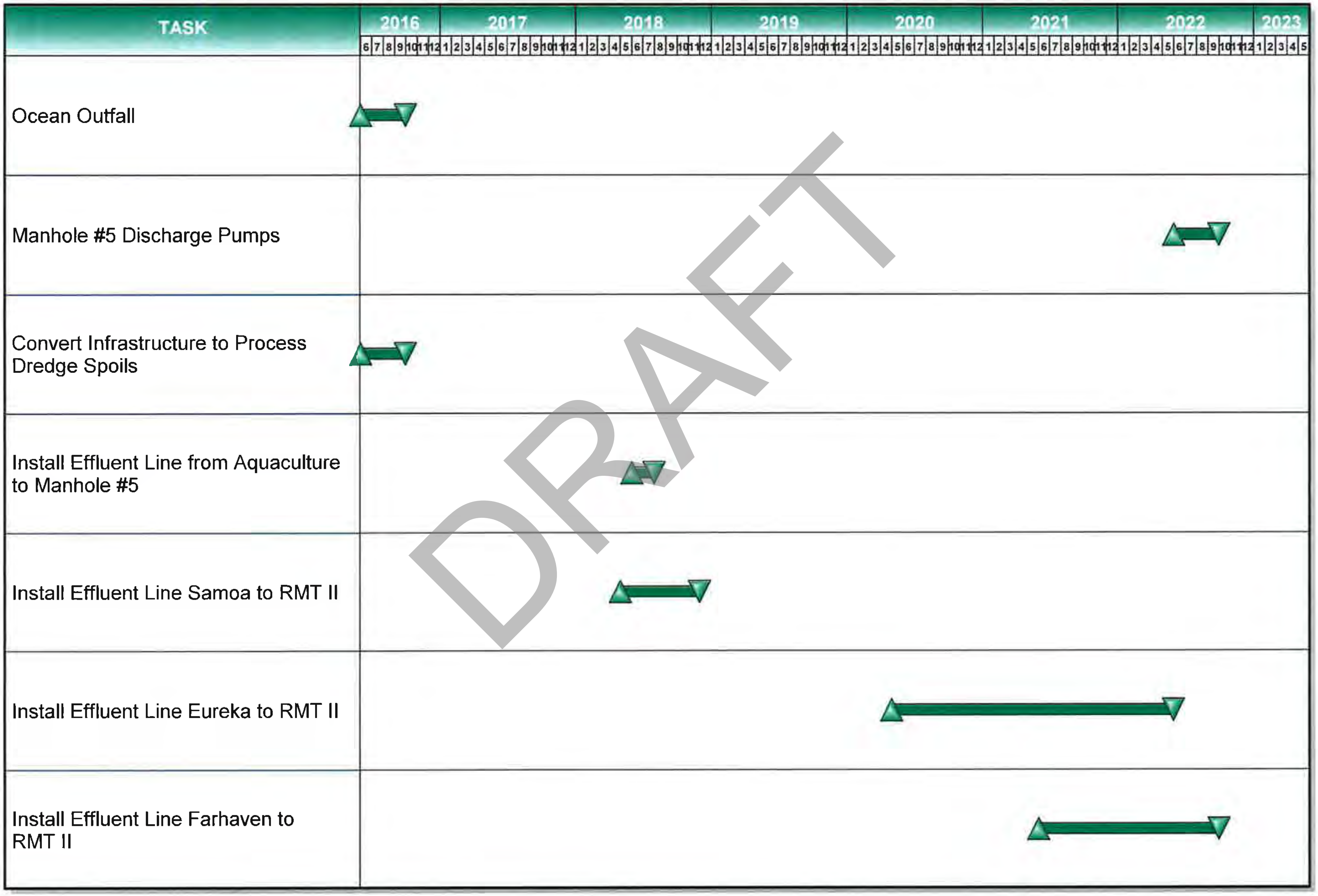
8.0 Proposed Schedule

Figure 16 presents a proposed schedule of when anticipated discharges would be added. Please note these are only anticipated time lines and many factors that are beyond the HBHRCD's control influence the proposed schedules.

8.1 Rehabilitation of Ocean Outfall and MH-5

Work on the ocean outfall is based upon when the expanded discharges will be added. If the outfall will be used to discharge treated water from dredging operations in Fall 2016, then the outfall rehabilitation should occur this summer. Otherwise, the HBHRCD should link the ocean outfall repair to the addition of the Samoa discharge or the expansion of aquaculture discharge when it exceeds the 8,500 gpd limit of the existing leachfield.

Figure 16
Proposed Schedule
Wastewater Infrastructure RMT II



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The repair to the two 350-hp discharge pumps at MH-5 will only be necessary when the cumulative discharge in the outfall reaches 15 MGD. The only discharge options that would require rehabilitation of the outfall pumps are the City of Eureka discharging treated effluent to the ocean outfall or onsite aquaculture operations approaching 15 MGD. For the purposes of this study, we anticipate rehabilitation of the ocean outfall pumps in 2022.

8.2 Onsite Wastewater Sources

8.2.1 Aquaculture

Currently, all waste discharges from onsite aquaculture operations discharge to the existing leachfield are estimated to be 2,400 gpd. If the HBHRCD elects to expand aquaculture operations beyond the capacity of the existing leachfield (approximately 8,500 gpd) the HBHRCD would need to discharge aquaculture effluent to the ocean outfall. It is anticipated the HBHRCD would start using the ocean outfall for aquaculture waste in 2018.

8.2.2 Dewatering Dredge Spoils

The HBHRCD recently purchased a cutterhead suction dredge and is in the process of permitting a pilot scale dredging and dewatering operation. If permitting for maintenance dredging of Humboldt Bay is in place, the HBHRCD anticipates using the RMT II facility to dewater dredge material as soon as Fall 2016.

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8.3 Offsite Wastewater Sources

8.3.1 Samoa

The community of Samoa is very interested in discharging its treated effluent to the ocean outfall. Preliminary discussions with the HBHRCD have already occurred. Assuming the town of Samoa decides to pursue the ocean outfall alternative by this spring and begin permitting and design, Samoa could begin construction in Spring 2018 and be online by Fall 2018.

8.3.2 Fairhaven

Currently, there is no requirement for the community of Fairhaven to upgrade its method of wastewater disposal (on site). It is assumed for this study, that Fairhaven would participate with the City of Eureka if Eureka were to install an effluent line to the ocean outfall. For this study, we have assumed this would occur in 2022.

8.3.3 Eureka

Currently, the City of Eureka discharges to Humboldt Bay during an outgoing (ebb) tide. At this time, the City is not interested in extending a wastewater effluent line to the ocean outfall. However, the RWQCB has expressed interest in the City pursuing use of the ocean outfall option. If the City were to pursue this alternative, it would take several years to permit, design, and install the effluent line from Eureka to Samoa. For this study, we have assumed a period of 5 years for that process. Assuming the City initiates this alternative in 2017, the estimated timeline for the City to discharge into the ocean outfall would be in 2022.

9.0 Summary

Several potential onsite and offsite uses were evaluated for use of existing infrastructure at RMT II. In addition, we evaluated what improvements would be required for the potential uses; associated planning level costs were presented in Section 7.0.

9.1 Existing Infrastructure

Existing infrastructure at RMT II has reuse potential for discharge of treated wastewater effluent, processing of dredge spoils, and aquaculture activities. All potential uses require investment in infrastructure and coordination with various regulatory agencies to acquire necessary permits.

9.2 Aquaculture

Aquaculture facilities are currently operating at the site. Wastewater from these operations is discharged to the existing septic tank and leachfield system. The existing leachfield capacity is approximately 8,500 gpd. Expanded aquaculture operations producing more than 8,500 gpd would require infrastructure improvements, including rehabilitation of the existing ocean outfall; the addition of a solids settling tank; a discharge line; and, for flows exceeding 15 MGD, pumps for MH-5.

Based on the estimated flow required per kilogram of fish and the waste loadings produced by finfish operations, solids, total nitrogen, and total phosphorous concentrations in the discharge would be well below limits set by the Ocean Plan. Therefore, nutrient treatment would not be required for finfish operations, and bivalve production may be exempt from NPDES permitting requirements.

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9.3 Dredge Spoils Processing

Disposal of approximately 30,000 cubic yards of solids is required as part of annual dredging operations in Humboldt Bay. Two options for dredge spoils processing were examined in this report. The first option would use the existing onsite MicroFloc water treatment system. This option would alternate pumping of dredge slurry between the two existing clarifiers, then filtering the supernatant using three of the existing filters. The supernatant would be discharged through the ocean outfall, and the solids would be excavated from the clarifiers and either stored elsewhere onsite, or sent off site for disposal. The second option would use geotubes to dewater dredge spoils, and either pump supernatant to the ocean outfall or return it to the bay through standard stormwater BMPs. Planning level cost estimates are presented in Section 7.0.

Both options for dredge spoils processing may require the use of a coagulant to reduce effluent turbidity below relevant limits. The ocean plan requires discharge turbidity to be below 75 NTUs, which corresponds to approximately 75 mg/L TSS. The use of a coagulant may require the discharge to be regulated by an NPDES permit. Please note that construction of a temporary storage site for dredge material dewatering was not evaluated.

9.4 Offsite Water Sources

The ocean outfall at RMT II can be used as a disposal point for treated wastewater effluent from surrounding communities. Expected quantities and characteristics of treated effluent were estimated for the City of Eureka, and the communities of Samoa and Fairhaven (Section 4.0). Required infrastructure for each line is discussed in detail in Section 6.0, but generally includes pipelines from each community to MH-5 at the RMT II, and pumping facilities commensurate with expected flows from each community. Installation of a pipeline from the City of Eureka would include installation of a pipeline below Humboldt Bay using HDD.

Permitting the installation of pipelines is fairly complex, and requires permits from numerous agencies. Most permits take anywhere from 1 to 12 months, but it is assumed that the application process for most permits would occur concurrently. Most permits are required regardless of which portions of the project are implemented, although costs are reduced if the project scope is reduced.

Each individual community would be responsible for costs associated with installation of pipelines from their community. Individual communities also would be responsible for maintaining individual NPDES permits and meeting required effluent standards.

9.5 Outfall

The existing ocean outfall is an approximately 1.5-mile long, 48-inch diameter pipe with 144 diffuser ports. It is currently used to discharge approximately 170,000 gpd of process water from DG Fairhaven Power. The total hydraulic capacity of the outfall is estimated at 40 MGD, for discharges with a salinity less than 30 psu. Expanded use of the outfall will require cleaning and rehabilitation of the existing diffuser ports. Estimated costs for the rehabilitation are presented in Section 7.4.

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10.0 References

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1988, LP Pulp Mill Plan and Location Drawing

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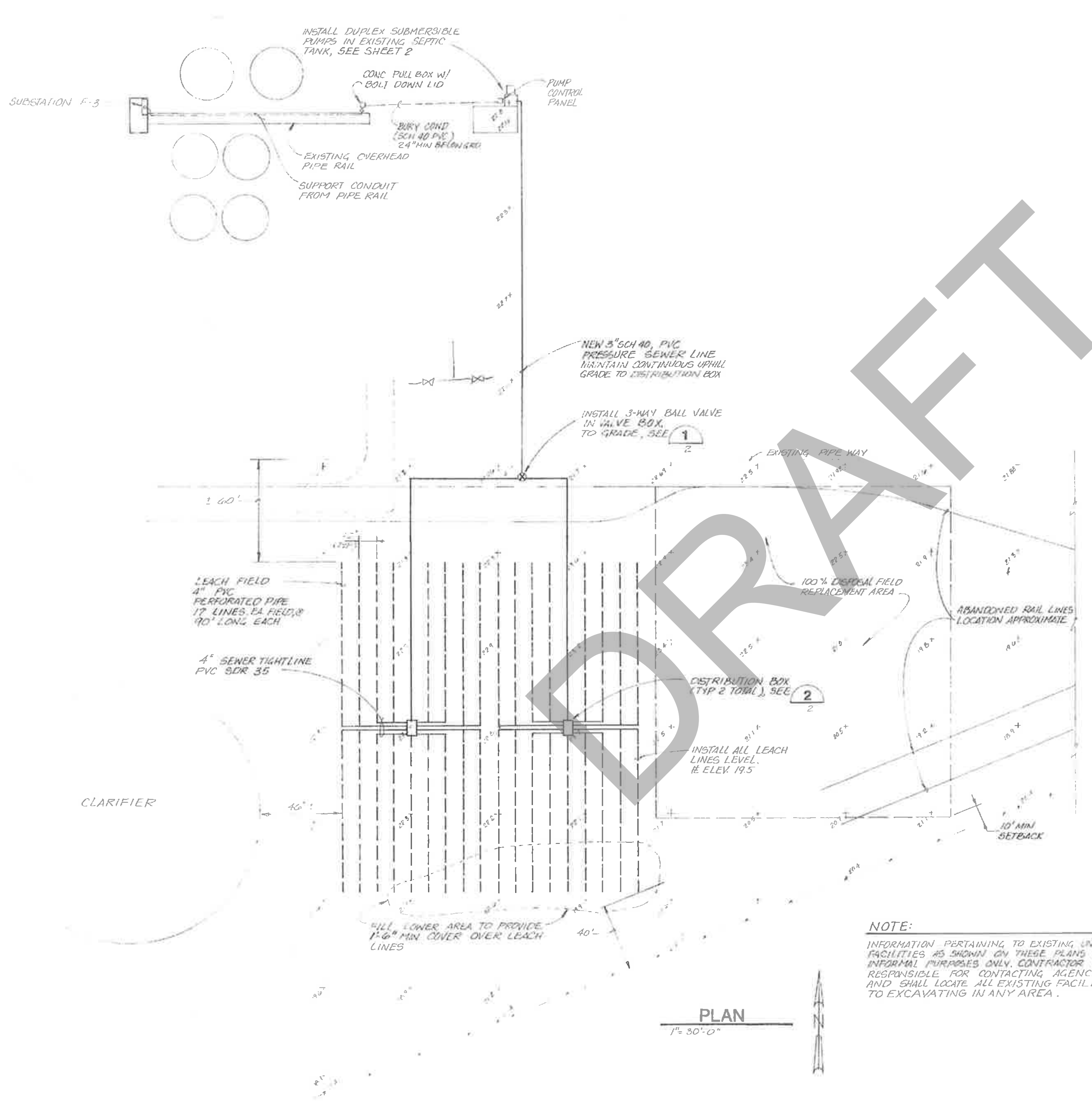
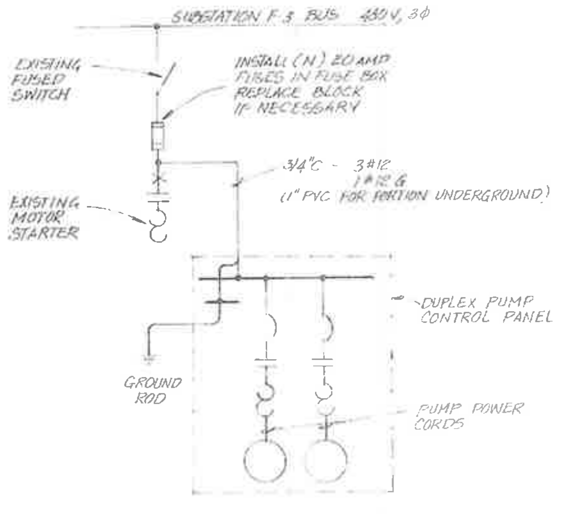
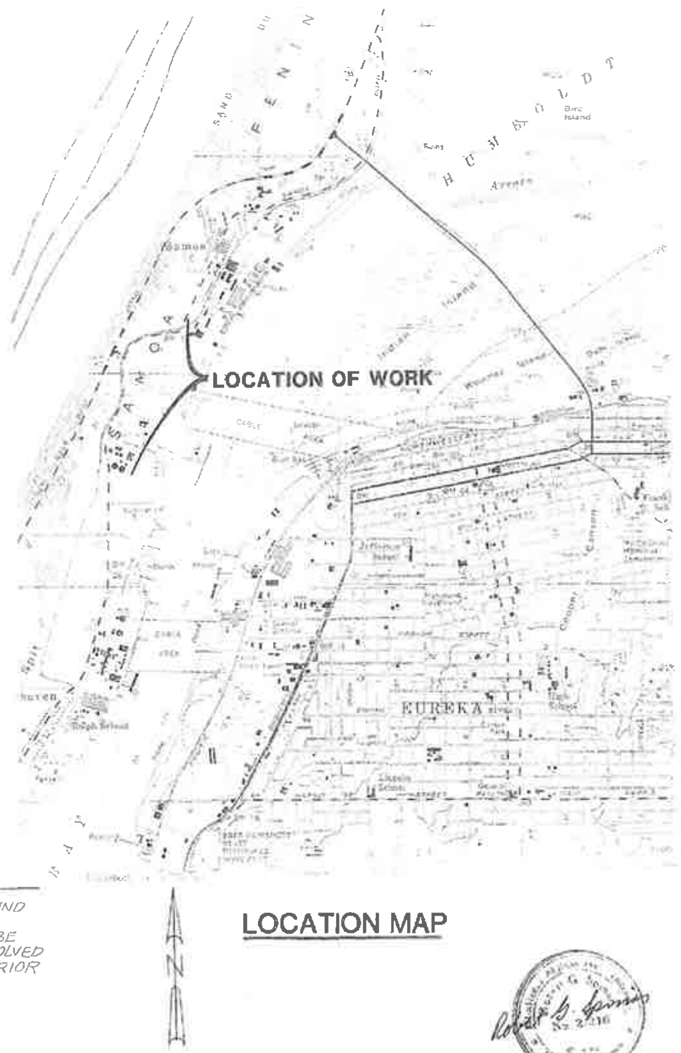


PLAN
1"=30'-0"

NOTE:
INFORMATION PERTAINING TO EXISTING UNDERGROUND FACILITIES AS SHOWN ON THESE PLANS IS FOR INFORMAL PURPOSES ONLY. CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING AGENCIES INVOLVED AND SHALL LOCATE ALL EXISTING FACILITIES PRIOR TO EXCAVATING IN ANY AREA.



ELECTRICAL ONE-LINE DIAGRAM



LOCATION MAP

Exp 12/31/87

SHN
SELVAGE • HEBER • NELSON & ASSOCIATES
CONSULTING ENGINEERS (707) 444 0427
2600 HARRISON AVE. EUREKA, CA. 95501

LOUISIANA-PACIFIC CORPORATION
PULP MILL LEACHFIELD
AND PUMP STATION
PLAN & LOCATION

RS/HM
PB
RS

1 of 3

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B

HWE Preliminary Review of Existing MicroFloc Treatment System

DRAFT

HEMPHILL water engineering

Memorandum

To: Mike Foget, PE/SHN Consulting Engineers and Geologists, Inc.

From: Brian Hemphill
Project: Redwood Marine Terminal II

CC:

Date: January 15, 2016
Job No:

Re: Preliminary Review of Existing Microfloc Treatment System

DRAFT

INTRODUCTION

This memorandum presents the results of the preliminary inspection of the existing Microfloc industrial wastewater treatment system at the Samoa facility. This is a part of the overall assessment of infrastructure at the site, and development of potential future uses.

A site visit was conducted on September 28, 2015. It consisted of a walk-through of the site and treatment facilities. No internal inspections were completed; these are deferred to a later point at which specific potential uses have been identified and a detailed condition assessment will be required.

SYSTEM DESIGN BASIS

Some of the original design documents were found at the site. These reveal that the system was originally designed in 1966 for the Georgia-Pacific paper mill. A simplified flow schematic of the system is provided in Figure 1 on the following page.

The system includes a chemical feed system; two large clarifiers to settle solids; ten horizontal pressure filters to further remove fine solids; four softeners that remove dissolved solids from filtered water; and a sea water filter intended to produce water to regenerate the softeners. The softening system is designed to treat a portion of the filtered water. The fully softened product is blended with filter effluent, which results in a partially softened water that is suitable for general process requirements.

The system was designed for a nominal capacity of 30 million gallons per day (mgd), which is equivalent to 20,800 gallons per minute (gpm). Peak flow capacity is 25,000 gpm.

Other pertinent design parameters taken from design documentation are provided in Table 1.

FIGURE 1. MICROFLOC TREATMENT SYSTEM SCHMATIC

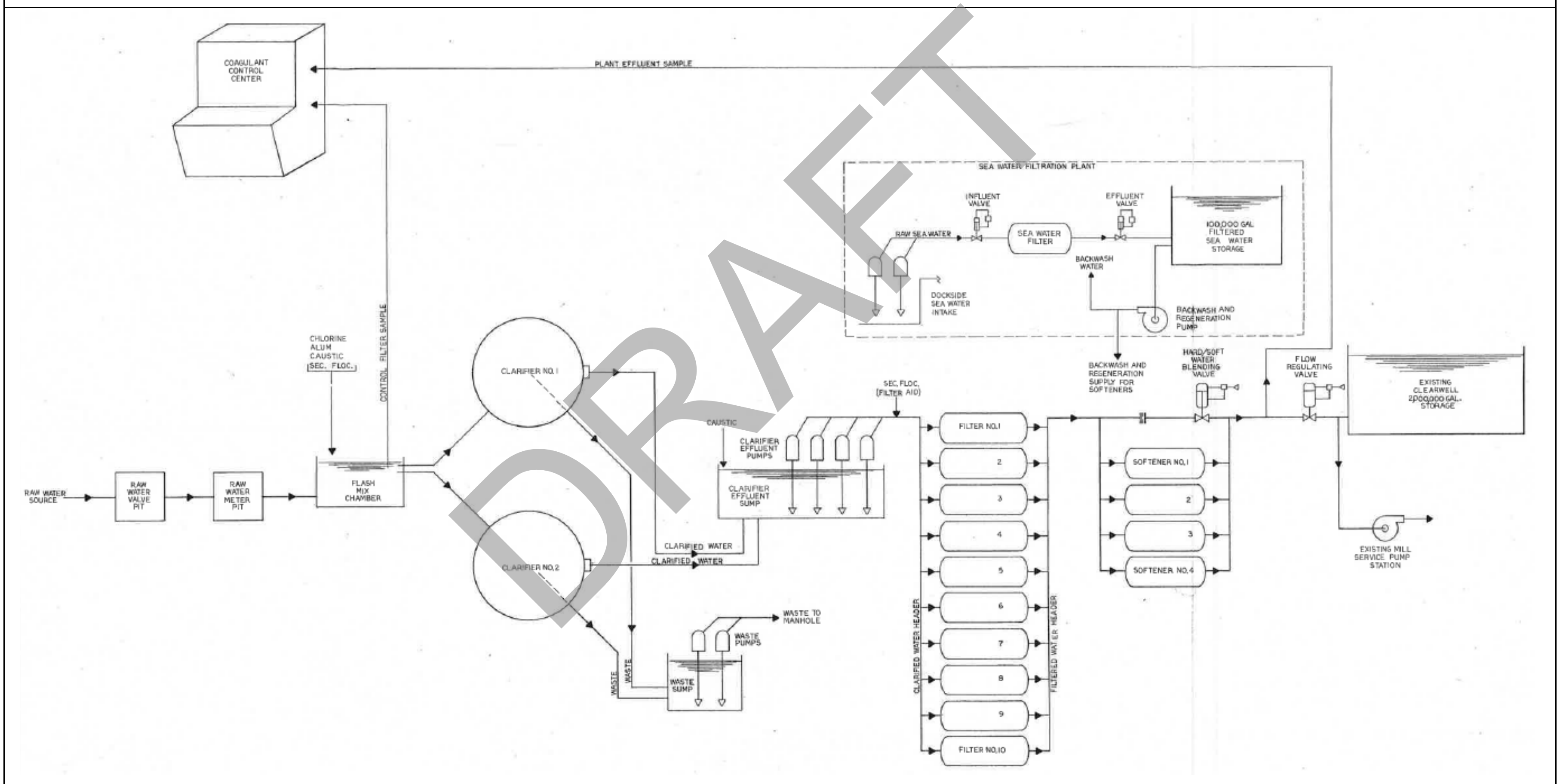

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TABLE 1. WATER TREATMENT SYSTEM DESIGN SUMMARY	
PROCESS EQUIPMENT	
Number of Clarifiers	2
Diameter	150 ft.
Sidewater Depth	8.0 ft.
Total Clarifier Surface Area	35,343 sq. ft.
Clarifier Volume, Each	1,470,000 gallons
Number of Filters	10
Filter Dimensions	10' diameter x 37' long
Total Filter Surface Area	3,700 sq. ft.
Design Capacity, Nominal @ Load Rate	20,800 gpm @ 5.6 gpm/ sq. ft.
Design Capacity, Maximum	25,000 gpm @ 6.7 gpm/ sq. ft.

The design documentation states that the design influent loading for the filters was 100 NTU (nephelometric turbidity units), which would typically correspond to about 100 mg/l of suspended solids.

The system employs the method of using filter effluent as the source of backwash water. This avoids the need for a storage tank for filtered water and separate backwash supply pumps, and is common in installations with multiple independent filters. However, this method requires that at least four other filters are operating while another is in backwash, since the required backwash water flow rate is typically 3-5 times the filter effluent flow.

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ASSESSMENT OF SYSTEM CONDITION

The system was assessed by means of a walk-through. It is reported to not having been operational since 2008. It was not possible to operate any of the machinery.

The system is equipped throughout with pneumatically-actuated butterfly valves, which is typical for this type of system. It appears that many of the valves are original, and some have been replaced. The piping galleries, valves, and related equipment appear to be in reasonably good condition.

The control system is as supplied in the 1960s, based on electromechanical control devices and pneumatically powered instruments and actuators. The panels appear to be significantly corroded, and it should be assumed that the control devices themselves are no longer serviceable. Even if they were, they are obsolete. Any future operation should assume replacement of the controls and field instruments (such as level and pressure sensors) with modern digital devices.

It was not feasible to inspect the internals of the pressure filters because of difficult access conditions and the requirement to observe confined space entry procedures. It was reported that the filters were in normal service when the plant was shut down in 2008, with the expectation that they would be restarted. It turned out that they were not restarted. It is reasonable to assume that the filter media and underdrain system in the filters are still in operable condition. This would need to be confirmed based on an internal inspection of the tanks and the filter media. It is probably reasonable to assume that most of the valves would be operable following a minor rebuild.

The condition of the softening system is more difficult to assess. The longevity of the resin in the filters is unknown. To be safe, it should be assumed that the resin would be replaced if it is to be used again for softening.

SYSTEM CAPABILITIES

The combination of clarifiers and pressure filters provides a robust treatment system that could produce high quality water from a wide range of contaminated feed streams. This system is designed to remove suspended particles, including very small particles and certain dissolved organic and inorganic substances (such as natural color and dissolved iron and manganese) that can be coagulated or precipitated using chemical treatment such as alum or ferric chloride.

The design surface loading rate of 5.6 gpm/sq. ft. (nominal) is conservative by modern design standards, so the rated capacity of 30 mgd would be valid for most applications.

Specific applications need to be carefully reviewed.

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C

CH2M Diffuser Performance Assessment

DRAFT

Final

Diffuser Performance Assessment Report for the Redwood Marine Terminal II Ocean Outfall

DRAFT

Prepared for:

County of Humboldt and
Humboldt Bay Harbor, Recreation and Conservation District

Project Funding Provided by:
HUD Community Development Block Grant 14-CDBG-9890

February 2016

ch2m
2525 Airpark Drive
Redding, CA 96001

Contents

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Acronyms and Abbreviations

°C	degrees Celsius
cfs	cubic feet per second
DGPS	differential global positioning system
EPA	U.S. Environmental Protection Agency
ft	feet
fpsec	feet per second
in	inches
m	meters
m/s	meters per second
MGD	million gallons per day
NPDES	National Pollutant Discharge Elimination System
NOAA	National Oceanic and Atmospheric Administration
Psi	Pounds per square inch
psu	practical salinity units
TM	technical memorandum

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SECTION 1.0

Introduction

CH2M has conducted a planning-level feasibility analysis of the use of the Redwood Marine Terminal II (RMT II) ocean outfall/diffuser system to dispose of process wastewater under varying effluent flow, salinity, and temperature ranges. The Humboldt Bay Harbor, Recreation and Conservation District (HBHRCD) is interested in utilizing the ocean outfall/diffuser system for the purposes of discharging effluent from a variety of possible municipal, commercial, and/or industrial clients. The exact makeup of the future clientele and of the effluent flow and characteristics is not yet fully known.

1.1 Purpose

This Technical Memorandum (TM) provides a planning level feasibility analysis of potential ocean outfall/diffuser performance (port velocities, head loss, and initial dilution) under a range of effluent conditions and diffuser configurations. This information will be used to assess potential future National Pollutant Discharge Elimination System (NPDES) permitting and mixing zone needs. It is anticipated that the range of effluent flows, effluent densities, and diffuser configurations (number of open ports) selected as model inputs will provide a sufficient range of effluent discharge conditions to demonstrate outfall suitability for the majority of potential outfall users.

Ambient receiving water conditions were based on existing receiving water hydrographic profiles collected around the outfall for a previous mixing zone assessment study. The report also documents the input variable selection of the hydraulic and dilution models used in the assessment and the corresponding results demonstrating diffuser performance.

1.2 Background

The headworks of the ocean outfall are located on the Samoa Peninsula between Humboldt Bay and the Pacific Ocean near Eureka in Humboldt County, California (Figure 1). The outfall was formerly used to discharge approximately 15 million gallons per day (MGD) of treated industrial wastewater from the Evergreen Pulp Mill into the Pacific Ocean (Figure 2). A detailed description of the outfall and diffuser and provided in Section 2.1. At the time this TM was produced, the pulp mill facility was no longer in operation and the outfall was being used to dispose of less than 200,000 gallons per day of industrial process water from the DG Fairhaven Power Plant.

The HBHRCD is the current owner of the outfall, headworks, former Evergreen facility, and associated property. The HBHRCD has received HUD Community Development Block Grant funding to investigate potential future uses of the land, facilities, and outfall system. Possible uses include aquaculture/mariculture, consolidation of regional wastewater treatment plant effluent for disposal, temporary decanting and drying of dredge spoils, and industrial clients. This TM examines the performance of the ocean outfall's diffuser under the range of effluent flows and densities that could be anticipated with these potential discharges.

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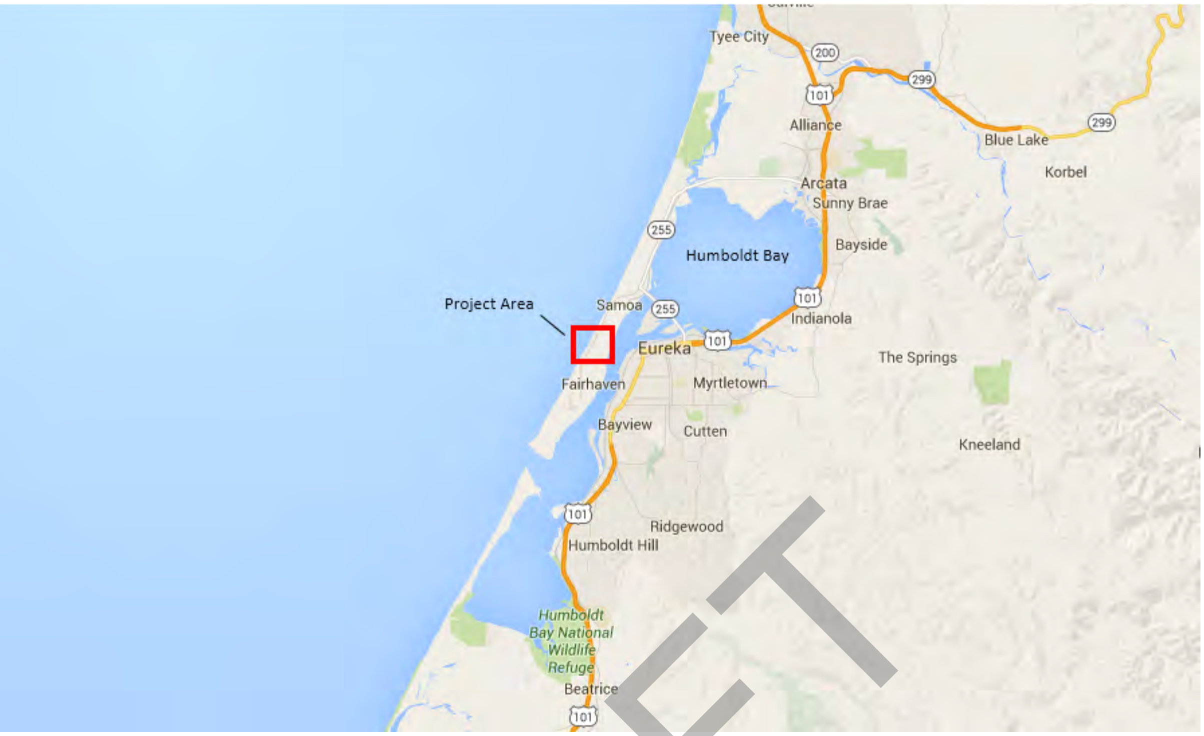

Figure 1. A map of the general area near Eureka, California, where the ocean outfall, outlined in red, is located.

Figure 2. A picture of the location of the RMT II ocean outfall and diffuser.

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1.3 Approach

The approach to evaluating the effectiveness and performance of an outfall/diffuser system used in this TM involves the following:

- Define the physical attributes of the existing outfall and diffuser system.
- Characterize the receiving water physical properties needed to evaluate diffuser performance.
- Characterize the effluent flow and properties of the potential discharge.
- Evaluate expected port velocities required to conform to the regulatory requirements of a high rate diffuser and the corresponding head required for the flow ranges considered. The model selected for use is CH2M's HYDRO model.
- Evaluate the expected dilution performance that such an outfall/diffuser system would provide using an initial dilution model. The model selected for use is the U.S. Environmental Protection Agency's UDKHDEN model.

1.4 Scope and Limitations

This TM is a planning-level feasibility evaluation. At the time of this analysis, the expected daily flow rate is unknown and will be dependent on the combined volume of future clients. In addition, the effluent density will be dependent on waste flows potentially from both freshwater and seawater effluent streams. As a result, a range of various effluent flows and salinities was modeled to allow greater flexibility in the utility of modeled results. Receiving water data needed for the model input came from existing data sets and no new field measurements were collected.

This document provides the rational for model input variable selection, model inputs used, and corresponding dilution and mixing zone dimensions. Calculation of parameter specific dilution is not addressed here and is dependent on effluent and receiving water concentrations of the specific parameter of interest. However, based on known effluent flow rate and density, the modeled dilution closest to the conditions of interest can be used to calculate final dilution or compare dilution required to predicted available dilution.

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SECTION 2.0

Model Selection and Input Requirements

The hydraulics of the existing diffuser were modeled using CH2M's HYDRO model for multiport diffusers. The results of this model provide the flow distributions through the ports and the head loss through the diffuser under varying effluent flows and numbers of open ports. The EPA's initial dilution model UDKHDEN was used to predict diffuser dilution performance. The model predicts the initial dilution and plume trapping level (depth below the surface) for each flow and port configuration considered. The dilution model also provides the Froude number (Frρ) for use in assessing seawater intrusion (back flooding and clearing requirements) and potential port wear. The remainder of this section addressed the model input data requirements for the models and values selected.

2.1 Outfall and Diffuser Description

The on-shore end of the outfall is located on the narrow North Spit of the Samoa Peninsula between the coast of the Pacific Ocean and the north arm of Humboldt Bay (Figure 1). Effluent would be discharged through an existing submerged outfall that is approximately 8,200 feet (2,497 m) long and terminates in an 852-foot (258-meter) multiport diffuser aligned perpendicular to the shoreline. The diffuser contains a total of 144 ports, each with a diameter of 2.4 inches Ports are paired, so that there are 72 ports on each side of the barrel (pipe) with a spacing of 12 feet (3.66 m) on center between ports (Figure 3). The diffuser has a 36-inch (0.91-m) internal diameter, and its ports discharge at a 45-degree vertical orientation, as shown on Figure 4. The diffuser is approximately 82 feet (25 meters maximum depth) below the surface.

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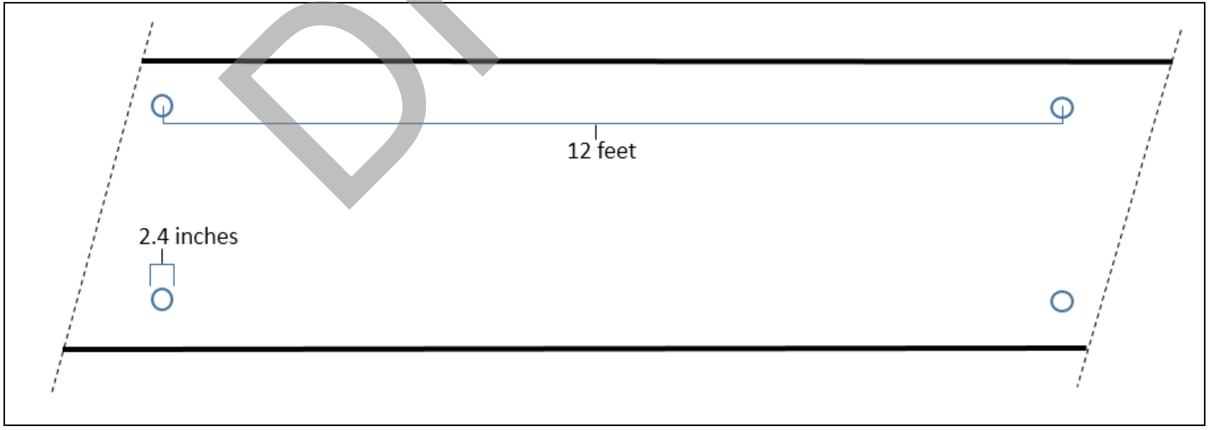

Figure 3. A plan view diagrams of a section of the diffuser showing port pairing, diameter, and spacing.

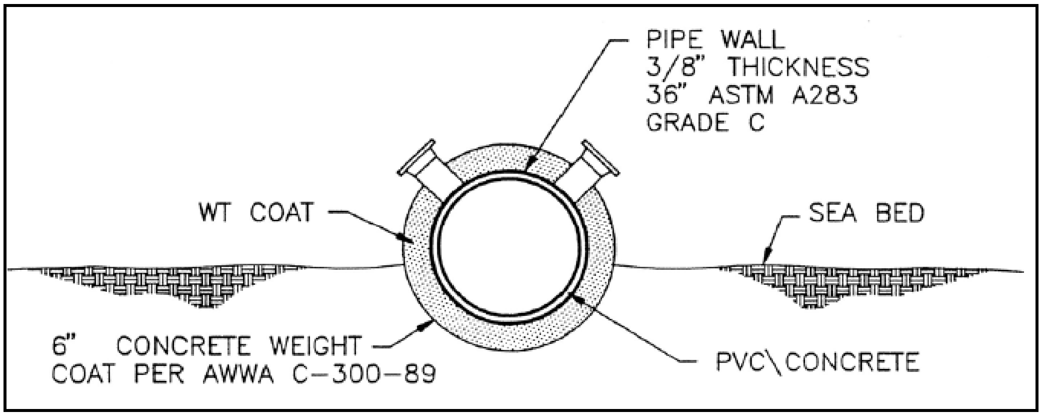

Figure 4. A diagram of the pipeline and diffuser cross-section showing pipe diameter and port orientation.

Model input variables use to characterize the diffuser include the following:

- Pipe diameter= 36-inch (0.91 m)
- Port diameter= 2.4-inch (0.06 m)
- Port elevation= 3.9 inches (0.01 m)
- Vertical Angle= 0
- Horizontal angle= 45 degrees (also exits at 135 degrees)
- Number of ports= 144 (72 on left side of pipe and 72 on right side in parallel)
- Port Spacing= 12 ft (3.66 m)
- Ave. port depth= 79 ft (24 m; range 22.9 to 25.0 m)

2.2 Receiving Water Hydrographic Data

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In 2007, CH2M performed a study of the dissolved oxygen (DO) and sediment effects of the outfall discharge when the outfall was used by Evergreen Pulp, Inc[1]. As part of that study, CH2M reviewed existing data records of hydrographic data collected in the vicinity of the outfall. Because that data had only limited utility for model application, CH2M also performed two field sampling surveys to collected higher quality, site-specific hydrographic data. A series of profiles and current measurements were collected in June and October 2007. No additional hydrographic profile or current data from the outfall is known to have been collected since this study. The data collected in 2007, representing two seasons and providing profile data from the depth of the diffuser to the surface, is considered the best available data and was therefore selected to be representative of ambient conditions for the purposes of model input data.

The profiles screened for use in the dilution model to represent ambient receiving water (seawater) conditions are provided in Attachment 1 and include density profiles, temperature profiles, and salinity profiles. The temperature and salinity data of Cast 1 from June 2007 were used for dilution modeling. This is the same profile used for dilution modeling in the 2007 Dissolved Oxygen study footnoted above. Salinity and temperature values used in the model are provided in Table 1.

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[1] CH2M. *2007 Receiving Water Monitoring Report – Evaluation of Dissolved Oxygen and Sediment Effects.* Prepared for Evergreen Pulp, Inc. Prepared by CH2M. December 2007.

Table 1. Salinity and Temperature Data Selected for the Dilution Model.

Depth* m	Salinity psu	Temperature °C	Depth* m	Salinity psu	Temperature °C
0	33.85	10.95	13	34.02	9.99
2	33.85	10.95	14	34.03	9.96
3	33.91	10.66	15	34.03	9.95
4	33.97	10.43	16	34.04	9.94
5	33.98	10.27	17	34.04	9.94
6	34.00	10.18	18	34.03	9.94
7	34.01	10.12	19	34.03	9.93
8	34.02	10.07	20	34.04	9.89
9	34.02	10.04	20	34.04	9.89
10	34.03	10.01	21	34.05	9.80
11	34.03	10.02	22	34.08	9.64
12	34.03	10.01	24	34.08	9.64

* Depth below the surface.

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2.2.1 Current Speed and Direction

During the 2007 dissolved oxygen study hydrographic profiling field event, current speed was estimated using speed and direction data recorded from drogue tracking. The depth averaged current speed was reported as 0.072 m/s. Drogue tracking data from the 2007 study are provided in Attachment 2. Coastal currents along the northern Californian coast generally trend southward and are dominated by the California Current (Figure 5). Although there can be near-shore counter-currents, the general current trend along the North Spit of the Samoa Peninsula would be expected to be parallel to the coastline which runs roughly north-south. The diffuser extends into the ocean perpendicular to the coastline which would result in currents running perpendicular to the diffuser (an angle of 90 degrees to the diffuser barrel).

Figure 5. A map of ocean current directions (NOAA).

Model input variables use to characterize the ambient currents include the following:

• Current speed	0.072 m/s
• Current direction	90 degrees (to diffuser)

2.3 Effluent Characteristics

Effluent flow, salinity, and temperature are required by the initial dilution model. Effluent volume (flow) and density (salinity and temperature) will depend on the wastewater contributors with which the HBHRCD partners to use the outfall.

Discharge through the diffuser is controlled by pipe diameter, port size, port discharge rate (port velocity), and the number of available ports. The maximum port diameter and number of ports are fixed at 2.4 inches and 144 ports, respectively. A minimum port velocity of 10 fps is generally required by the permitting agencies to meet the definition of a high rate diffuser. Port velocity can be calculated as follows:

Port velocity (per port) = flow (cfs) / total port area (in sq ft).

For example, using the existing port diameter with all ports open would yeild:

At 25 MGD (38.6817 cfs), 2.4 inch ports (0.2 ft), and 144 open ports would yield

Port velocity = 38.6817 cfs/(PI x (0.2 ft/2)^2) x 144) = 8.55 fps

At 30 MGD (46.4181 cfs), 2.4 inch ports (0.2 ft), and 144 open ports would yield

Port velocity = 46.4181 cfs/(PI x (0.2 ft/2)^2) x 144) = 10.26 fps

A table of port velocity vs. flow and number of ports is provided in Attachment 3. A summary of required number of open ports to achieve target port velocities at selected flow increments are provided in Section 3. Flow was modeled incrementally at 1, 5, 10, 15, 20, 25, 30, 35, and 40 MGD.

Dilution occurs as the effluent plume disperses after exiting the diffuser. Dilution is increased as the plume rises through the water column. Plume properties that increase plume rise, such as lower salinity and increased temperature compared to the receiving water, increase dilution. Conversely, effluent salinity and temperature that are similar to the receiving water salinity and temperature would reduce dilution. Effluent with a density greater than the receiving water could significantly reduce dilution and result in the plume contacting the seabed which can increase the complexity of NPDES permitting.

A series of effluent temperatures was selected ranging from 10°C (ambient seawater) to 25°C (potential industrial wastewater). Salinity input data ranged from 0.1 psu (predominantly freshwater) to 30 psu (predominantly seawater).

Model input variables use to characterize the effluent include the following:

• Flow	1, 5, 10, 15, 20, 25, 30, 35 and 40 MGD
• Temperature	10, 15, 20, 25, and 30 °C
• Salinity	0.1, 1, 10, 20, and 25 psu

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SECTION 3.0

Model Results

3.1 Port Velocity

The number of open ports on the diffuser controls the velocity of flow through each port. A high-rate diffuser is commonly defined by regulatory agencies as a diffuser with port velocities of ten feet per second or greater. However, port velocities in excess of roughly fifteen feet per second (fps) or greater can result in damage to the diffuser pipe and ports. As a result, the range of port velocities targeted in this study were between ten and fifteen feet per second.

Port velocities and the range of open ports ranging from numbers 1 to 144 (1 to 72 ports showing each port and 74 to 144 at paired port intervals) are provided for the selected flows (1, 5, 10, 15, 20, 25, 30, 35, and 40 MGD) in Attachment 3. Figure 6 provides a plot of port velocity (in MGD) vs. number of open ports for each flow increment. Boundaries for 10 and 15 fps are indicated. A summary of the range of open ports for each flow increment is provided in Table 2. It is noted that when the flow rate is held constant, port velocity decreases as additional ports are opened. This range of ports is then used to model head loss, Froude number, and dilution.

Table 2. Ranges of Port Velocities and Open Ports for Select Flows.

Flow Rate	Calculated Port Velocity Range	Range of Open Ports
MGD	fps	count
1	9.85 to 16.42	5 to 3
5	10.26 to 15.39	24 to 16
10	10.05 to 14.92	49 to 33
15	9.98 to 15.08	74 to 49
20	10.05 to 14.92	98 to 66
25	10.09 to 15.02	122 to 82
30	10.26 to 15.08	144 to 98
35	11.97 to 15.12	144 to 114
40	13.68 to 14.92	144 to 132
45	>15.39	144

Table 2 provides averaged port velocities. Minor variation in individual ports is expected and the variation increases with the number of open ports. In addition, differences in density (that is temperature and salinity) can also generate minor differences in port velocity. The model HYDRO was used to evaluate individual port velocities and assess variation attributed to temperature and salinity for the ranges considered in this TM. Attachment 4 provides the summary of minimum, maximum, and average port velocities

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for 0.1 psu and 30 psu and 10°C and 25°C cases for each flow rate. At the maximum flow rate (40 MGD) and greatest temperature and salinity, the variation in port velocity was less than 6 percent of the average port velocity.

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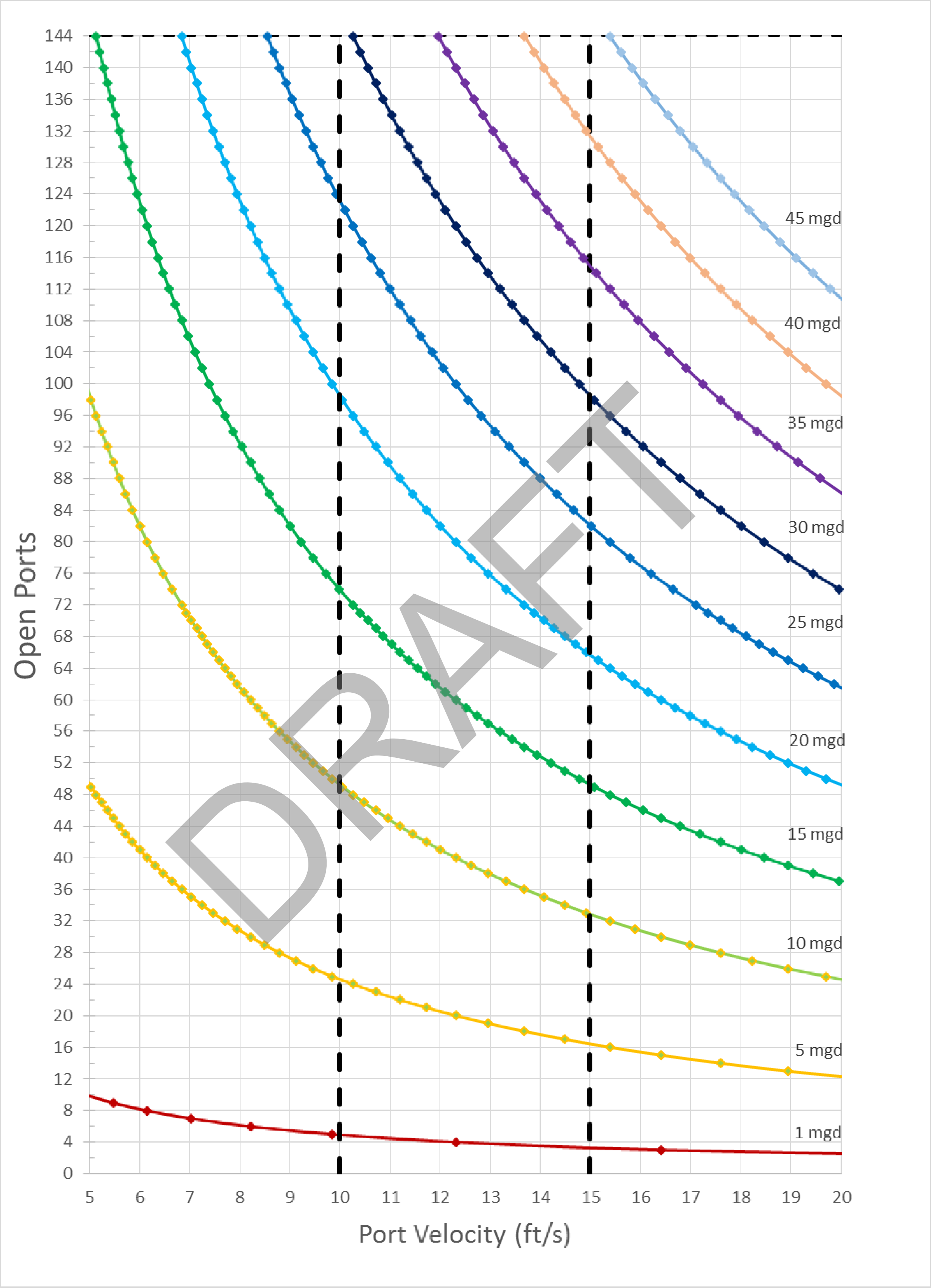

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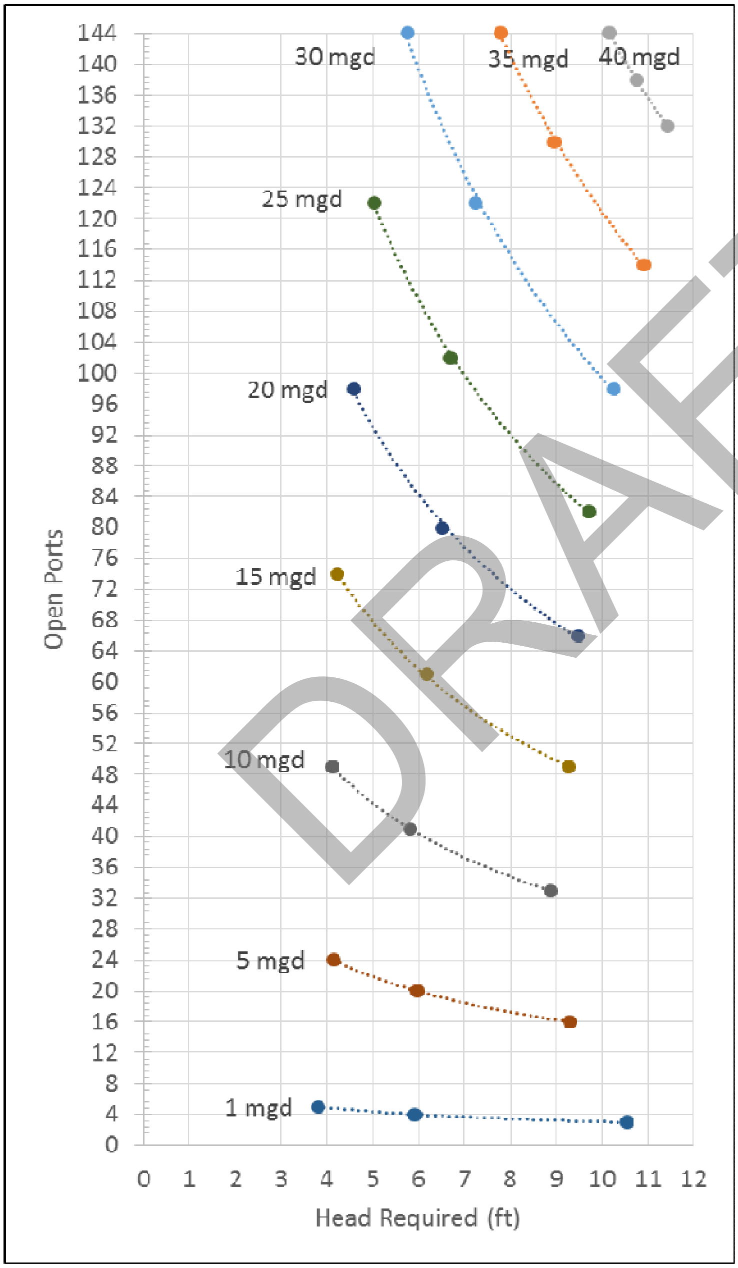
Figure 6. Port Velocities vs. Open Ports for Modeled Flow Increments.

3.2 Head Loss

The model HYDRO was used to calculate head loss (required head) for the flow, salinity, and temperature cases assessed. Variation in head loss attributed to temperature and salinity for a given discharge rate where insignificant at less than 0.02 feet (see Attachment 4 for individual values). Figure 7 provides the required head and pressure based on flow increments modeled.



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Flow (MGD)	Open Ports	Head (feet)	Pressure (psi)
1	3	10.55	4.57
	4	5.93	2.57
	5	3.80	1.65
5	16	9.30	4.03
	20	5.97	2.58
	24	4.15	1.80
10	33	8.87	3.84
	41	5.81	2.52
	49	4.12	1.78
15	49	9.27	4.01
	61	6.17	2.67
	74	4.22	1.83
20	66	9.47	4.10
	80	6.51	2.82
	98	4.58	1.98
25	82	9.72	4.21
	102	6.69	2.90
	122	5.04	2.18
30	98	10.26	4.44
	122	7.25	3.14
	144	5.75	2.49
35	114	10.90	4.72
	130	8.97	3.88
	144	7.78	3.37
40	132	11.42	4.94
	138	10.74	4.65
	144	10.15	4.39

Figure 7. Required Head and Pressure for Model Flow Rates

3.3 UDKHDEN Model Results

Dilution modeling was performed for a range of flows up to 40 MGD starting at 1 MGD and increasing at 5 MGD increments from 5 to 40 MGD. The maximum flow of 40 MGD was selected based both on port velocity assessment and the hydraulic limitation of the diffuser with all ports open. For each flow increment, three diffuser configurations (number of open ports) were selected to bracket target port velocities. The number of open ports that yielded port velocities closest to 10 fps and 15 fps, respectively (refer to Table 2), and a port configuration of approximately midway between the two selected. For each flow increment and port configuration, salinity and temperature were varied to provide a representative range of effluent densities. As described above, salinity increments consisted of 0.1, 1, 10, 20, and 30 psu and temperature ranges consisted of 10, 15, 20, and 25ºC.

A total of 520 model runs were performed. Individual model run outputs are provided on CD. Model run name, flow, number of ports, salinity, temperature, port spacing, and resulting Froude number, trapping level, and dilution are listed in Attachment 5. Mixing zone size associated with a given model run are included in the model output files but were not summarized for this planning level study.

Effluent salinity has a more significant effect on dilution than does temperature at the ranges selected. Therefore data assessment and data presentation are in terms of dilution vs salinity. A summary of the range of open ports, trapping levels, and dilution that could be expected for a given flow under modeled salinity ranges are provided in Table 3. Graphical representation of the modeled dilution for each salinity and temperature range are provided in Figures 8 through 16.

High-rate diffusers are generally designed to provide at least a 100:1 dilution. As shown in Table 3, dilution decrease as effluent flow increases. At the coldest temperature (10°C) and highest salinity (30 psu), dilution falls below 100:1 and becomes dependent on the number of open ports.

Table 3. Modeled Dilution

Flow MGD	Range of Open Ports	Salinity (psu)	Trapping Level Below the Surface (m)			Plume Dilution		
1	3 to 5	0.1	7.27	to	9.21	589.71	to	856.94
		1.0	7.36	to	9.28	588.40	to	846.95
		10.0	8.39	to	13.36	529.80	to	673.25
		20.0	13.22	to	19.09	245.68	to	497.23
		30.0	20.05	to	21.26	88.63	to	150.01
5	16 to 24	0.1	7.46	to	9.12	618.76	to	828.38
		1.0	7.53	to	9.23	615.31	to	821.22
		10.0	8.59	to	13.29	556.56	to	773.21
		20.0	13.37	to	18.77	256.65	to	509.42

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Table 3. Modeled Dilution

Flow MGD	Range of Open Ports	Salinity (psu)	Trapping Level Below the Surface (m)			Plume Dilution		
		30.0	20.15	to	21.23	91.85	to	147.09
10	33 to 49	0.1	7.50	to	9.20	635.25	to	837.35
		1.0	7.57	to	9.29	630.05	to	833.68
		10.0	8.83	to	13.32	569.13	to	787.04
		20.0	13.43	to	19.01	246.46	to	498.27
		30.0	20.17	to	21.24	92.79	to	150.88
15	49 to 74	0.1	6.93	to	8.53	507.07	to	755.90
		1.0	6.95	to	8.67	503.93	to	745.80
		10.0	7.80	to	9.64	468.50	to	681.17
		20.0	12.99	to	15.15	309.60	to	465.92
		30.0	20.12	to	21.16	86.65	to	143.14
20	66 to 98	0.1	6.36	to	7.69	434.10	to	644.17
		1.0	6.41	to	7.81	432.76	to	641.09
		10.0	7.37	to	9.29	405.10	to	587.73
		20.0	9.28	to	13.92	271.59	to	423.55
		30.0	19.70	to	21.08	77.77	to	134.27
25	82 to 122	0.1	5.82	to	7.16	375.82	to	512.68
		1.0	5.85	to	7.22	374.65	to	509.58
		10.0	6.82	to	8.53	349.13	to	481.57
		20.0	8.70	to	13.60	273.81	to	421.40
		30.0	19.20	to	21.08	73.65	to	115.66
30	98 to 144	0.1	5.80	to	7.11	375.71	to	505.22
		1.0	5.85	to	7.22	373.77	to	503.33
		10.0	6.78	to	8.36	349.05	to	474.43
		20.0	8.54	to	13.57	273.38	to	368.46
		30.0	19.20	to	21.09	73.51	to	115.80
35	114 to 144	0.1	6.07	to	6.70	411.10	to	450.67
		1.0	6.20	to	6.77	408.98	to	448.27
		10.0	7.15	to	7.75	382.83	to	421.74
		20.0	9.12	to	13.21	276.26	to	371.38
		30.0	19.45	to	21.01	75.51	to	113.41
40	132 to	0.1	5.79	to	6.29	377.53	to	410.62

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Table 3. Modeled Dilution

Flow MGD	Range of Open Ports	Salinity (psu)	Trapping Level Below the Surface (m)	Plume Dilution
	144	1.0	5.90 to 6.39	374.83 to 407.20
		10.0	6.81 to 7.48	350.25 to 385.10
		20.0	8.54 to 9.67	305.93 to 341.44
		30.0	19.21 to 20.86	73.86 to 108.14

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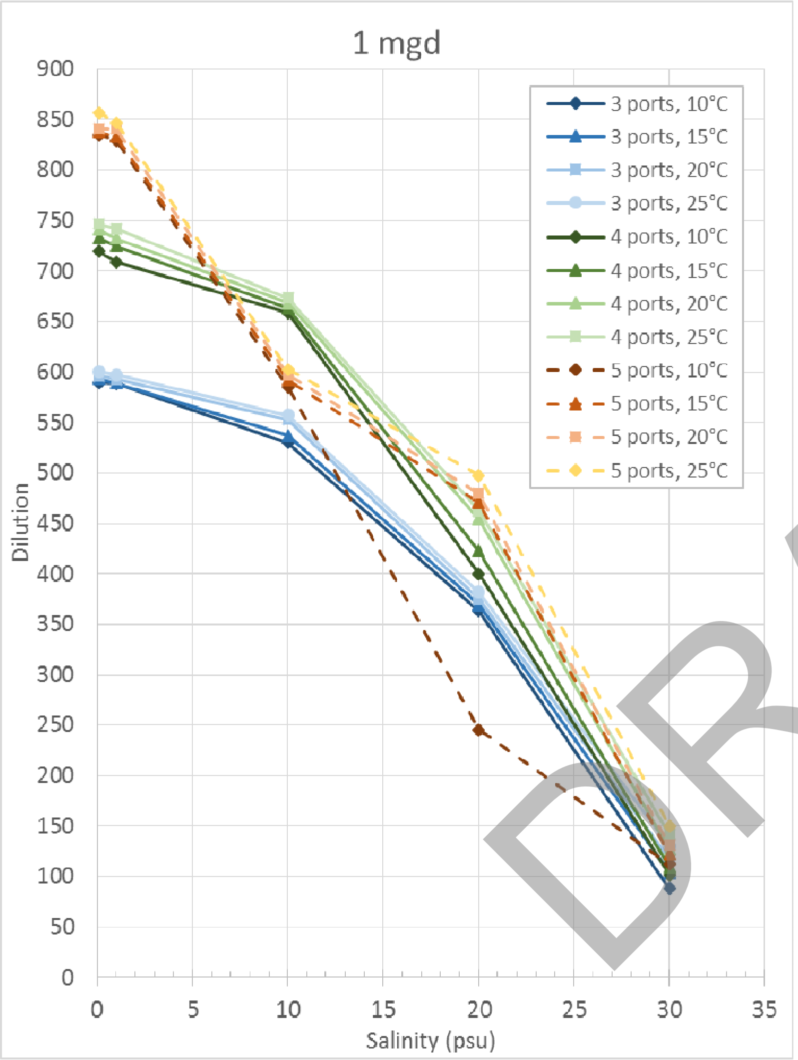

Figure 8. Dilution vs. Salinity for Selected Open Ports at 1 MGD.

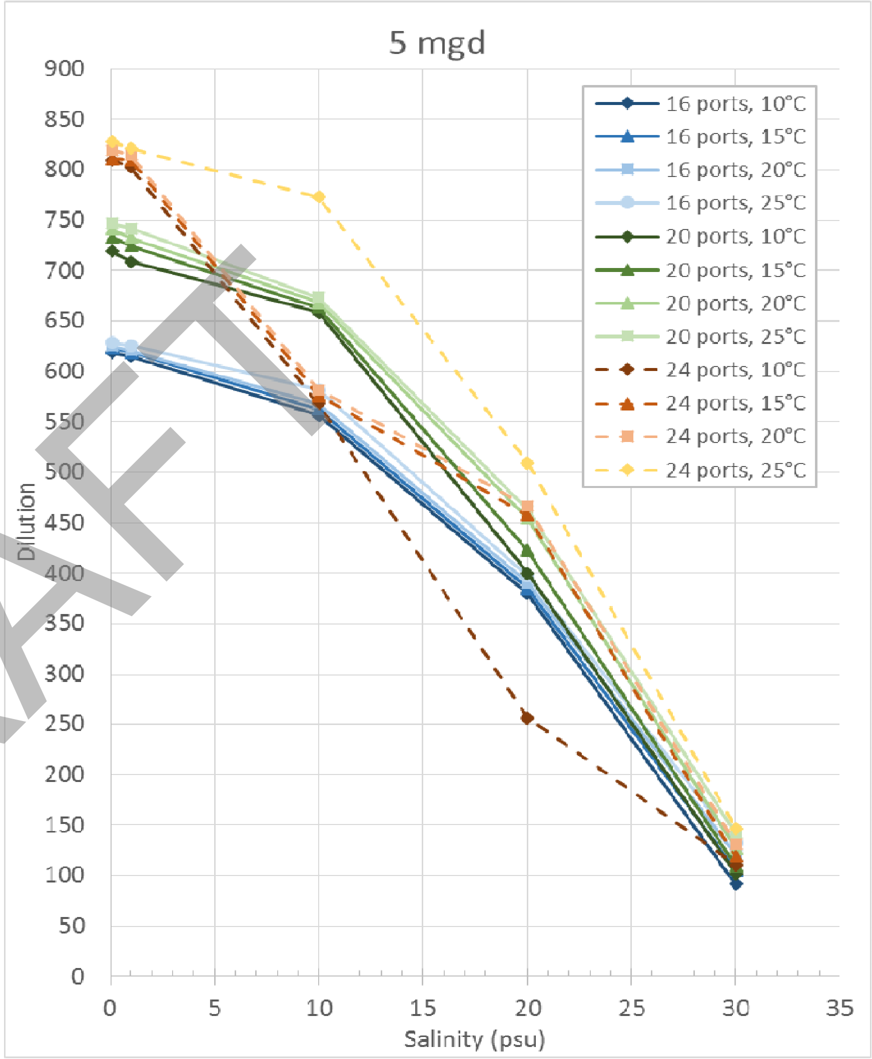

Figure 9. Dilution vs. Salinity for Selected Open Ports at 5 MGD.

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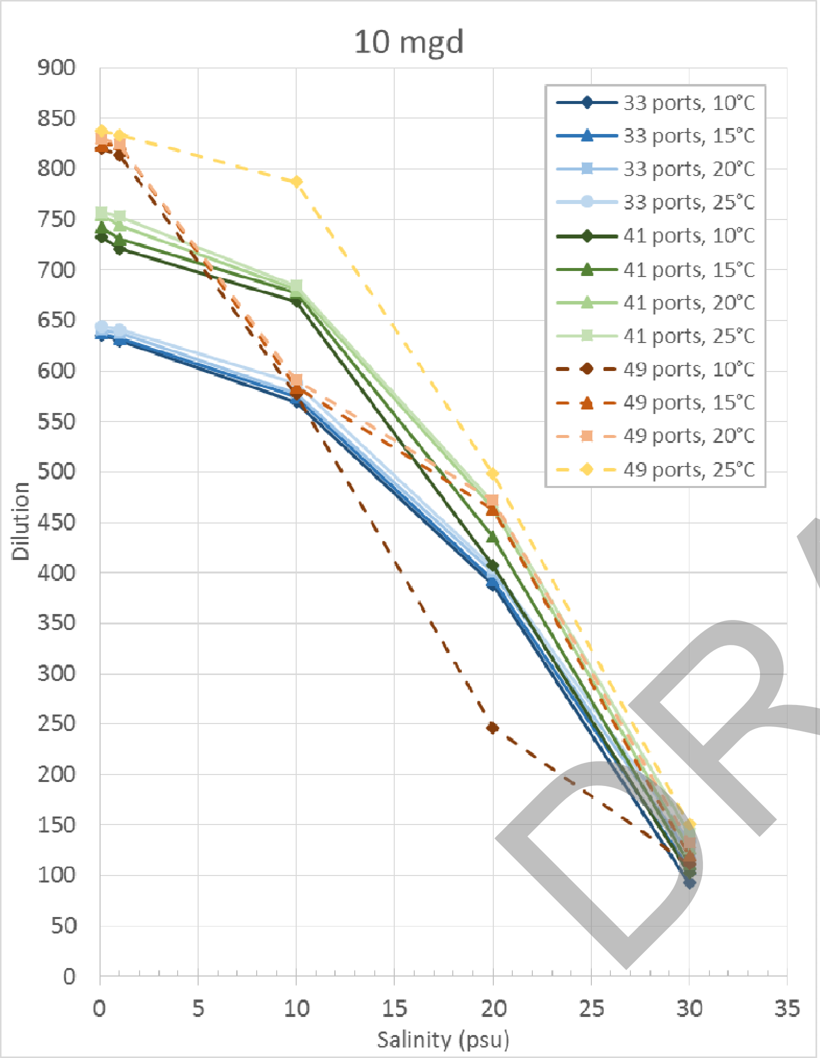

Figure 10. Dilution vs. Salinity for Selected Open Ports at 10 MGD.

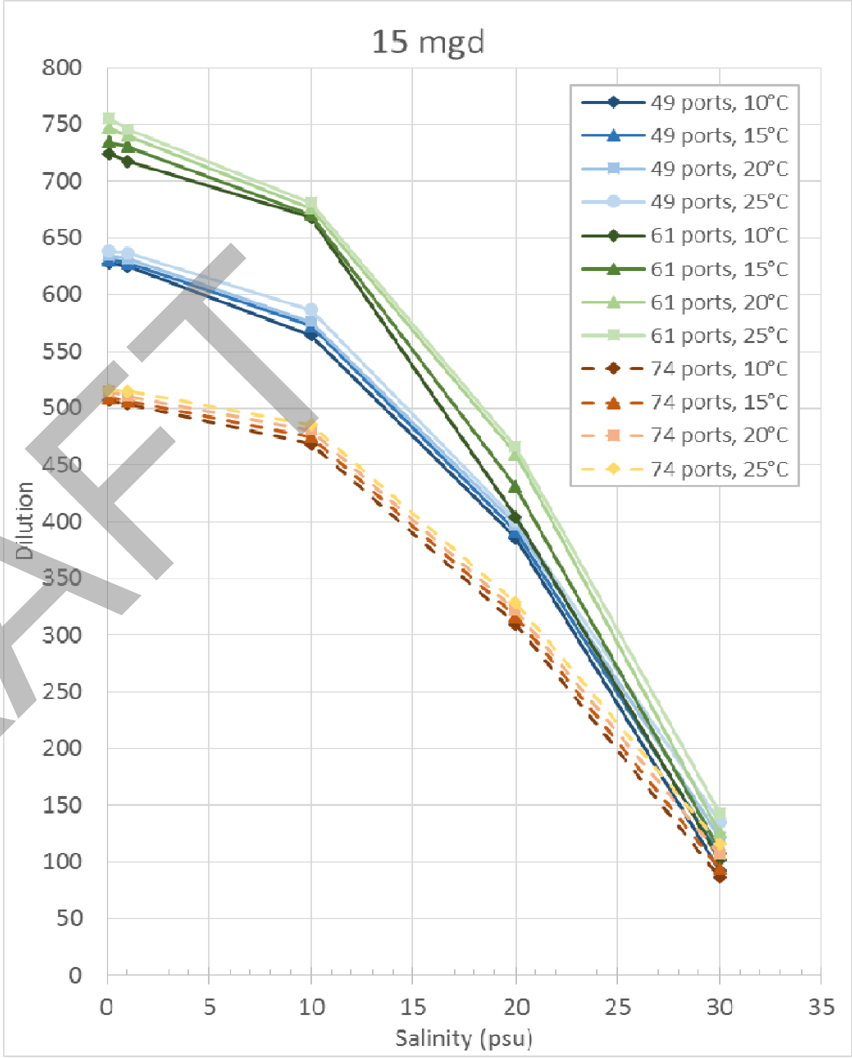

Figure 11. Dilution vs. Salinity for Selected Open Ports at 15 MGD.

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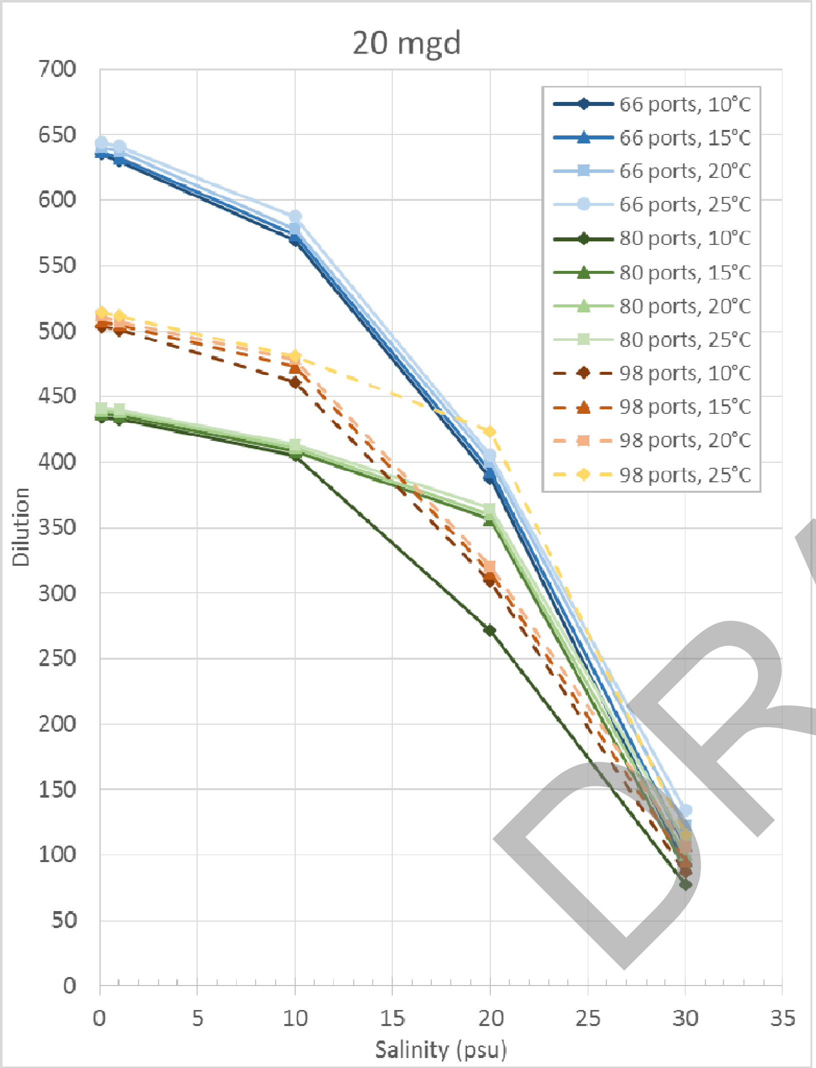

Figure 12. Dilution vs. Salinity for Selected Open Ports at 20 MGD.

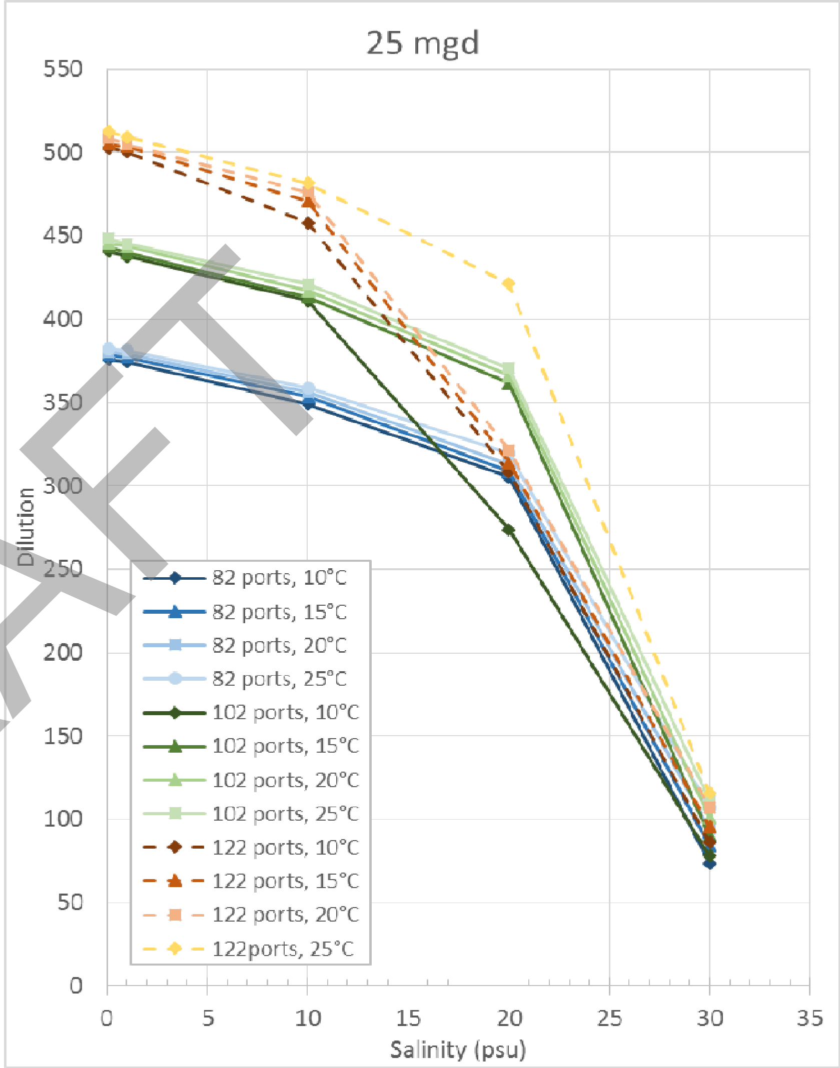

Figure 13. Dilution vs. Salinity for Selected Open Ports at 25 MGD.

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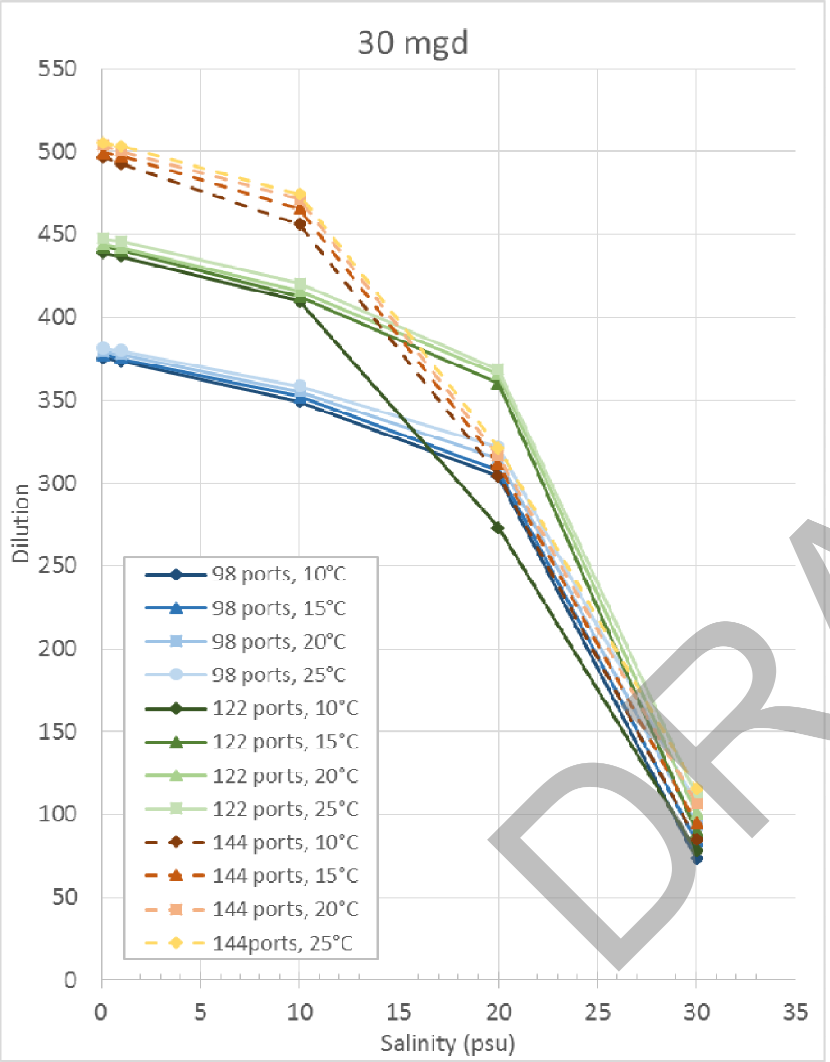

Figure 14. Dilution vs. Salinity for Selected Open Ports at 30 MGD.

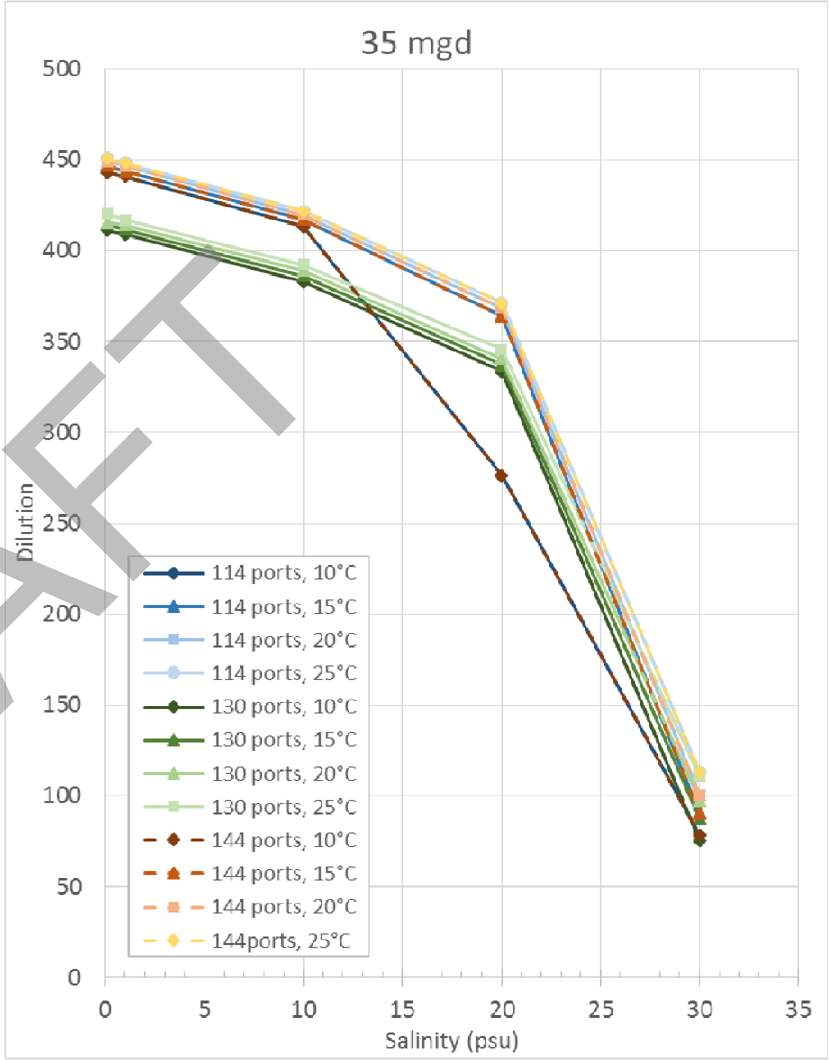

Figure 15. Dilution vs. Salinity for Selected Open Ports at 35 MGD.

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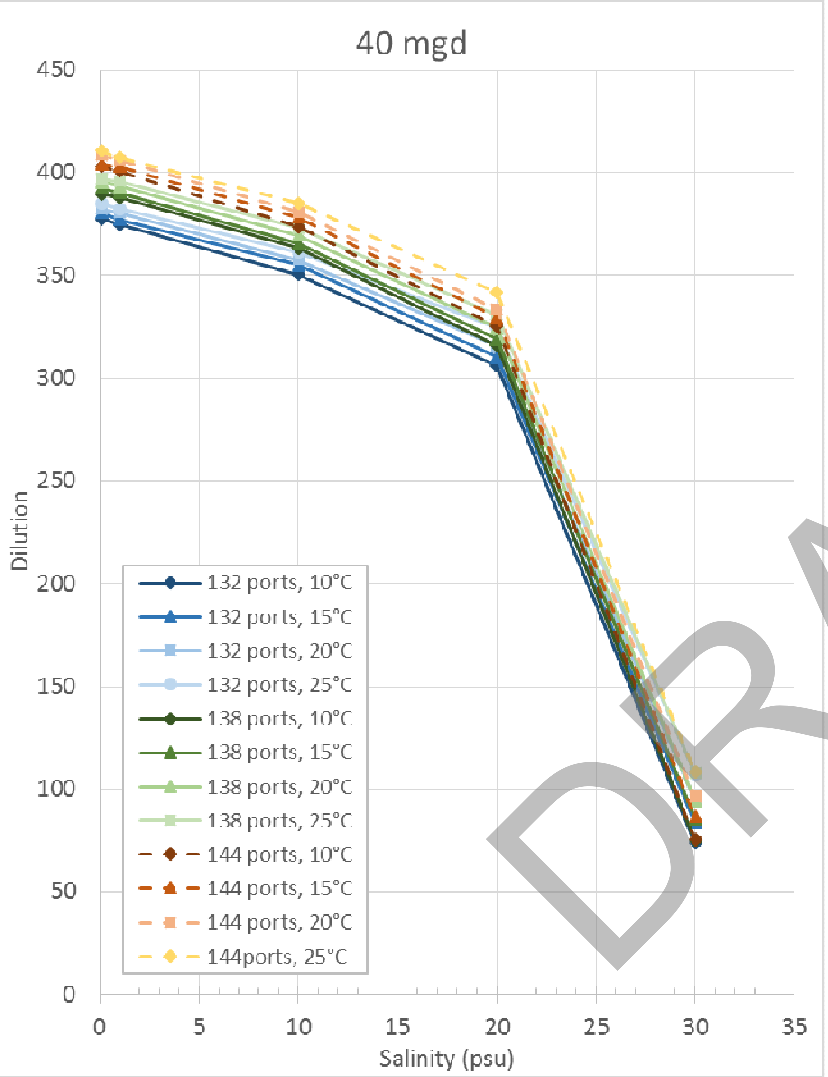

Figure 16. Dilution vs. Salinity for Selected Open Ports at 40 MGD.

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SECTION 4.0

Discussion and Recommendations

The capacity of the Samoa Peninsula outfall is defined by pipe diameter, number of available diffuser ports, and port diameter. Available dilution capacity is controlled by effluent flow rate and density. Detailed modeling was performed to assess dilution performance based on varying effluent flow, salinity, and temperature. Key findings include:

- Hydraulic assessment indicates the outfall can discharge up to 40 MGD based on 144 2.4-inch ports, however effluent with a higher salinity content will reduce dilution.
- Targeted diffuser port velocities (10-15 fps) are achievable for flows between 1 and 40 MGD under existing diffuser design by establishing a port opening schedule.
- Required head for the target port velocities evaluated ranged from 3.8 to 11. 4 feet (1.65 to 4.94 psi).
- Dilution decreases with increased flow, but target dilution of greater than 100:1 was easily achieved for flows up to 40 MGD for all conditions evaluated with the exception of effluent salinity of 30 psu. At this salinity, lower dilution must be accepted at some conditions.
- Dilution increases with increased effluent temperature. Effluent temperatures approximating receiving water temperatures provided significantly lower dilution than temperatures above that of the receiving water when salinities were greater than 10 psu.
- Dilution decreases with increased effluent salinity. A target dilution of greater than 100:1 is easily achieved for the range of flows evaluated with salinities up to 20 psu. Salinities between 20 and 25 psu, while not specifically modeled, appear to maintain dilution greater than 100:1 under flow and temperature regimes tested based on trend line analysis. Salinities of 30 psu start to fall below the target dilution of 100:1 as effluent temperature decreases.
- Salinities between 30 and 35 psu (full strength seawater) can be discharged from the outfall, but dilution would be lower than that expected for the regulatory definition of a high rate diffuser. For example, effluent at 5 MGD at 32 psu at 15°C would yield a dilution of 84:1. If all effluent parameters met end of pipe water quality standards, that is, did not require a mixing zone, straight seawater could be discharged for purely disposal purposes.

Modeling was performed based on existing hydrographic profile data and current speed data collected in the vicinity of the outfall. Prior to applying for an NPDES permit for the outfall, it is recommended that additional hydrographic profiles and higher quality current data be collected. The hydrographic profile used in this study was representative of ambient conditions, but may not represent the critical conditions that would yield the lowest dilution for regulatory purposes. It is recommended that additional hydrographic

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profiles (conductivity, temperature, and pressure to calculate density, salinity, and depth) be collected over a time frame encompassing seasonal variation to establish a critical density profile. Further, it is recommended that an acoustic Doppler current profiler (ADCP) be placed in the vicinity of the outfall to collect current speed and direction data at various seasonal increments recording data for a minimum of 24 hours during each deployment to capture the full range of tidal variation. Dilution modeling should be performed again once better resolution of the nature of the effluent and the receiving water is available.

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Attachment 1

Hydrographic Profiles from June and October 2007

Figure 1. Hydrographic Profile Measurement Locations from June 6, 2007.

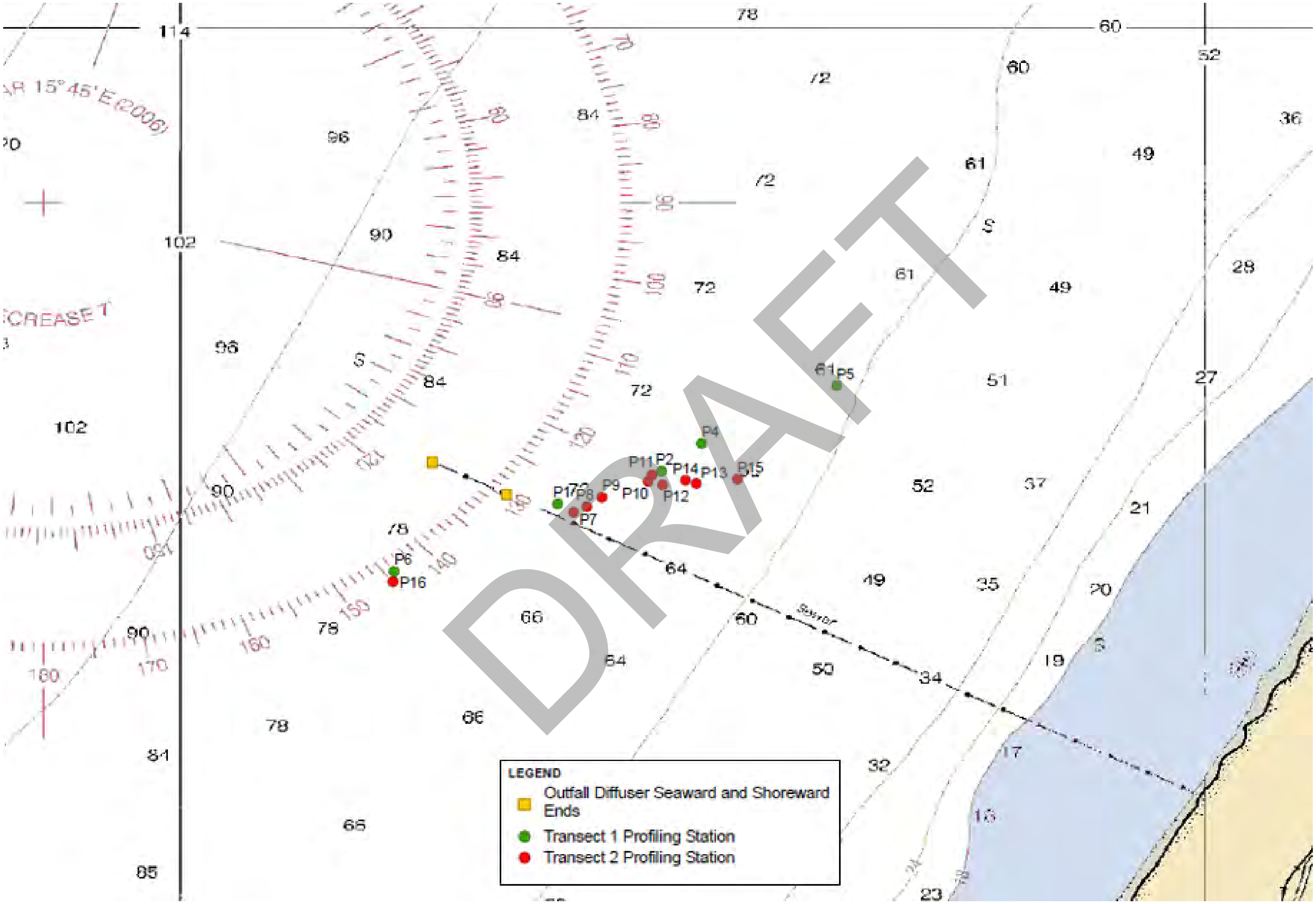

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Figure 2. Hydrographic Profile measurement Locations from October 8, 2007.

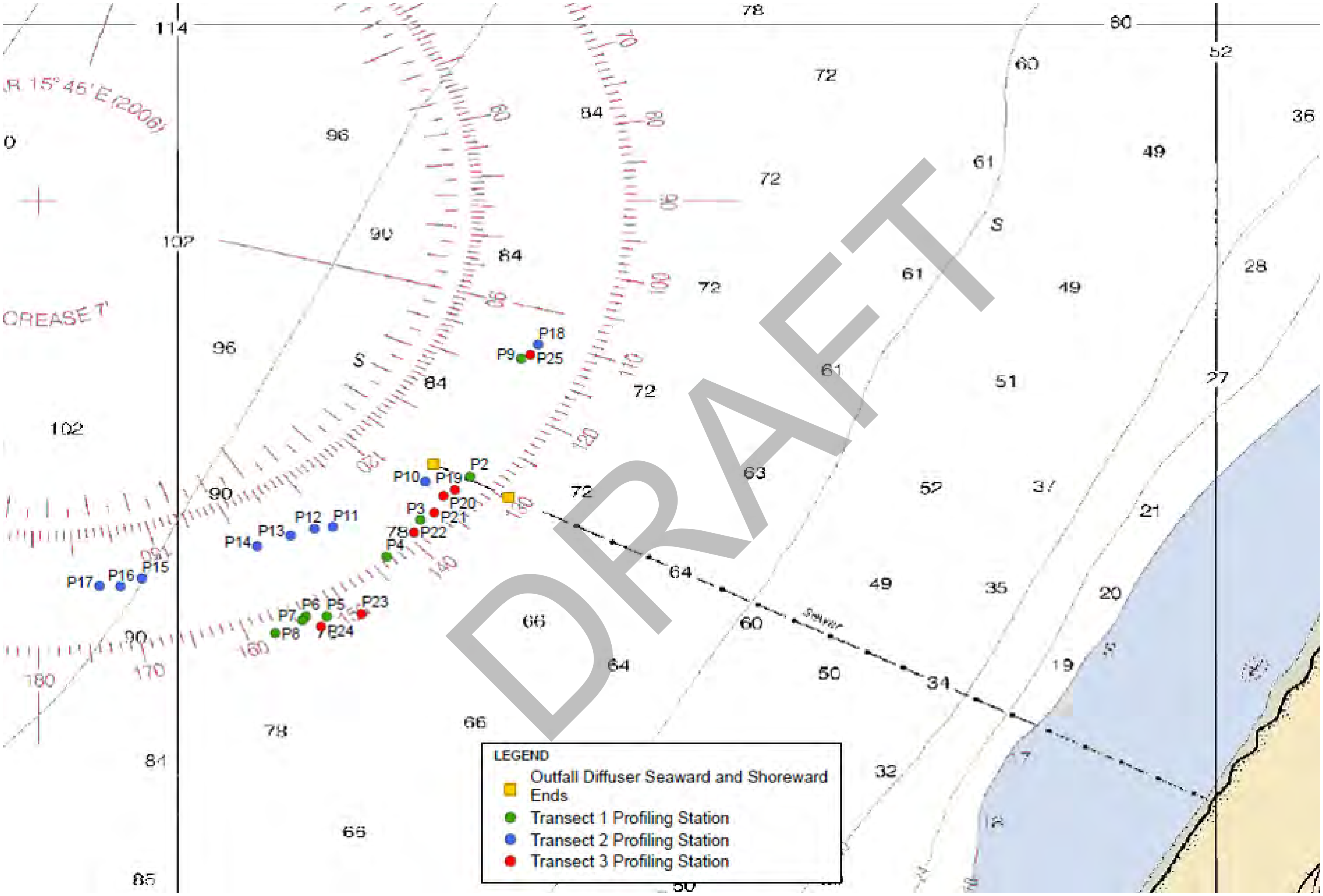

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Figure 1. Plots of Density Profiles Based on Temperature and Salinity Data Collected on June 6, 2007 from Around the Samoa Peninsula Outfall.

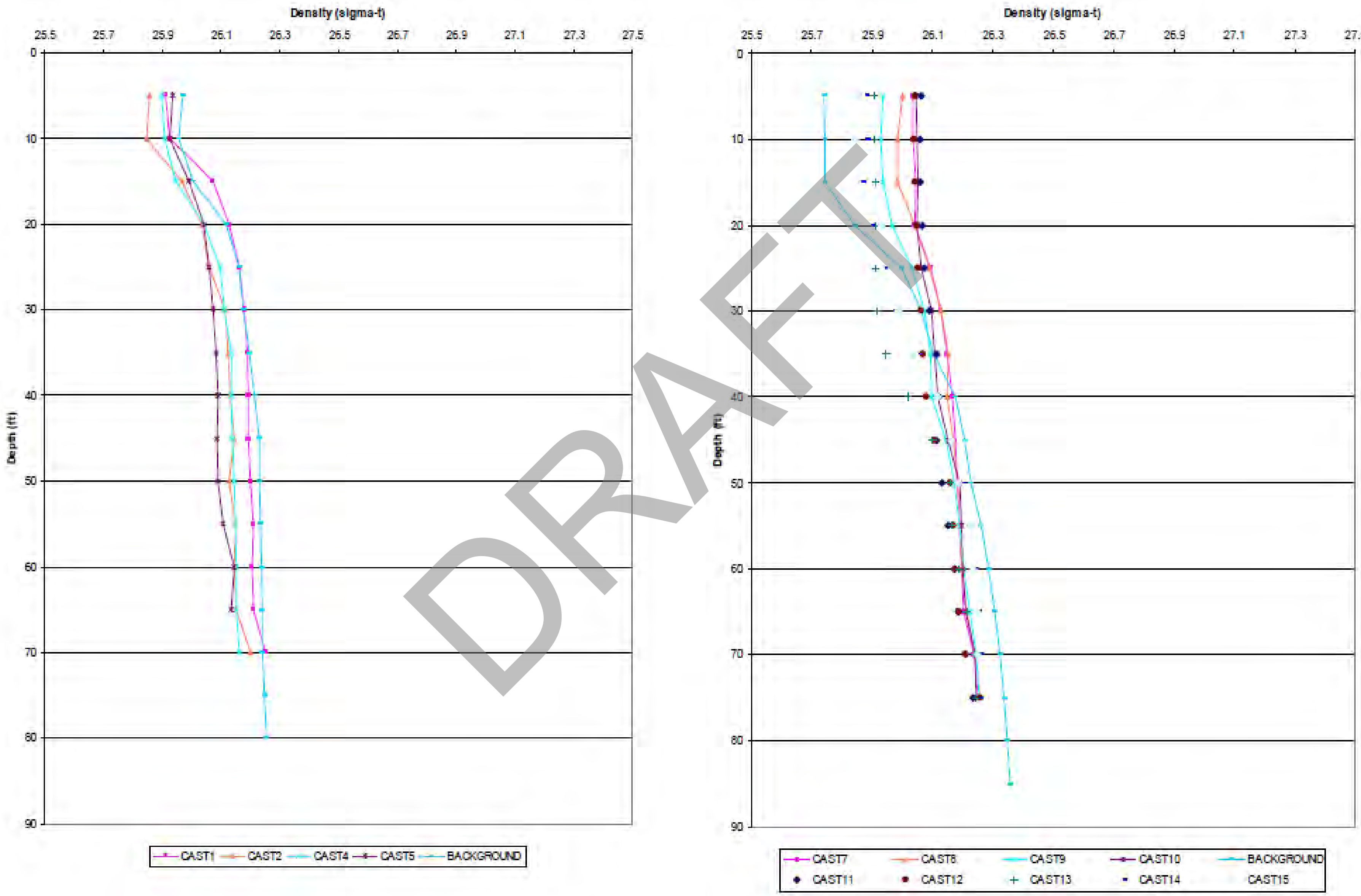

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Figure 2. Plots of Density Profiles Based on Temperature and Salinity Data Collected on October 8, 2007 from Around the Samoa Peninsula Outfall.

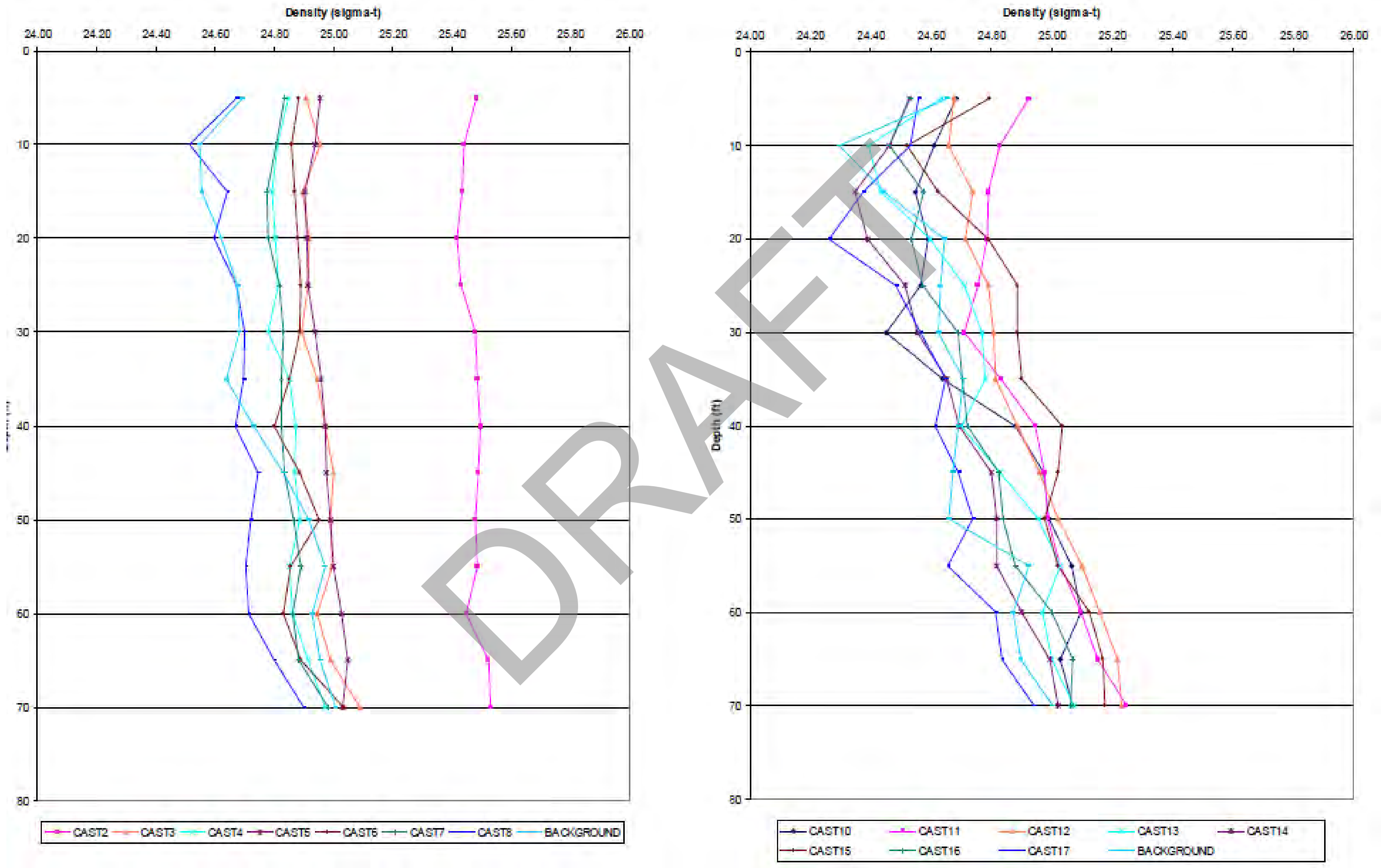

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Figure 2 continued. . Plots of Density Profiles Based on Temperature and Salinity Data Collected on October 8, 2007 from Around the Samoa Peninsula Outfall.

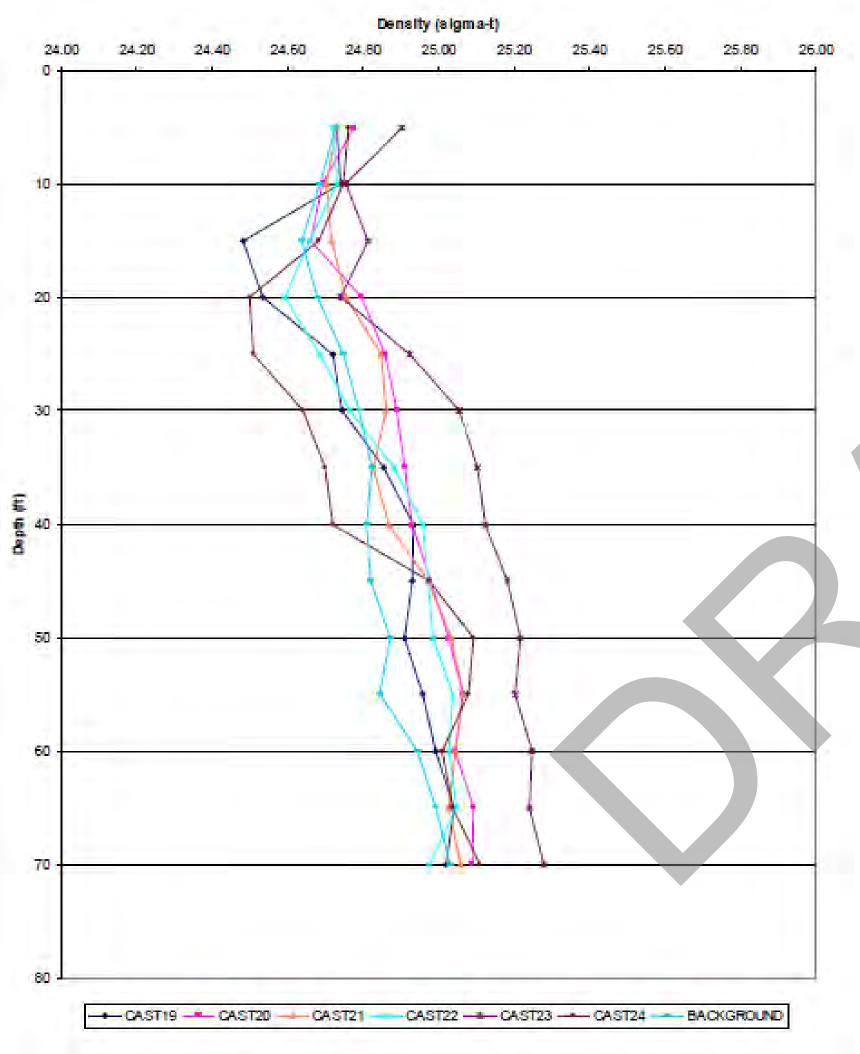

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Figure 3. Plots of Temperature Profile Data Collected June 6, 2007 from Around the Samoa Peninsula Outfall.

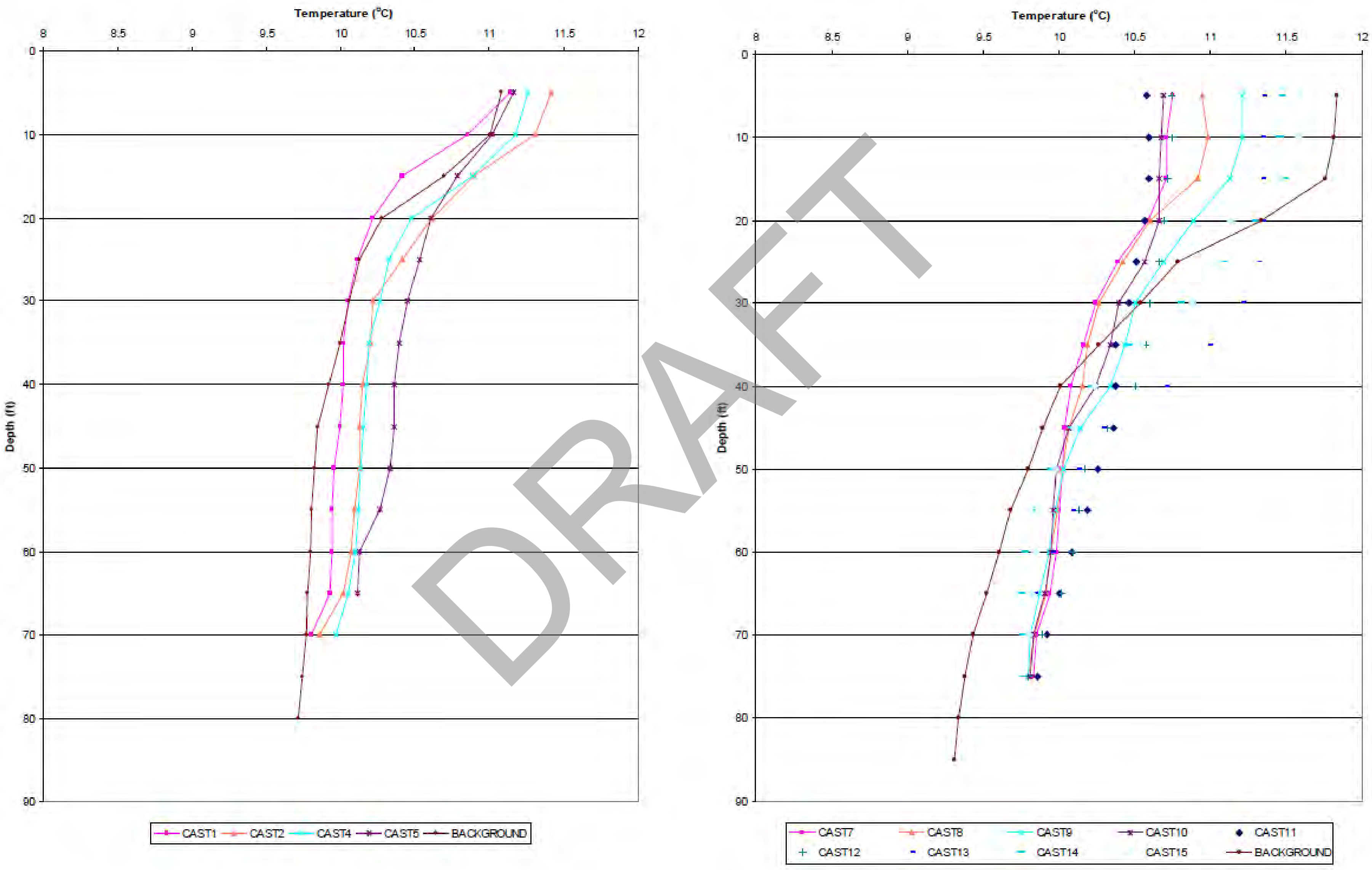

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Figure 4. Plots of Temperature Profile Data Collected October 8, 2007 from Around the Samoa Peninsula Outfall.

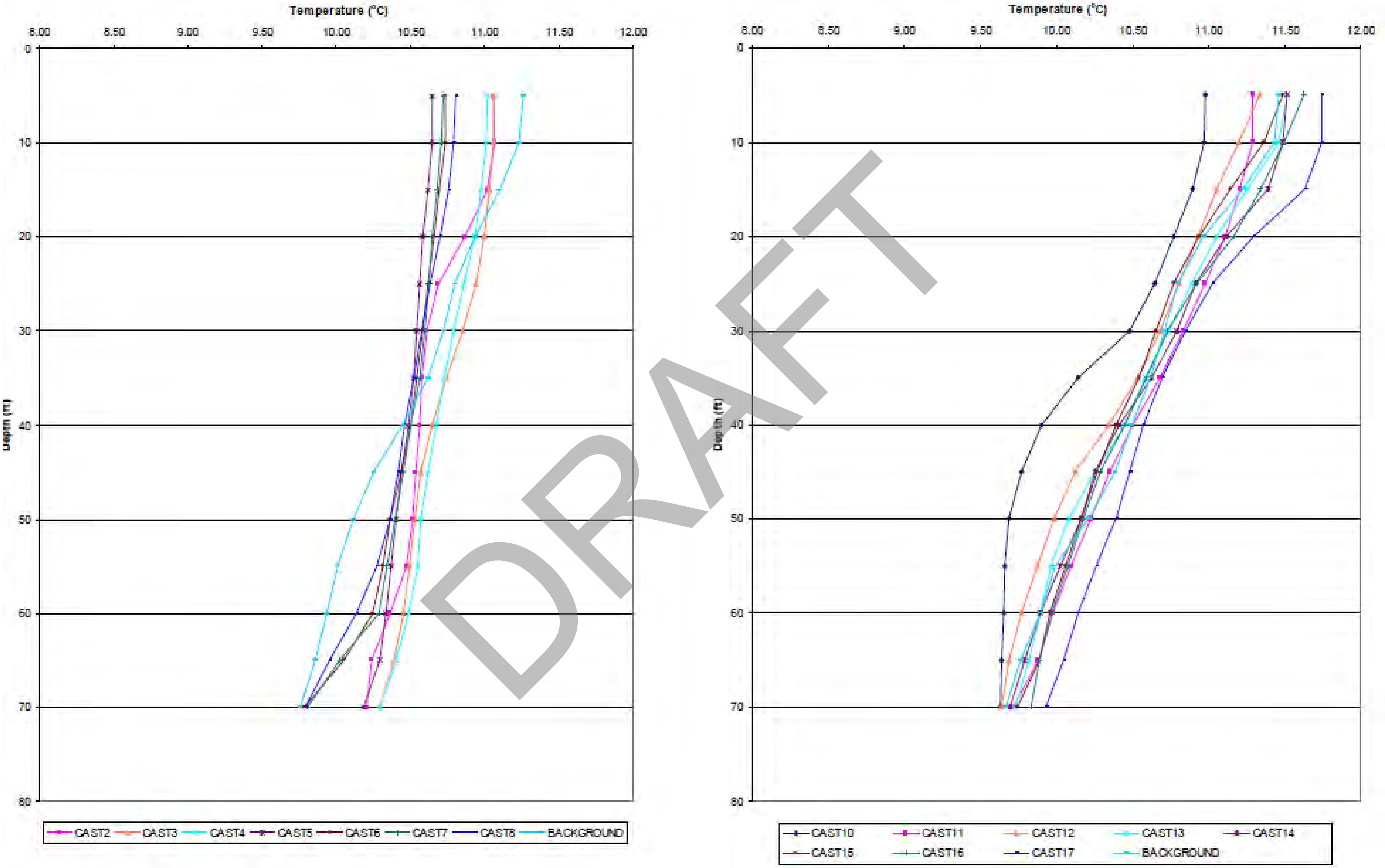

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Figure 4 continued. Plots of Temperature Profile Data Collected October 8, 2007 from Around the Samoa Peninsula Outfall

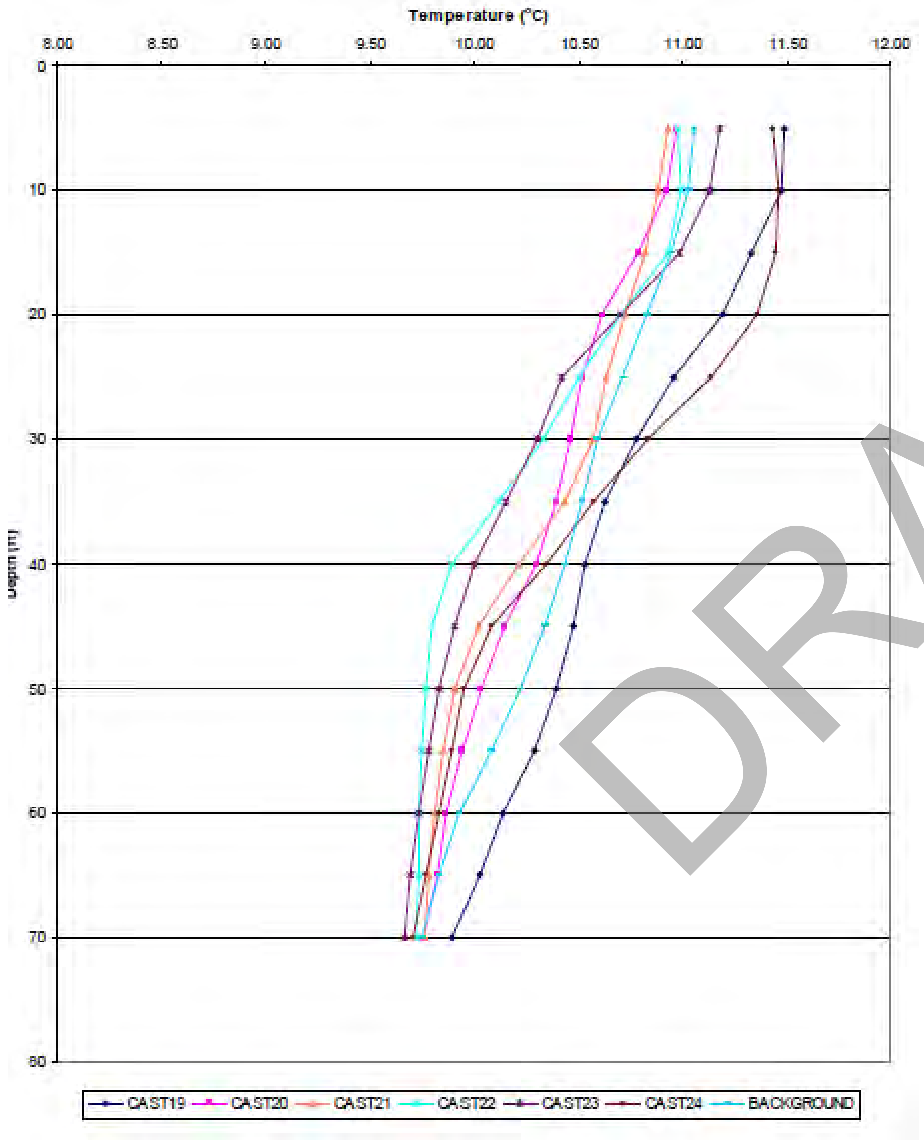

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Figure 5. Plots of Salinity Profile Data Collected June 6, 2007 from Around the Samoa Peninsula Outfall

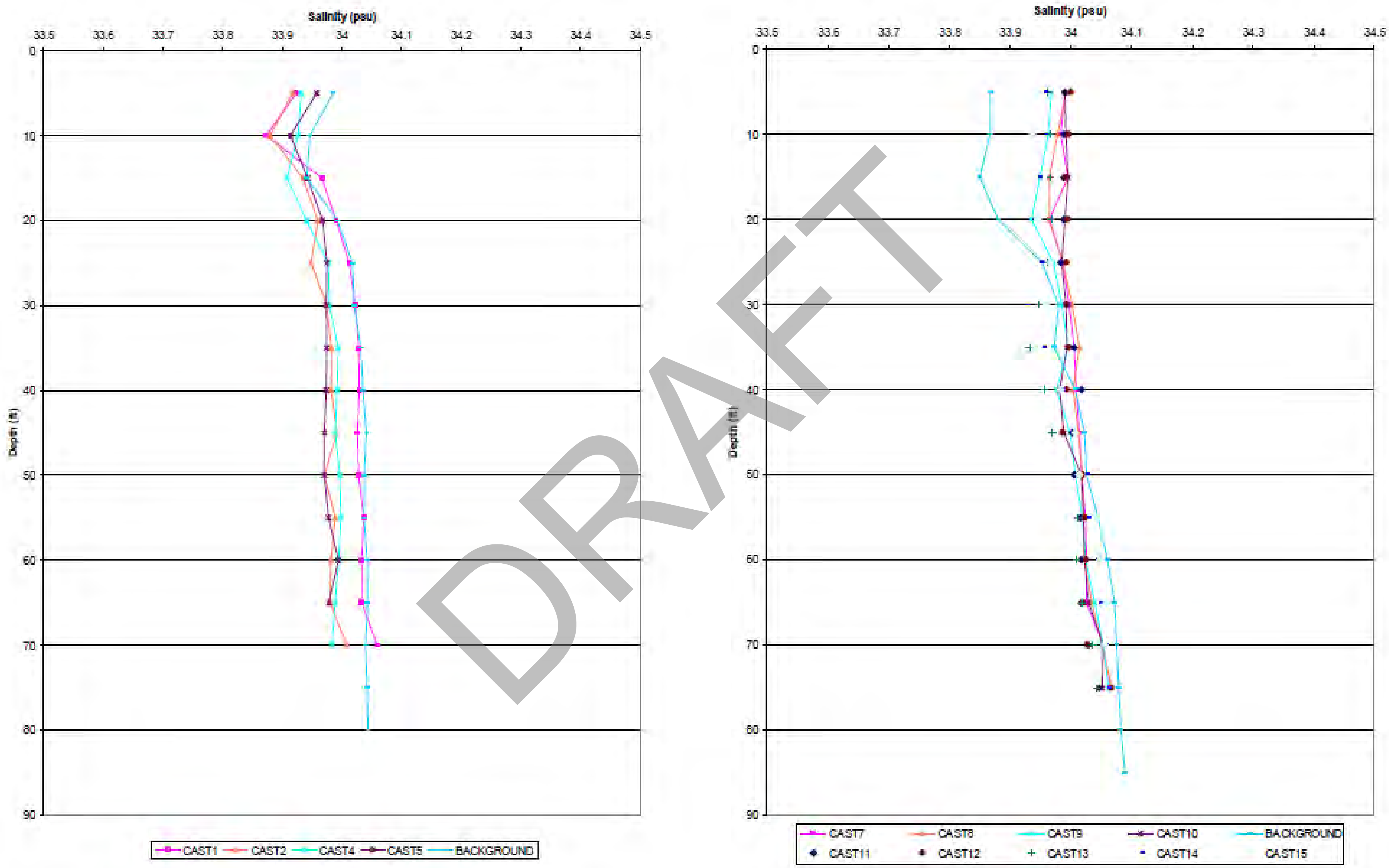

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Figure 6. Plots of Salinity Profile Data Collected October 8, 2007 from Around the Samoa Peninsula Outfall.

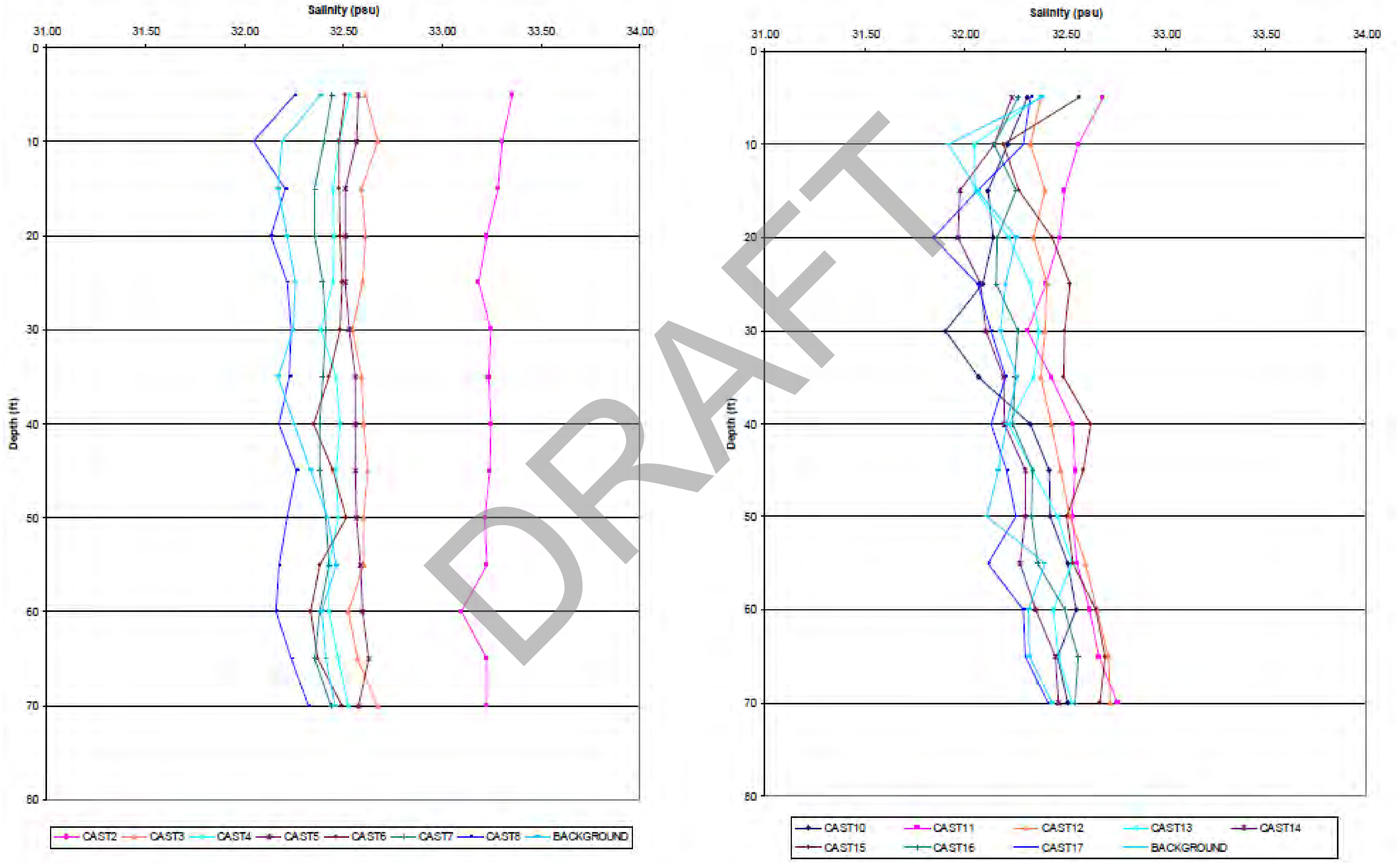

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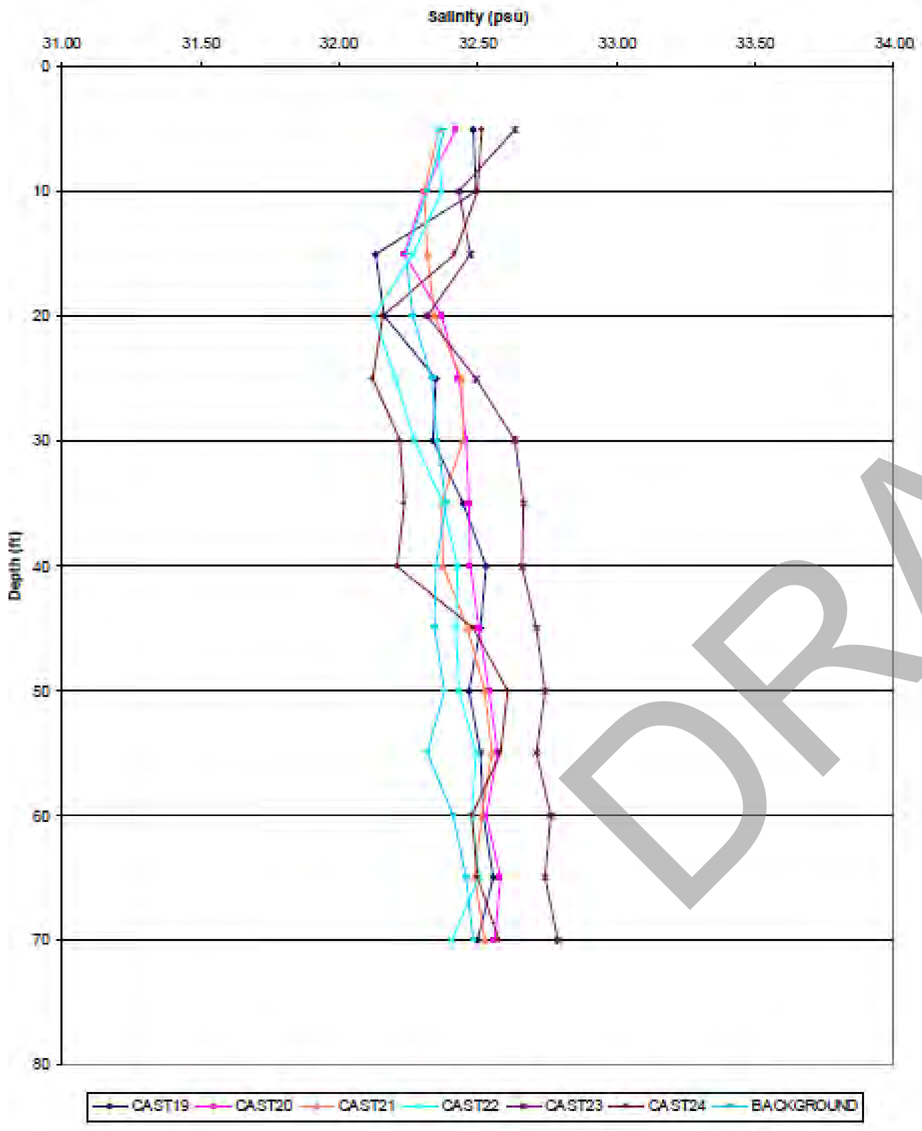
Figure 6 continued. Plots of Salinity Profile Data Collected October 8, 2007 from Around the Samoa Peninsula Outfall.



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Attachment 2
Current Speed and Direction Data

Table 1. Current Speeds collect near the Evergreen Ocean Outfall 6 June 2007

Path (Cast No. to Cast No.)	Start	End	Duration	Duration (min)	Distance (ft)	Speed (ft/min)	Speed (m/s)
7 to 8	14:05	14:19	0:14	14	136	9.7	0.049
8 to 9	14:19	14:32	0:13	13	175	13.5	0.068
9 to 10	14:32	15:00	0:28	28	454	16.2	0.082
10 to 11	15:00	15:14	0:14	14	87	6.2	0.032
11 to 12	15:14	15:19	0:05	5	152	30.4	0.154
12 to 13	15:19	15:43	0:24	24	304	12.7	0.064
13 to 14	15:43	15:55	0:12	12	103	8.6	0.044
14 to 15	15:55	16:11	0:16	16	466	29.1	0.148
15 to Recovery	16:11	16:23	0:12	12	158	13.2	0.067
Average						15.5	
Total Path	14:05	16:23	2:18	138	2035	14.7	0.075
7 to recovery (direct)	14:05	16:23	2:18	138	1720	12.5	0.063
Average (15.5, 14.7, 12.5)						**14.2**	**0.072**

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Attachment 3
Port Velocities Calculated for the Samoa Peninsula Outfall

Port Velocity vs. Flow and Number of Ports in Ft/Sec
for the RMT II Ocean Outfall

Number of Ports	Total Port Area (sq.ft)	Flow (mgd)									
		1	5	10	15	20	25	30	35	40	45
		Flow (cfs)									
		1.5473	7.7363	15.4727	23.2090	30.9454	38.6817	46.4181	54.1544	61.8908	69.6271
		Port Velocity (ft/sec)									
1	0.031	49.3	246.3	492.5	738.8	985.0	1231.3	1477.5	1723.8	1970.0	2216.3
2	0.063	24.6	123.1	246.3	369.4	492.5	615.6	738.8	861.9	985.0	1108.1
3	0.094	16.4	82.1	164.2	246.3	328.3	410.4	492.5	574.6	656.7	738.8
4	0.126	**12.3**	61.6	123.1	184.7	246.3	307.8	369.4	430.9	492.5	554.1
5	0.157	**9.9**	49.3	98.5	147.8	197.0	246.3	295.5	344.8	394.0	443.3
6	0.188	8.2	41.0	82.1	123.1	164.2	205.2	246.3	287.3	328.3	369.4
7	0.220	7.0	35.2	70.4	105.5	140.7	175.9	211.1	246.3	281.4	316.6
8	0.251	6.2	30.8	61.6	92.3	123.1	153.9	184.7	215.5	246.3	277.0
9	0.283	5.5	27.4	54.7	82.1	109.4	136.8	164.2	191.5	218.9	246.3
10	0.314	4.9	24.6	49.3	73.9	98.5	123.1	147.8	172.4	197.0	221.6
11	0.346	4.5	22.4	44.8	67.2	89.5	111.9	134.3	156.7	179.1	201.5
12	0.377	4.1	20.5	41.0	61.6	82.1	102.6	123.1	143.6	164.2	184.7
13	0.408	3.8	18.9	37.9	56.8	75.8	94.7	113.7	132.6	151.5	170.5
14	0.440	3.5	17.6	35.2	52.8	70.4	87.9	105.5	123.1	140.7	158.3
15	0.471	3.3	16.4	32.8	49.3	65.7	82.1	98.5	114.9	131.3	147.8
16	0.503	3.1	**15.4**	30.8	46.2	61.6	77.0	92.3	107.7	123.1	138.5
17	0.534	2.9	**14.5**	29.0	43.5	57.9	72.4	86.9	101.4	115.9	130.4
18	0.565	2.7	**13.7**	27.4	41.0	54.7	68.4	82.1	95.8	109.4	123.1
19	0.597	2.6	**13.0**	25.9	38.9	51.8	64.8	77.8	90.7	103.7	116.6
20	0.628	2.5	**12.3**	24.6	36.9	49.3	61.6	73.9	86.2	98.5	110.8
21	0.660	2.3	**11.7**	23.5	35.2	46.9	58.6	70.4	82.1	93.8	105.5
22	0.691	2.2	**11.2**	22.4	33.6	44.8	56.0	67.2	78.4	89.5	100.7
23	0.723	2.1	**10.7**	21.4	32.1	42.8	53.5	64.2	74.9	85.7	96.4
24	0.754	2.1	**10.3**	20.5	30.8	41.0	51.3	61.6	71.8	82.1	92.3
25	0.785	2.0	9.9	19.7	29.6	39.4	49.3	59.1	69.0	78.8	88.7
26	0.817	1.9	9.5	18.9	28.4	37.9	47.4	56.8	66.3	75.8	85.2
27	0.848	1.8	9.1	18.2	27.4	36.5	45.6	54.7	63.8	73.0	82.1
28	0.880	1.8	8.8	17.6	26.4	35.2	44.0	52.8	61.6	70.4	79.2
29	0.911	1.7	8.5	17.0	25.5	34.0	42.5	50.9	59.4	67.9	76.4
30	0.942	1.6	8.2	16.4	24.6	32.8	41.0	49.3	57.5	65.7	73.9
31	0.974	1.6	7.9	15.9	23.8	31.8	39.7	47.7	55.6	63.5	71.5
32	1.005	1.5	7.7	15.4	23.1	30.8	38.5	46.2	53.9	61.6	69.3
33	1.037	1.5	7.5	**14.9**	22.4	29.8	37.3	44.8	52.2	59.7	67.2
34	1.068	1.4	7.2	**14.5**	21.7	29.0	36.2	43.5	50.7	57.9	65.2
35	1.100	1.4	7.0	**14.1**	21.1	28.1	35.2	42.2	49.3	56.3	63.3
36	1.131	1.4	6.8	**13.7**	20.5	27.4	34.2	41.0	47.9	54.7	61.6
37	1.162	1.3	6.7	**13.3**	20.0	26.6	33.3	39.9	46.6	53.2	59.9
38	1.194	1.3	6.5	**13.0**	19.4	25.9	32.4	38.9	45.4	51.8	58.3
39	1.225	1.3	6.3	**12.6**	18.9	25.3	31.6	37.9	44.2	50.5	56.8
40	1.257	1.2	6.2	**12.3**	18.5	24.6	30.8	36.9	43.1	49.3	55.4
41	1.288	1.2	6.0	**12.0**	18.0	24.0	30.0	36.0	42.0	48.0	54.1
42	1.319	1.2	5.9	**11.7**	17.6	23.5	29.3	35.2	41.0	46.9	52.8
43	1.351	1.1	5.7	**11.5**	17.2	22.9	28.6	34.4	40.1	45.8	51.5
44	1.382	1.1	5.6	**11.2**	16.8	22.4	28.0	33.6	39.2	44.8	50.4
45	1.414	1.1	5.5	**10.9**	16.4	21.9	27.4	32.8	38.3	43.8	49.3
46	1.445	1.1	5.4	**10.7**	16.1	21.4	26.8	32.1	37.5	42.8	48.2
47	1.477	1.0	5.2	**10.5**	15.7	21.0	26.2	31.4	36.7	41.9	47.2
48	1.508	1.0	5.1	**10.3**	15.4	20.5	25.7	30.8	35.9	41.0	46.2
49	1.539	1.0	5.0	**10.1**	**15.1**	20.1	25.1	30.2	35.2	40.2	45.2
50	1.571	1.0	4.9	9.9	**14.8**	19.7	24.6	29.6	34.5	39.4	44.3
51	1.602	1.0	4.8	9.7	**14.5**	19.3	24.1	29.0	33.8	38.6	43.5
52	1.634	0.9	4.7	9.5	**14.2**	18.9	23.7	28.4	33.1	37.9	42.6
53	1.665	0.9	4.6	9.3	**13.9**	18.6	23.2	27.9	32.5	37.2	41.8
54	1.696	0.9	4.6	9.1	**13.7**	18.2	22.8	27.4	31.9	36.5	41.0
55	1.728	0.9	4.5	9.0	**13.4**	17.9	22.4	26.9	31.3	35.8	40.3
56	1.759	0.9	4.4	8.8	**13.2**	17.6	22.0	26.4	30.8	35.2	39.6
57	1.791	0.9	4.3	8.6	**13.0**	17.3	21.6	25.9	30.2	34.6	38.9
58	1.822	0.8	4.2	8.5	**12.7**	17.0	21.2	25.5	29.7	34.0	38.2
59	1.854	0.8	4.2	8.3	**12.5**	16.7	20.9	25.0	29.2	33.4	37.6

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60	1.885	0.8	4.1	8.2	**12.3**	16.4	20.5	24.6	28.7	32.8	36.9
61	1.916	0.8	4.0	8.1	**12.1**	16.1	20.2	24.2	28.3	32.3	36.3
62	1.948	0.8	4.0	7.9	**11.9**	15.9	19.9	23.8	27.8	31.8	35.7
63	1.979	0.8	3.9	7.8	**11.7**	15.6	19.5	23.5	27.4	31.3	35.2
64	2.011	0.8	3.8	7.7	**11.5**	15.4	19.2	23.1	26.9	30.8	34.6
65	2.042	0.8	3.8	7.6	**11.4**	15.2	18.9	22.7	26.5	30.3	34.1
66	2.073	0.7	3.7	7.5	**11.2**	**14.9**	18.7	22.4	26.1	29.8	33.6
67	2.105	0.7	3.7	7.4	**11.0**	**14.7**	18.4	22.1	25.7	29.4	33.1
68	2.136	0.7	3.6	7.2	**10.9**	**14.5**	18.1	21.7	25.3	29.0	32.6
69	2.168	0.7	3.6	7.1	**10.7**	**14.3**	17.8	21.4	25.0	28.6	32.1
70	2.199	0.7	3.5	7.0	**10.6**	**14.1**	17.6	21.1	24.6	28.1	31.7
71	2.231	0.7	3.5	6.9	**10.4**	**13.9**	17.3	20.8	24.3	27.7	31.2
72	2.262	0.7	3.4	6.8	**10.3**	**13.7**	17.1	20.5	23.9	27.4	30.8
74	2.325	0.7	3.3	6.7	**10.0**	**13.3**	16.6	20.0	23.3	26.6	29.9
76	2.388	0.6	3.2	6.5	9.7	**13.0**	16.2	19.4	22.7	25.9	29.2
78	2.450	0.6	3.2	6.3	9.5	**12.6**	15.8	18.9	22.1	25.3	28.4
80	2.513	0.6	3.1	6.2	9.2	**12.3**	15.4	18.5	21.5	24.6	27.7
82	2.576	0.6	3.0	6.0	9.0	**12.0**	**15.0**	18.0	21.0	24.0	27.0
84	2.639	0.6	2.9	5.9	8.8	**11.7**	**14.7**	17.6	20.5	23.5	26.4
86	2.702	0.6	2.9	5.7	8.6	**11.5**	**14.3**	17.2	20.0	22.9	25.8
88	2.765	0.6	2.8	5.6	8.4	**11.2**	**14.0**	16.8	19.6	22.4	25.2
90	2.827	0.5	2.7	5.5	8.2	**10.9**	**13.7**	16.4	19.2	21.9	24.6
92	2.890	0.5	2.7	5.4	8.0	**10.7**	**13.4**	16.1	18.7	21.4	24.1
94	2.953	0.5	2.6	5.2	7.9	**10.5**	**13.1**	15.7	18.3	21.0	23.6
96	3.016	0.5	2.6	5.1	7.7	**10.3**	**12.8**	15.4	18.0	20.5	23.1
98	3.079	0.5	2.5	5.0	7.5	**10.1**	**12.6**	**15.1**	17.6	20.1	22.6
100	3.142	0.5	2.5	4.9	7.4	9.9	**12.3**	**14.8**	17.2	19.7	22.2
102	3.204	0.5	2.4	4.8	7.2	9.7	**12.1**	**14.5**	16.9	19.3	21.7
104	3.267	0.5	2.4	4.7	7.1	9.5	**11.8**	**14.2**	16.6	18.9	21.3
106	3.330	0.5	2.3	4.6	7.0	9.3	**11.6**	**13.9**	16.3	18.6	20.9
108	3.393	0.5	2.3	4.6	6.8	9.1	**11.4**	**13.7**	16.0	18.2	20.5
110	3.456	0.4	2.2	4.5	6.7	9.0	**11.2**	**13.4**	15.7	17.9	20.1
112	3.519	0.4	2.2	4.4	6.6	8.8	**11.0**	**13.2**	15.4	17.6	19.8
114	3.581	0.4	2.2	4.3	6.5	8.6	**10.8**	**13.0**	**15.1**	17.3	19.4
116	3.644	0.4	2.1	4.2	6.4	8.5	**10.6**	**12.7**	**14.9**	17.0	19.1
118	3.707	0.4	2.1	4.2	6.3	8.3	**10.4**	**12.5**	**14.6**	16.7	18.8
120	3.770	0.4	2.1	4.1	6.2	8.2	**10.3**	**12.3**	**14.4**	16.4	18.5
122	3.833	0.4	2.0	4.0	6.1	8.1	**10.1**	**12.1**	**14.1**	16.1	18.2
124	3.896	0.4	2.0	4.0	6.0	7.9	9.9	**11.9**	**13.9**	15.9	17.9
126	3.958	0.4	2.0	3.9	5.9	7.8	9.8	**11.7**	**13.7**	15.6	17.6
128	4.021	0.4	1.9	3.8	5.8	7.7	9.6	**11.5**	**13.5**	15.4	17.3
130	4.084	0.4	1.9	3.8	5.7	7.6	9.5	**11.4**	**13.3**	**15.2**	17.0
132	4.147	0.4	1.9	3.7	5.6	7.5	9.3	**11.2**	**13.1**	**14.9**	16.8
134	4.210	0.4	1.8	3.7	5.5	7.4	9.2	**11.0**	**12.9**	**14.7**	16.5
136	4.273	0.4	1.8	3.6	5.4	7.2	9.1	**10.9**	**12.7**	**14.5**	16.3
138	4.335	0.4	1.8	3.6	5.4	7.1	8.9	**10.7**	**12.5**	**14.3**	16.1
140	4.398	0.4	1.8	3.5	5.3	7.0	8.8	**10.6**	**12.3**	**14.1**	15.8
142	4.461	0.3	1.7	3.5	5.2	6.9	8.7	**10.4**	**12.1**	**13.9**	15.6
144	4.524	0.3	1.7	3.4	5.1	6.8	8.6	**10.3**	**12.0**	**13.7**	15.4

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Attachment 4
HYDRO Model Results for Head Loss and Port Velocity

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	1 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	3	3	3	3	4	4	4	4	5	5	5	5
Port Spacing (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Avg Port Vel (ft/sec)	16.42	16.42	16.42	16.42	12.31	12.31	12.31	12.31	9.85	9.85	9.85	9.85
Min Port Vel (ft/sec)	16.42	16.42	16.42	16.41	12.31	12.31	12.31	12.31	9.85	9.85	9.85	9.85
Max Port Vel (ft/sec)	16.42	16.42	16.42	16.42	12.31	12.31	12.31	12.31	9.85	9.85	9.85	9.85
Head loss	10.55	10.55	10.54	10.54	5.93	5.93	5.93	5.93	3.80	3.80	3.80	3.80
	5 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	16	16	16	16	20	20	20	20	24	24	24	24
Port Spacing (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Avg Port Vel (ft/sec)	15.39	15.39	15.39	15.39	12.31	12.31	12.31	12.31	10.26	10.26	10.26	10.26
Min Port Vel (ft/sec)	15.39	15.39	15.39	15.38	12.31	12.31	12.3	12.3	10.26	10.25	10.25	10.25
Max Port Vel (ft/sec)	15.39	15.39	15.4	15.4	12.31	12.31	12.32	12.32	10.27	10.27	10.27	10.26
Head loss	9.30	9.30	9.30	9.30	5.97	5.97	5.97	5.96	4.16	4.16	4.15	4.15
	10											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	33	33	33	33	41	41	41	41	49	49	49	49
Port Spacing (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Avg Port Vel (ft/sec)	14.92	14.92	14.92	14.93	12.01	12.01	12.01	12.01	10.05	10.05	10.05	10.05
Min Port Vel (ft/sec)	14.91	14.91	14.9	14.9	12.01	12.01	12	12	10.04	10.04	10.04	10.04
Max Port Vel (ft/sec)	14.93	14.94	14.94	14.93	12.05	12.05	12.03	12.03	10.11	10.12	10.09	10.1
Head loss	8.87	8.87	8.85	8.86	5.81	5.82	5.80	5.80	4.14	4.14	4.12	4.13
	15 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	49	49	49	49	61	61	61	61	74	74	74	74
Port Spacing (ft)	12	12	12	12	12	12	12	12	6	6	6	6
Avg Port Vel (ft/sec)	15.08	15.08	15.08	15.08	12.11	12.11	12.11	12.11	9.98	9.98	9.98	9.98
Min Port Vel (ft/sec)	15.06	15.06	15.05	15.05	12.1	12.1	12.09	12.09	9.92	9.92	9.9	9.91
Max Port Vel (ft/sec)	15.14	15.14	15.12	15.13	12.24	12.24	12.22	12.22	10.03	10.03	10.05	10.04
Head loss	9.27	9.27	9.26	9.26	6.17	6.17	6.15	6.15	4.23	4.23	4.22	4.22
	20 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	66	66	66	66	80	80	80	80	98	98	98	98
Port Spacing (ft)	12	12	12	12	6	6	6	6	6	6	6	6
Avg Port Vel (ft/sec)	14.92	14.92	14.92	14.92	12.31	12.31	12.31	12.31	10.05	10.05	10.05	10.05
Min Port Vel (ft/sec)	14.9	14.9	14.9	14.9	12.21	12.23	12.2	12.2	10	10	9.98	9.98
Max Port Vel (ft/sec)	15.1	15.1	15.08	15.08	12.39	12.39	12.35	12.35	10.11	10.19	10.17	10.17
Head loss	9.47	9.47	9.44	9.45	6.51	6.52	6.50	6.50	4.59	4.60	4.58	4.58
	25 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	82	82	82	82	102	102	102	102	122	122	122	122
Port Spacing (ft)	6	6	6	6	6	6	6	6	6	6	6	6
Avg Port Vel (ft/sec)	15.02	15.02	15.02	15.02	12.07	12.07	12.07	12.07	10.09	10.09	10.09	10.09
Min Port Vel (ft/sec)	14.9	4.88	14.86	14.87	11.99	11.99	11.98	11.98	10.04	10.04	10.03	10.03
Max Port Vel (ft/sec)	15.12	15.07	15.13	15.07	12.24	12.24	12.22	12.22	10.41	10.41	10.39	10.39
Head loss	9.72	9.72	9.70	9.70	6.69	6.69	6.67	6.67	5.07	5.07	5.04	5.05
	30 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	98	98	98	98	122	122	122	122	144	144	144	144
Port Spacing (ft)	6	6	6	6	6	6	6	6	6	6	6	6
Avg Port Vel (ft/sec)	15.08	15.08	15.08	15.08	12.11	12.11	12.11	12.11	10.26	10.26	10.26	10.26
Min Port Vel (ft/sec)	14.94	14.94	14.93	14.93	12.03	12.03	12.02	12.02	10.19	10.19	10.18	10.18
Max Port Vel (ft/sec)	15.22	15.22	15.22	15.22	12.21	12.46	12.44	12.44	10.84	10.84	10.81	10.81
Head loss	10.26	10.26	10.24	10.24	7.25	7.26	7.23	7.24	5.77	5.77	5.75	5.75

	35 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	114	114	114	114	130	130	130	130	144	144	144	144
Port Spacing (ft)	6	6	6	6	6	6	6	6	6	6	6	6
Avg Port Vel (ft/sec)	15.12	15.12	15.12	15.12	13.26	13.26	13.26	13.26	11.97	11.97	11.97	11.97
Min Port Vel (ft/sec)	15	15	14.99	14.99	13.17	13.17	13.16	13.16	11.88	11.88	11.87	11.87
Max Port Vel (ft/sec)	15.41	15.41	15.39	15.39	13.72	13.72	13.7	13.7	12.6	12.6	12.57	12.58
Head loss	10.90	10.91	10.88	10.89	8.97	8.97	8.95	8.95	7.81	7.81	7.78	7.79

	40 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	132	132	132	132	138	138	138	138	144	144	144	144
Port Spacing (ft)	6	6	6	6	6	6	6	6	6	6	6	6
Avg Port Vel (ft/sec)	14.92	14.92	14.92	14.92	14.28	14.28	14.28	14.28	13.68	13.68	13.68	13.68
Min Port Vel (ft/sec)	14.81	14.81	14.8	14.8	14.17	14.17	14.16	14.16	13.57	13.57	13.57	13.57
Max Port Vel (ft/sec)	15.44	15.44	15.42	15.42	14.87	14.87	14.85	14.85	14.36	14.36	14.34	14.34
Head loss	11.42	11.42	11.40	11.40	10.74	10.74	10.72	10.72	10.15	10.15	10.15	10.13

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Attachment 5
UDKHDEN Model Results Summary

Model Run	Flow mgd	Open Ports	Sal. psu	Temp. °C	Spacing m	Froude No.	Trapping Level	Dilution
1	1	3	0.1	10	3.66	41.38	7.54	589.71
2	1	3	1	10	3.66	41.96	7.57	588.40
3	1	3	10	10	3.66	49.36	9.13	529.80
4	1	3	20	10	3.66	64.71	13.79	363.02
5	1	3	30	10	3.66	119.74	21.04	88.63
6	1	3	0.1	15	3.66	40.91	7.46	593.18
7	1	3	1	15	3.66	41.46	7.56	589.08
8	1	3	10	15	3.66	48.43	8.93	537.17
9	1	3	20	15	3.66	62.39	13.60	369.36
10	1	3	30	15	3.66	105.49	20.69	104.09
11	1	3	0.1	20	3.66	40.23	7.39	596.07
12	1	3	1	20	3.66	40.74	7.47	592.70
13	1	3	10	20	3.66	47.22	8.49	553.02
14	1	3	20	20	3.66	59.69	13.43	374.72
15	1	3	30	20	3.66	93.18	20.37	117.27
16	1	3	0.1	25	3.66	39.40	7.27	600.54
17	1	3	1	25	3.66	39.88	7.36	597.14
18	1	3	10	25	3.66	45.82	8.39	556.99
19	1	3	20	25	3.66	56.82	13.22	382.03
20	1	3	30	25	3.66	82.96	20.05	130.35
21	1	4	0.1	10	3.66	31.04	8.43	719.04
22	1	4	1	10	3.66	31.47	8.64	708.66
23	1	4	10	10	3.66	37.02	9.63	658.53
24	1	4	20	10	3.66	48.53	15.11	399.90
25	1	4	30	10	3.66	89.81	21.15	101.80
26	1	4	0.1	15	3.66	30.68	8.15	732.98
27	1	4	1	15	3.66	31.09	8.31	724.94
28	1	4	10	15	3.66	36.32	9.54	663.18
29	1	4	20	15	3.66	46.79	14.62	422.47
30	1	4	30	15	3.66	79.12	21.00	109.56
31	1	4	0.1	20	3.66	30.17	7.99	741.36
32	1	4	1	20	3.66	30.56	8.17	732.35
33	1	4	10	20	3.66	35.41	9.43	668.44
34	1	4	20	20	3.66	44.76	13.94	454.32
35	1	4	30	20	3.66	69.88	20.68	127.21
36	1	4	0.1	25	3.66	29.55	7.89	746.56
37	1	4	1	25	3.66	29.91	7.99	741.52
38	1	4	10	25	3.66	34.36	9.34	673.25
39	1	4	20	25	3.66	42.62	13.76	462.22
40	1	4	30	25	3.66	62.22	20.39	142.16
41	1	5	0.1	10	3.66	24.83	9.21	834.61
42	1	5	1	10	3.66	25.18	9.28	829.61
43	1	5	10	10	3.66	29.61	13.36	585.20

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44	1	5	20	10	3.66	38.83	19.09	245.68
45	1	5	30	10	3.66	71.84	21.26	112.23
46	1	5	0.1	15	3.66	24.54	9.17	837.36
47	1	5	1	15	3.66	24.87	9.24	833.20
48	1	5	10	15	3.66	29.06	13.24	592.12
49	1	5	20	15	3.66	37.43	15.36	470.50
50	1	5	30	15	3.66	63.29	21.10	122.34
51	1	5	0.1	20	3.66	24.14	9.12	840.83
52	1	5	1	20	3.66	24.45	9.11	840.85
53	1	5	10	20	3.66	28.33	13.16	597.20
54	1	5	20	20	3.66	35.81	15.18	479.40
55	1	5	30	20	3.66	55.91	20.96	130.99
56	1	5	0.1	25	3.66	23.64	8.86	856.94
57	1	5	1	25	3.66	23.93	9.02	846.95
58	1	5	10	25	3.66	27.49	13.07	602.65
59	1	5	20	25	3.66	34.09	14.86	497.23
60	1	5	30	25	3.66	49.78	20.67	150.01

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CH2M Aquaculture Waste Load Estimation

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TECHNICAL MEMORANDUM

Aquaculture Waste Load Estimation
Redwood Marine Terminal II

PREPARED FOR:	County of Humboldt and Humboldt Bay Harbor, Recreation and Conservation District
PREPARED BY:	CH2M
DATE:	February 2016

1.0 Introduction

Aquaculture has been identified as a key industry with opportunities for growth in Humboldt County, and is one of several proposed uses of the Redwood Marine Terminal II (RMT II) site. The existing infrastructure and facilities at the RMT II site offer opportunities to develop, expand and diversify aquaculture in the region. Among these opportunities are the availability and access to both seawater and freshwater for aquaculture operations, marine dock access, a wastewater treatment facility that could potentially receive and treat waste from aquaculture operations, and an ocean outfall for discharge of the treated waste from aquaculture facilities.

Management of the wastewater generated by proposed aquaculture facilities is a key issue to consider early in the planning process for reuse of the RMT II site. Aquaculture wastewater is typically high in nutrients and turbidity from particulate and dissolved waste matter, and could potentially carry pathogens such as enteric bacteria and other disease causing agents. This wastewater may need treatment before discharge into Humboldt Bay to comply with permit requirements. The production capacity (kilograms of fish produced per year) of the aquaculture facility will also need to be scaled to that of the wastewater treatment facility and the ocean outfall so as not to overwhelm the wastewater treatment and disposal capacity of these systems. It is therefore necessary to understand the aquaculture waste loads that would be generated by this proposed reuse of the RMT II site.

This technical memorandum (TM) focuses on a preliminary conceptual level estimation of potential waste loads that an aquaculture facility could generate at the RMT II site.

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2.0 Methods

2.1 Selection of Aquaculture Species and Operation

For an understanding of waste loads from an aquaculture facility, it is first necessary to select a target species. Waste loads are species dependent, particularly when different taxa such as finfish and bivalves are considered. Previous studies also indicate that the use of freshwater will be prohibitively expensive at the RMT II site (Vinci 2013). Selection of a species that could be cultured predominantly in saltwater would thus be advantageous.

Based on additional information received from discussions with Randy Lovell (California Department of Fish & Wildlife), Greg Dale (Coast Seafoods), and John Finger (Hog Island Oyster Company), steelhead (*Onchorhynchus mykiss*) culture with once-through seawater was selected as the target species and mode of operation, respectively, for the purpose of this analysis. Steelhead are essentially anadromous rainbow trout that yield medium-to-high market value and would minimize the use of freshwater at the RMT II site.

Discussions with the oyster producers also confirmed that oyster operations would not involve significant waste loads, relative to those generated from finfish operations. A bivalve hatchery mariculture operation at RMT II would generate only a minimal amount of waste and would in all likelihood qualify for an exemption to NPDES permitting requirements under the Environmental Protection Agency's (EPA) regulation of the Clean Water Act. The EPA requires NPDES permitting only for cold-water operations that produce more than 20,000 pounds of organisms per year and use 5,000 pounds of feed per month. Because algae feed for oyster hatcheries are most often grown onsite by culturing algae cells already present in the sourcewater, trace nutrients, and solar energy, hatcheries are normally exempt from these requirements. For example, the private oyster mariculture hatchery operation currently being developed in Humboldt Bay by Coast Seafood will be exempt from NPDES reporting requirements under this criteria. Therefore, selection of a finfish such as steelhead would allow estimation of maximum waste loads in order to appropriately size future potential waste treatment and discharge facilities at the RMT II site.

2.2 Nutritional Approach for Estimating Waste Loads from Steelhead Aquaculture

A nutritional approach is used to estimate waste loads from steelhead aquaculture operations (Bureau and Hua 2010). The key processes involved in waste generation are outlined in Figure 1. In this nutritional approach, feed is distributed to fish on a daily basis. The amount of feed distributed is dependent on the average size of the fish and water temperature at that time. Most of this feed is consumed by the fish, while some of it is wasted. This uneaten feed becomes a component of the total solid wastes. Most of the consumed feed is assimilated (digested) by the fish, while the undigested feed is eliminated as fecal waste. This fecal waste also contributes to the total solid wastes.

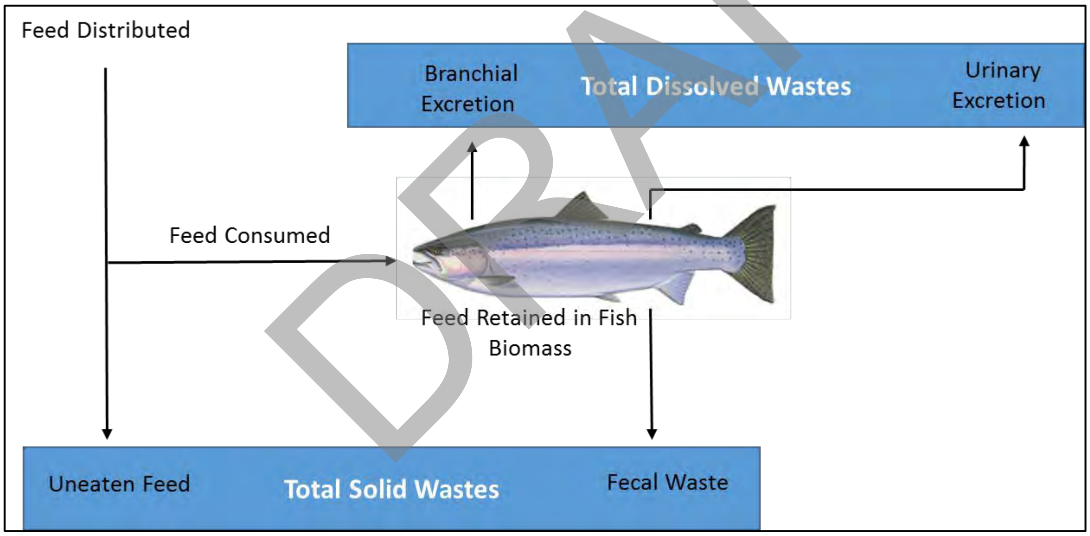

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Figure 1. Schematic depicting the nutritional approach for estimating waste loads from finfish aquaculture

Total dissolved wastes are a direct function of the consumption, metabolism and retention of nutrients by the fish (Bureau and Hua, 2010). Nutrients assimilated from the consumed feed are absorbed and can potentially be metabolized by the fish to support various life processes and functions. A significant proportion of the assimilated nutrients is retained in fish biomass. The absorbed nutrients that are not retained are metabolized, and end-products of nutrient breakdown (catabolism) are eliminated by the fish through branchial or urinary excretion (Figure 1). For example, in saltwater fish, amino acid catabolism results in the production of NH_3-N/NH_4-N (henceforth called NH_4-N), which is excreted through the gills (branchial excretion), and accounts for 80-90% of nitrogenous metabolic wastes. The breakdown of nucleic acids present in the feed results in the production of urea, which is mainly excreted in the urine. Urea generally only represents about 10% of the dissolved nitrogenous waste. In addition, orthophosphates are the major form of dissolved P waste excreted by the fish.

2.3 Methods for Estimation of Waste Load Components

Wastes loads are estimated using the nutritional approach (Figure 1) that compartmentalizes the total wastes into solid and dissolved wastes. The solid and dissolved wastes components are further divided into nitrogenous and phosphorus wastes according to methods described by Bureau et al. (2003), Papatryphon et al. (2005), Roque d'Orbcastel et al. (2008), and Bureau and Hua (2010). The following sub-sections on solid waste and dissolved waste estimation describe the methods used in this analysis.

2.3.1 Solid Waste Estimation

Total Solid Wastes

The following equation describes the total solid wastes (SW) generated by fish.

$$SW = FE_w + UE_F$$

FE_W = Fecal Wastes = $F_C * (1 - ADC_{DM})$

UE_F = Uneaten Feed = $(F_D * F_W)$

Where;

ADC_{DM} = Apparent Digestibility Coefficient of Feed Dry Matter

F_W = Percent of Feed Wasted

F_C = Feed Consumed = $(F_D – UE_F)$

F_D = Feed Distributed = $(FBM * F_R)$

Where;

FBM = Fish Body Mass

F_R = Feeding Rate (as % of fish body mass per day)

Solid Nitrogenous (N) Wastes

The following equation describes the solid N waste (SW_N) generated by fish, which is a part of the total solid waste.

$$SW_N = FE_N + UE_N$$

FE_N = Fecal N Waste = $F_C * F_N * (1 – ADC_{Pr})$

UE_N = N in Uneaten Feed = $(UE_F * F_N)$

Where;

ADC_{Pr} = Apparent Digestibility Coefficient of Crude Protein in Feed

F_N = Percent N Content of Feed

F_C = Feed Consumed

UE_F = Uneaten Feed

Solid Phosphorus (P) Wastes

The following equation describes the solid P waste (SW_P) generated by fish, which is a part of the total solid waste.

$$SW_P = FE_P + UE_P$$

FE_P = Fecal P Waste = $F_C * F_P * (1 – ADC_P)$

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UE_P = P in Uneaten Feed = (UE_F * F_P)

Where;

ADC_P = Apparent Digestibility Coefficient of P in Feed

F_P = Percent P Content of Feed

F_C = Feed Consumed

UE_F = Uneaten Feed

2.3.2 Dissolved Waste Estimation

Dissolved N Waste

The following equation describes the dissolved N waste (DW_N) generated by fish.

$$DW_N = C_N – FE_N - R_N$$

Where,

C_N = Consumed N = F_C * F_N

F_C = Feed Consumed

F_N = Percent N Content of Feed

FE_N = Fecal N Waste

R_N = N Retained by Fish = (F_C * B_N)/FCR

B_N = N Content of Whole Fish Body (as % of fish body mass)

FCR = Feed Conversion Ratio

Ammonia-N Waste

Ammonia-N waste is assumed to be 80% of DW_N (Papatryphon et al. 2005).

Dissolved P Waste

The following equation describes the dissolved P waste (DW_P) generated by fish.

$$DW_P = C_P – FE_P – R_P$$

Where,

C_P = Consumed P = F_C * F_P

F_C = Feed Consumed

F_P = Percent P Content of Feed

FE_P = Fecal P Waste

R_P = P Retained by Fish = (F_C * B_P)/FCR

B_P = P Content of Whole Fish Body (as % of fish body mass)

FCR = Feed Conversion Ratio

2.3.3 Total Waste Estimation

Total waste components for the purpose of this analysis include total solid waste, total N waste, and total P waste. Total solid waste is estimated as described in section 2.3.1. This section describes estimation methods for total N waste and total P waste.

Total N Waste

Total N waste (TW_N) is estimated with the equation,

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$$TW_N = SW_N + DW_N$$

Where,

SW_N = Solid N Waste

DW_N = Dissolved N Waste

Total P Waste

Total P waste (TW_P) is estimated with the equation,

$$TW_P = SW_P + DW_P$$

Where,

SW_P = Solid P Waste

DW_P = Dissolved P Waste

2.4 Assumptions for Analysis of Waste Loads from Steelhead Aquaculture

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The amount of waste loads generated from finfish aquaculture operations will depend on general factors such as water temperatures and fish growth (sizes achieved) during the production cycle, and the total annual production capacity. Specific feed-related factors are also important such as feed rations distributed, feed wastage (uneaten feed), feed composition, feed digestibility and feed conversion ratios, among other factors. Waste load estimation for steelhead aquaculture operations in this analysis uses the following assumptions and coefficients based on a literature review of these various factors (Tables 1, 2 and 3).

Table 1. General Factors Considered for Estimating Waste Loads From Steelhead Aquaculture Operations

General Factors	Assumptions and Rationale	Reference
Water Temperature	Assumption: Estimate waste loads for three water temperature scenarios: 10 ^{0}C, 15 ^{0}C, and 20 ^{0}C. Rationale: Steelhead can withstand a vast range of temperatures but spawning and growth occurs in a narrower range (9 ^{0}C - 14 ^{0}C) and the optimum temperature for culture is below 21 ^{0}C.	*FAO. Online article*
Fish Growth and Fish Sizes	Assumption: Estimate waste loads for four sizes of fish during this growth period, 5 g, 50 g, 250 g, and 500 g. Rationale: During the annual production cycle, steelhead grow from a startup size of 5 g fish to a 500 g (1.1 lb) fish at harvest (market size).	*1) FAO.* *2) Klontz (1991)*
Total Annual Fish Production Capacity	Assumption: Estimate waste loads for four fish production capacity scenarios, 5,000 kg; 50,000 kg; 250,000 kg; and 500,000 kg. Rationale: The RMT II site can be configured to house fish production systems that might produce as much as 500,000 kg of fish per year.	*Vinci (2013)*

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Table 2. Aquaculture Feed and Fish Body Composition Factors Considered for Estimating Waste Loads From Steelhead Aquaculture Operations

Parameters	Symbol	Value	Reference
Feed Composition (%)			
Nitrogen	F_N	7.0	*Bureau and Hua (2010)*
Phosphorus	F_P	1.1	*Bureau and Hua (2010)*
Feed Wasted (%)			
Feed Wasted	F_W	5.0	*Bureau et al. (2003)*
Apparent Digestibility Coefficient (%)			
Feed Dry Matter	ADC_{DM}	78.0	*Bureau and Hua (2010)*
Crude Protein in Feed	ADC_{Pr}	88.0	*Bureau and Hua (2010)*
Phosphorus in Feed	ADC_P	60.0	*Bureau and Hua (2010)*
Feed Conversion Ratio (feed:gain)	FCR	1.1	*Bureau and Hua (2010)*
Whole Fish Body Composition (% of body weight)			
N Content of Whole Fish Body	B_N	2.65	*Roque d'Orbcastel et al. (2008)*
P Content of Whole Fish Body	B_P	0.4	*Papatryphon et al. (2005)*

In aquaculture operations, feed is distributed to steelhead on a daily basis to achieve growth of the fish to market size over a specific period of time. Daily feeding rates (daily rations) will depend on fish size and water temperatures on any particular day, which in turn will affect the amount of waste loads produced. Feeding rates are estimated as a percentage of fish body weight (% body mass/d) and are shown for the three water temperature and fish body size scenarios used to estimate waste loads (Table 3).

Table 3. Feeding Rates (Food Rations) Distributed to Steelhead as a Function of Fish Body Mass and Water Temperature.
Source for Feeding Rates: Hinshaw (1999

Individual Fish Mass (g)	Feeding Rates (F_R) (% of body weight)		
	10 ^{0}C	**15 ^{0}C**	**20 ^{0}C**
5.0	4.15	4.9	5.3
50.0	1.8	2.3	2.4
250.0	1.1	1.55	1.55
500.0	0.9	1.2	1.25

Notes: *Hinshaw (1999) provides fish size- and water temperature-specific feeding rates for rainbow trout where fish size is expressed as numbers of fish per pound. The number of fish/pound data in Hinshaw (1999) is converted to grams/individual fish (individual fish mass) based on 1 pound = 453.6 grams. For example, 100 fish/pound will have individual fish weighing 4.536 g each.*

2.5 Estimation of Aquaculture Waste Production

All solid and dissolved wastes are first estimated on a g/fish/d basis for fish of four different sizes under three different water temperature scenarios (Table 1). System-wide daily waste loads are estimated using individual fish waste production rates and scaling up to four aquaculture production capacity scenarios of 5,000, 50,000, 250,000 and 500,000 kg of fish (Table 1). At a market weight of 500 g (0.5 kg) per fish, these translate to fish production numbers of 10,000, 100,000, 500,000, and 1,000,0000 steelhead. Finally, annual waste loads generated by steelhead aquaculture are estimated and presented on a kilogram per metric ton of fish produced, and kilogram per annum basis.

3.0 Results and Discussion

This section describes the waste loads estimated for a steelhead aquaculture facility at the RMT II site. Waste load estimates presented in this section are based on feeding rates that are dependent on four sizes of steelhead that reflect various stages of growth, and at three water temperatures. The resulting amounts of feed distributed, feed consumed by the fish and feed left uneaten are presented in the Appendix (Table A-1).

Results of the solid and dissolved wastes loads are first described on an individual fish basis in sections 3.1-3.2. These individual fish waste load estimates are then projected to estimate system-wide daily waste loads based on total steelhead production capacity and described in section 3.3. Finally, annual waste loads expected from the steelhead aquaculture facility are presented in section 3.4.

3.1 Solid Wastes Generated by Individual Fish

Solid wastes include total solid wastes and its components, solid N wastes and solid P wastes, all of which increased by one to two orders of magnitude with increases in fish body mass and water temperatures (Appendix, Table A-2, Figures 2 and 3). At startup of system operations for example, a fish of 5 g at 10 ^{0}C produces 0.0537 g/d of solid waste, of which 0.0024 g is N waste and 0.001 g is P waste. At the end of one growth cycle of annual operations, a harvestable fish of 500 g (market size) at 20 ^{0}C produces approximately 1.6188 g/d of solid waste, of which 0.0718 g is N waste and 0.0296 g is P waste (Appendix Table A-2, Figures 2 and 3).

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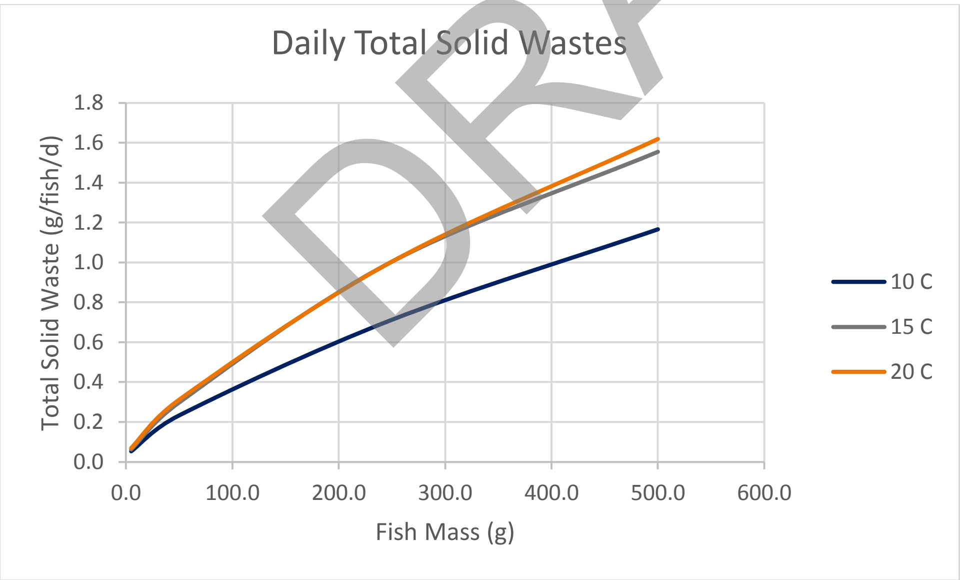

Figure 2. Estimated daily production of total solid wastes by individual steelhead trout

Figure 3. Estimated daily production of solid N and P wastes by individual steelhead trout

3.2 Dissolved Wastes Generated by Individual Fish

Dissolved wastes include dissolved N, of which 80% is NH_4-N waste, and dissolved P wastes. Fish body mass and water temperatures strongly affect production of each of these dissolved waste components (Appendix, Table A-3, Figures 4 and 5). At startup of system operations for example, a fish of 5 g at 10 ^{0}C produces 0.0074 g/d of dissolved N waste, of which 0.0059 g is as NH_4-N, and 0.0006 g is P waste. At the end of one growth cycle of annual operations, a harvestable fish of 500 g (market size) at 20 ^{0}C produces approximately 0.2227 g/d of dissolved N waste, of which 0.1782 g is as NH_4-N, and 0.0176 g of P waste (Appendix, Table A-3, Figures 4 and 5).

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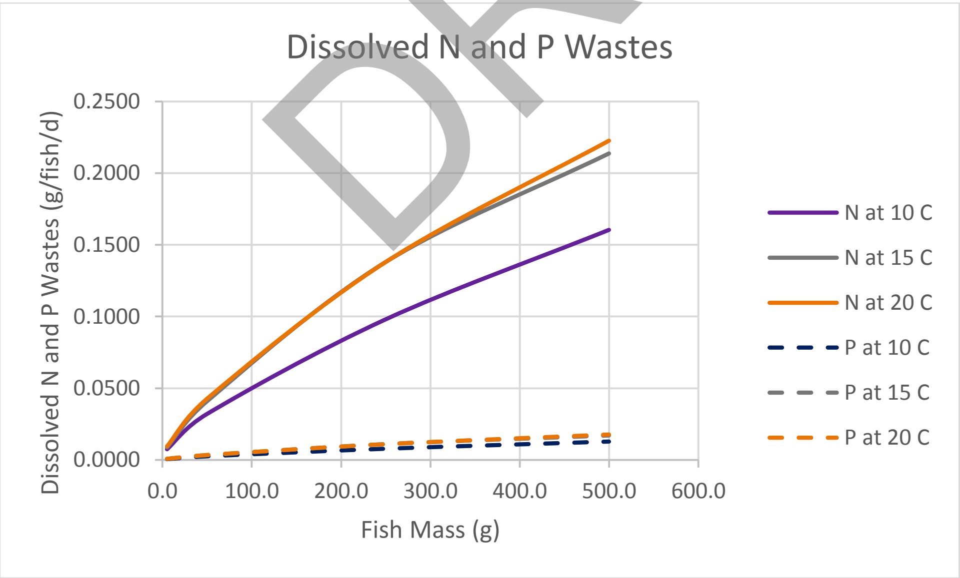

Figure 4. Estimated daily production of dissolved N and P wastes by individual steelhead trout

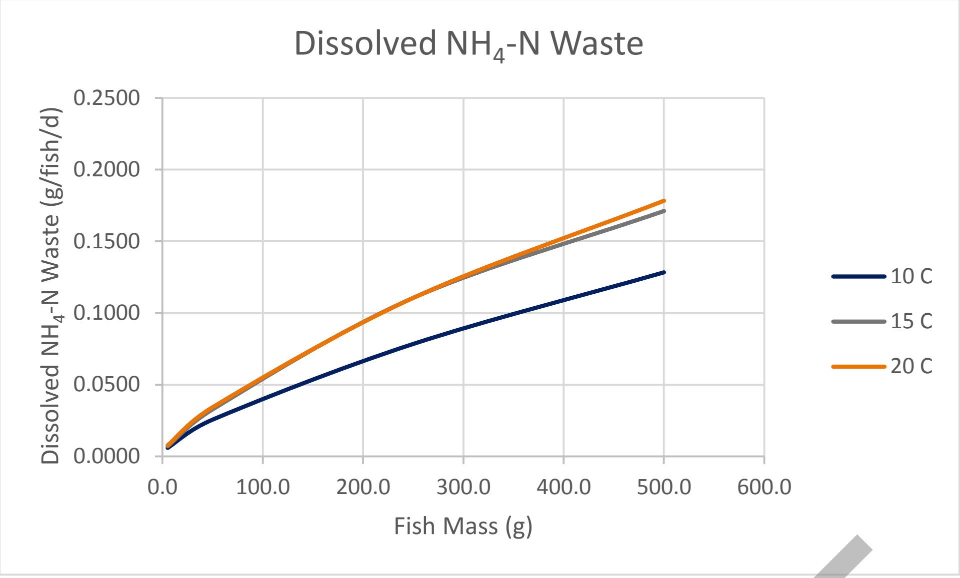

Figure 5. Estimated daily production of solid N and P wastes by individual steelhead trout

3.3 System-wide Daily Waste Loads Related to Total Steelhead Production Capacity

Daily wastes generated by steelhead aquaculture operating at various annual production capacities are evaluated at startup and harvest under three different water temperature regimes. Waste loads scaled to fish production capacities include total solid waste, total N and P waste (solid + dissolved N and P), NH_4-N waste, and dissolved P waste.

The ranges of daily total solid wastes, NH_4-N production, dissolved P waste production, and daily total N and P waste production all increase significantly with increasing fish production capacity (Appendix, Tables A-4 to A-8, Figures 6 to 10).

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3.3.1 Daily Total Solid Wastes and Fish Production Capacity

The relationship between production of total solid wastes and fish production capacity is shown in Figure 6. For example, at a production capacity of 5,000 kg of steelhead (10,000 fish), total solid waste production is 0.5 kg/d at 10 ^{0}C at startup and increases to 16.2 kg/d at 20 ^{0}C at harvest, as fish grow through the production cycle. At 500,000 kg of steelhead produced (1,000,000 fish), total solid waste production ranges from 53.7 kg/d at 10 ^{0}C at startup, to 1,618.8 kg/d at 20 ^{0}C at harvest size, which is also the maximum daily load under the scenarios examined (Appendix, Table A-4, Figure 6).

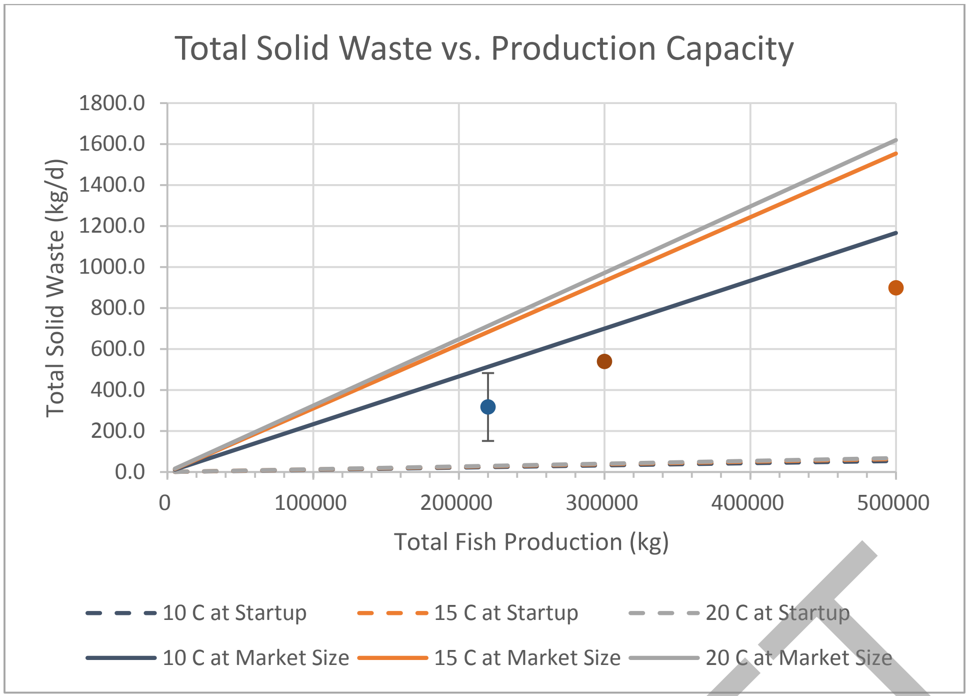

Figure 6. Daily total solid wastes produced by steelhead at various production capacities at startup of operations and at harvest, under three water temperature regimes

Note: It is assumed that none to negligible fish mortality occurs through the production cycle. Symbols represent data from other studies; blue symbol is data from Roque D'Orbcastel et al. (2008), and the other two symbols are estimates derived from Azevedo et al. (1998), corroborating that waste production estimated in this study falls within the ranges presented in other studies.

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3.3.2 Daily NH_4-N Wastes and Fish Production Capacity

The relationship between production of NH_4-N wastes and fish production capacity is shown in Figure 7. At a production capacity of 5,000 kg of steelhead (10,000 fish), NH_4-N waste production is 0.06 kg/d at 10 ^{0}C at startup and increases to 1.8 kg/d at 20 ^{0}C at harvest, reflecting an increase in waste produced as fish grow through the production cycle. At 500,000 kg of steelhead produced (1,000,000 fish), total NH_4-N waste production ranges from 5.9 kg/d at 10 ^{0}C at startup, to 178.2 kg/d at 20 ^{0}C at harvest size, and represents a significant increase in waste production as fish production capacity increases. The waste load of 178.2 kg/d also reflects the maximum daily load of NH_4-N waste under the scenarios examined (Appendix, Table A-5, Figure 7).

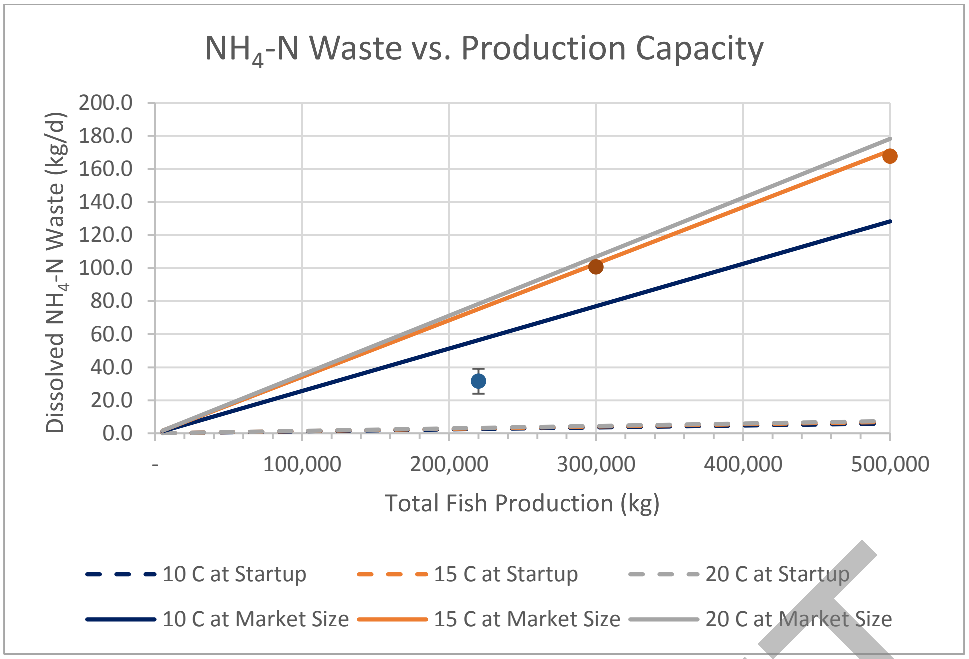

Figure 7. Daily NH_4-N wastes produced by steelhead at various production capacities at startup of operations and at harvest, under three water temperature regimes

Note: It is assumed that none to negligible fish mortality occurs through the production cycle. Symbols represent data from other studies; blue symbol is data from Roque D'Orbcastel et al. (2008), and the other two symbols are estimates derived from Azevedo et al. (1998), corroborating that waste production estimated in this study falls within the ranges presented in other studies.

3.3.3 Daily Dissolved P Waste and Fish Production Capacity

The relationship between production of dissolved P wastes and fish production capacity is shown in Figure 8. At a production capacity of 5,000 kg of steelhead (10,000 fish), dissolved P waste production is 0.006 kg/d at 10 ^{0}C at startup and increases to 0.18 kg/d at 20 ^{0}C at harvest, reflecting an increase in dissolved P waste generated as fish grow through the production cycle. At 500,000 kg of steelhead produced (1,000,000 fish), dissolved P waste production ranges from 0.58 kg/d at 10 ^{0}C at startup, to 17.6 kg/d at 20 ^{0}C at harvest size. The latter also reflects the maximum daily load of dissolved P waste, most of it as orthophosphate, under the scenarios examined (Appendix, Table A-6, Figure 8).

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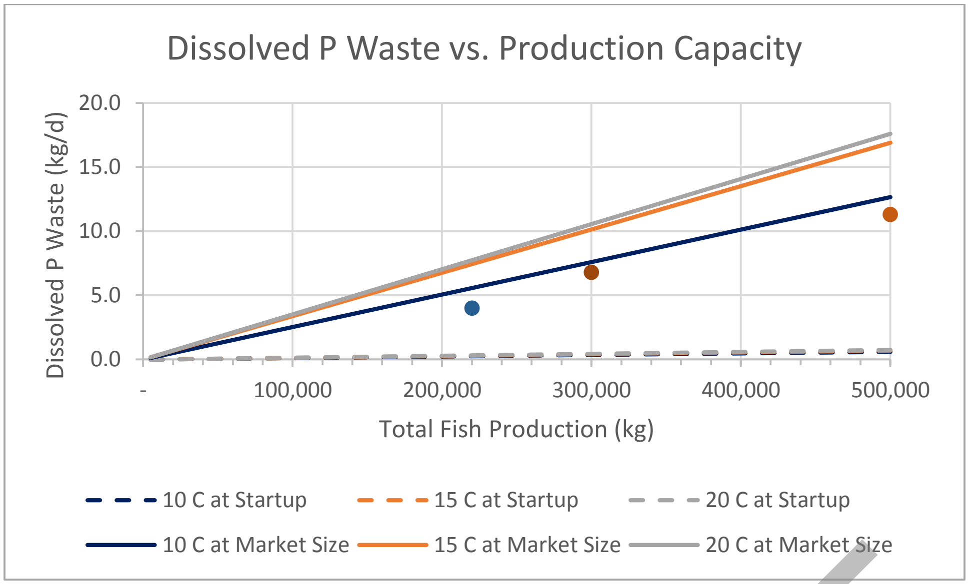

Figure 8. Daily dissolved P wastes produced by steelhead at various production capacities at startup of operations and at harvest, under three water temperature regimes

Note: It is assumed that none to negligible fish mortality occurs through the production cycle. Symbols represent data from other studies; blue symbol is data from Roque D'Orbcastel et al. (2008), and the other two symbols are estimates derived from Azevedo et al. (1998), corroborating that waste production estimated in this study falls within the ranges presented in other studies.

3.3.4 Daily Total N Waste and Fish Production Capacity

The relationship between daily total N wastes (dissolved N + solid N) is shown in Figure 9. At a production capacity of 5,000 kg of steelhead (10,000 fish), total N waste production is 0.1 kg/d at 10 ^{0}C at startup and increases to 2.9 kg/d at 20 ^{0}C at harvest. This reflects an increase in total N waste generated as fish grow through the production cycle. At 500,000 kg of steelhead produced (1,000,000 fish), total N waste production ranges from 9.8 kg/d at 10 ^{0}C at startup, to a maximum of 294.5 kg/d at 20 ^{0}C at harvest size under the scenarios examined (Appendix, Table A-7, Figure 9).

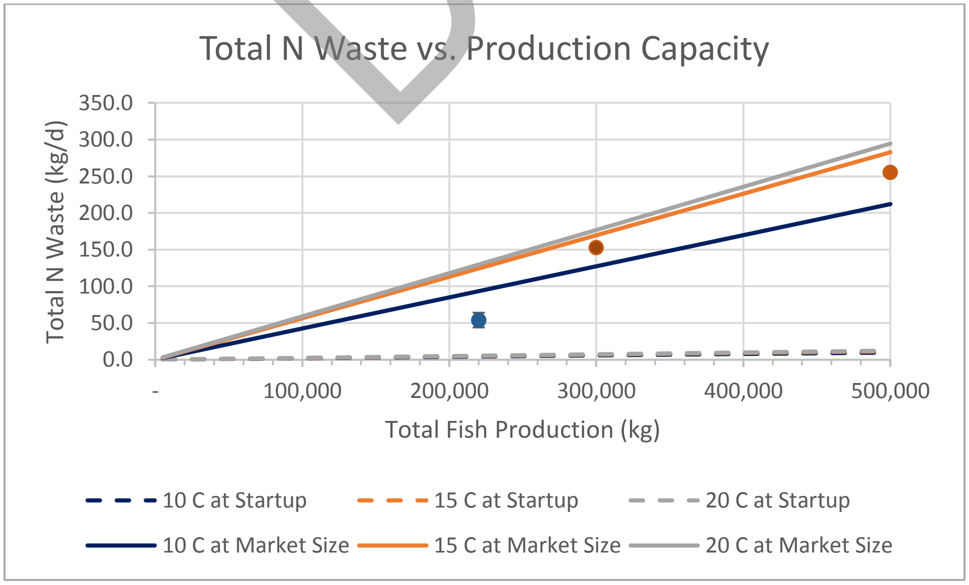

Figure 9. Daily total N wastes produced by steelhead at various production capacities at startup of operations and at harvest, under three water temperature regimes

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Note: It is assumed that none to negligible fish mortality occurs through the production cycle. Symbols represent data from other studies; blue symbol is data from Roque D'Orbcastel et al. (2008), and the other two symbols are estimates derived from Azevedo et al. (1998), corroborating that waste production estimated in this study falls within the ranges presented in other studies.

3.3.5 Daily Total P Waste and Fish Production Capacity

The relationship between daily total P wastes (dissolved P + solid P) is shown in Figure 10. At a production capacity of 5,000 kg of steelhead (10,000 fish), total P waste production is 0.02 kg/d at 10 ^{0}C at startup and increases to 0.47 kg/d at 20 ^{0}C at harvest. This reflects an increase in total P waste generated as fish grow through the production cycle. At 500,000 kg of steelhead produced (1,000,000 fish), total P waste production ranges from 1.57 kg/d at 10 ^{0}C at startup, to a maximum of 47.16 kg/d at 20 ^{0}C at harvest size, under the scenarios examined (Appendix, Table A-8, Figure 10).

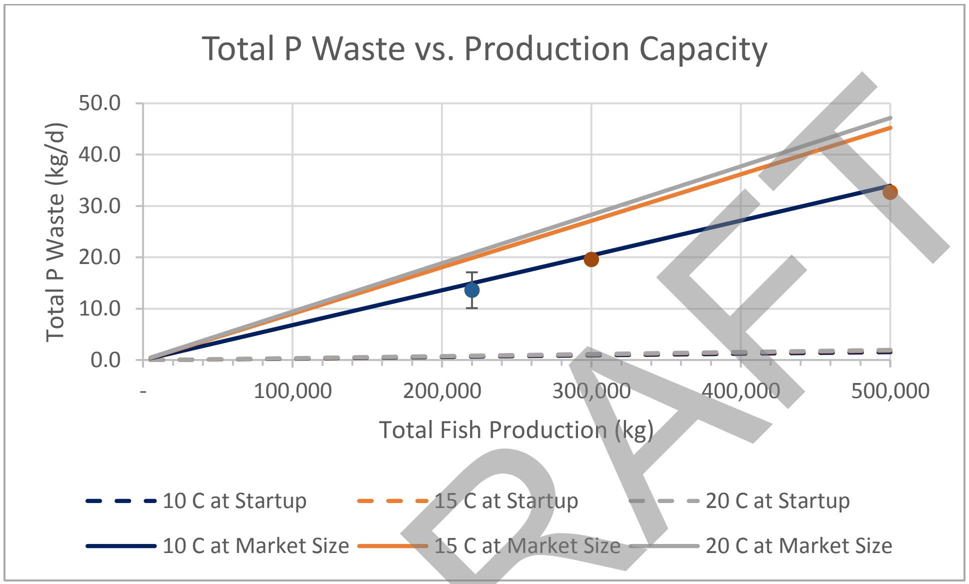

Figure 10. Daily total P wastes produced by steelhead at various production capacities at startup of operations and at harvest, under three water temperature regimes

Note: It is assumed that none to negligible fish mortality occurs through the production cycle. Symbols represent data from other studies; blue symbol is data from Roque D'Orbcastel et al. (2008), and the other two symbols are estimates derived from Azevedo et al. (1998), corroborating that waste production estimated in this study falls within the ranges presented in other studies.

3.4 Annual Waste Loads Generated by Steelhead Aquaculture

Annual waste loads generated per metric ton of fish produced are estimated for a single cycle of steelhead aquaculture that grows fish from 5 g at startup to 500 g market size over a 30 week (210 day) period. The average water temperature is assumed to be 15 ^{0}C during this production cycle, which is within the optimal water temperature range for growth of *O. mykiss* in aquaculture operations (Hinshaw 1999).

Total solid wastes formed the bulk of the total wastes generated at 306.5 kg per metric ton of fish produced, followed by N and P wastes (Figure 11).

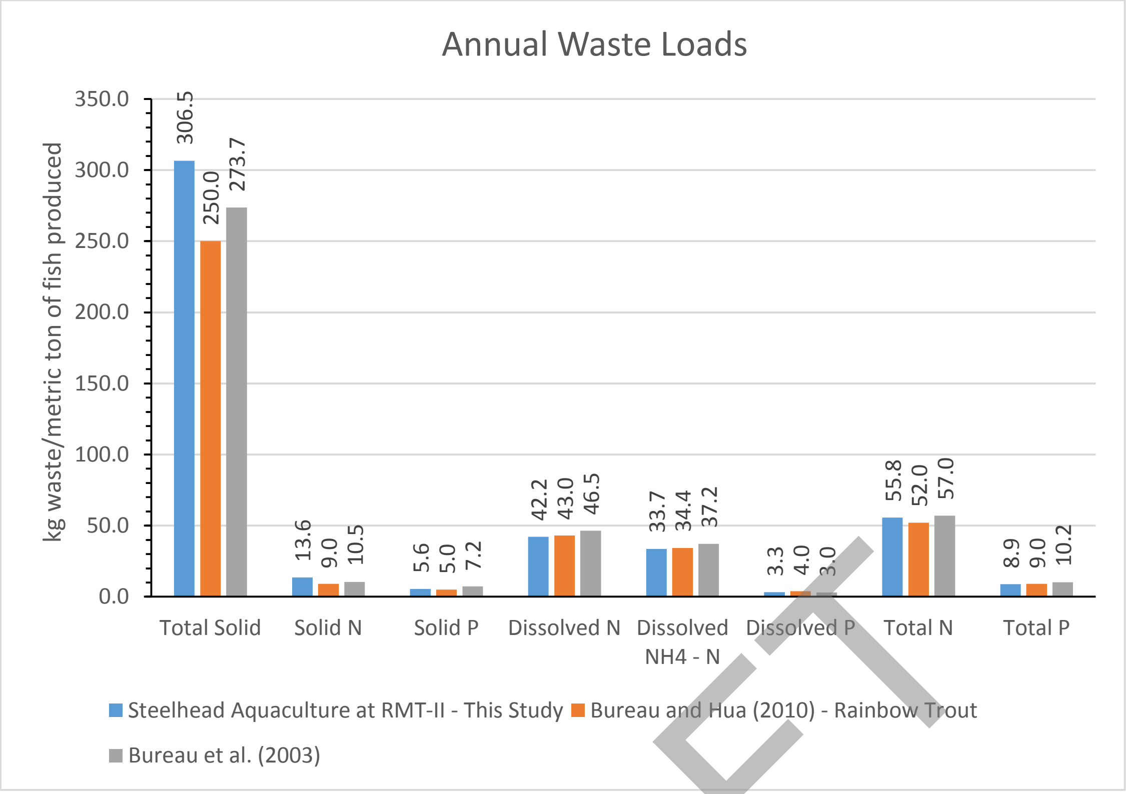

Figure 11. Total waste loads generated per metric ton of steelhead produced over a 30 week production period, compared to waste production estimates from other studies.

Table 4 further provides a breakdown of these waste loads based on various total fish production capacities of the steelhead aquaculture operations.

Table 4. Total waste loads generated by steelhead aquaculture over a 30 week production period at various fish production capacities.

	Total Fish Production (kg)			
Waste Load (kg)	**5,000**	**50,000**	**250,000**	**500,000**
Total Solid Waste (SW)	1,532	15,324	76,622	153,244
Solid N Waste (SW_N)	68	679	3,396	6,792
Solid P Waste (SW_P)	28	280	1,399	2,799
Dissolved N Waste (DW_N)	211	2,108	10,542	21,084
NH4 - N Waste (DW_{NH4-N})	169	1,687	8,433	16,867
Dissolved P Waste (DW_P)	17	167	833	1,666
Total N Waste (TW_N)	279	2,788	13,938	27,876
Total P Waste (TW_P)	45	446	2,232	4,464

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Appendix (Tables A-1 to A-8)

Table A-1. Fish body mass, rations fed, and related food consumption.

	Feeding Rates (F_R) (% of body weight)			Feed Distributed (F_D) (g/fish/d)			Uneaten Feed (UE_F) (g/fish/d)			Feed Consumed (F_C) (g/fish/d)		
Individual Fish Mass (g)	10 ^{0}C	15 ^{0}C	20 ^{0}C	10 ^{0}C	15 ^{0}C	20 ^{0}C	10 ^{0}C	15 ^{0}C	20 ^{0}C	10 ^{0}C	15 ^{0}C	20 ^{0}C
5	4.15	4.9	5.3	0.2075	0.2450	0.2650	0.0104	0.0123	0.0133	0.1971	0.2328	0.2518
50	1.8	2.3	2.4	0.9000	1.1500	1.2000	0.0450	0.0575	0.0600	0.8550	1.0925	1.1400
250	1.1	1.55	1.55	2.7500	3.8750	3.8750	0.1375	0.1938	0.1938	2.6125	3.6813	3.6813
500	0.9	1.2	1.25	4.5000	6.0000	6.2500	0.2250	0.3000	0.3125	4.2750	5.7000	5.9375

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Table A-2. Solid wastes for individual fish in relation to fish body mass and water temperature.

	Total Solid Waste (SW) (g/fish/d)			Solid N Waste (SW_N) (g/fish/d)			Solid P Waste (SW_P) (g/fish/d)		
Individual Fish Mass (g)	10 ^{0}C	15 ^{0}C	20 ^{0}C	10 ^{0}C	15 ^{0}C	20 ^{0}C	10 ^{0}C	15 ^{0}C	20 ^{0}C
5	0.0537	0.0635	0.0686	0.0024	0.0028	0.0030	0.0010	0.0012	0.0013
50	0.2331	0.2979	0.3108	0.0103	0.0132	0.0138	0.0043	0.0054	0.0057
250	0.7123	1.0036	1.0036	0.0316	0.0445	0.0445	0.0130	0.0183	0.0183
500	1.1655	1.5540	1.6188	0.0517	0.0689	0.0718	0.0213	0.0284	0.0296

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Table A-3. Dissolved wastes for individual fish in relation to fish body mass and water temperature

	Dissolved N Waste (DW_N) (g/fish/d)			**Dissolved NH_4-N Waste (DW_{NH4-N}) (g/fish/d)**			**Dissolved P Waste (DW_P) (g/fish/d)**		
Individual Fish Mass (g)	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5	0.0074	0.0087	0.0094	0.0059	0.0070	0.0076	0.0006	0.0007	0.0007
50	0.0321	0.0410	0.0428	0.0257	0.0328	0.0342	0.0025	0.0032	0.0034
250	0.0980	0.1381	0.1381	0.0784	0.1105	0.1105	0.0077	0.0109	0.0109
500	0.1604	0.2138	0.2227	0.1283	0.1710	0.1782	0.0127	0.0169	0.0176

Table A-4. Annual production capacity of aquaculture operations and daily solid wastes at startup and at harvest.

		Total Solid Waste (SW) (kg/d) at startup			**Total Solid Waste (SW) (kg/d) at harvest**		
Total Fish Production (kg)	**Total Number Fish Produced**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5,000	10,000	0.5	0.6	0.7	11.7	15.5	16.2
50,000	100,000	5.4	6.3	6.9	116.6	155.4	161.9
250,000	500,000	26.9	31.7	34.3	582.8	777.0	809.4
500,000	1,000,000	53.7	63.5	68.6	1165.5	1554.0	1618.8

Note: Fish size at startup is 5 g and at harvest is 500 g (market size).

Table A-5. Annual production capacity of aquaculture operations and daily NH_4-N wastes at startup and at harvest.

		NH_4-N Waste (DW_{NH4-N}) (kg/d) at Startup			NH4-N Waste (DW_{NH4-N}) (kg/d) at Harvest		
Total Fish Production (kg)	**Total Number Fish Produced**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5,000	10,000	0.06	0.07	0.08	1.3	1.7	1.8
50,000	100,000	0.6	0.7	0.8	12.8	17.1	17.8
250,000	500,000	3.0	3.5	3.8	64.1	85.5	89.1
500,000	1,000,000	5.9	7.0	7.6	128.3	171.0	178.2

Note: Fish size at startup is 5 g and at harvest is 500 g (market size).

Table A-6. Annual production capacity of aquaculture operations and daily dissolved P wastes at startup and at harvest.

		Dissolved P Waste (DW_P) (kg/d) at Startup			Dissolved P Waste (DW_P) (kg/d) at Harvest		
Total Fish Production (kg)	**Total Number Fish Produced**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5,000	10,000	0.006	0.007	0.007	0.13	0.17	0.18
50,000	100,000	0.058	0.069	0.075	1.27	1.69	1.76
250,000	500,000	0.29	0.34	0.37	6.33	8.45	8.80
500,000	1,000,000	0.58	0.69	0.75	12.67	16.89	17.60

Note: Fish size at startup is 5 g and at harvest is 500 g (market size).

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Table A-7. Annual production capacity of aquaculture operations and daily total N wastes at startup and at harvest.

		Total N Waste (TW_N) (kg/d) at Startup			**Total N Waste (TW_N) (kg/d) at Harvest**		
Total Fish Production (kg)	**Total Number Fish Produced**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5,000	10,000	0.10	0.12	0.12	2.1	2.8	2.9
50,000	100,000	1.0	1.2	1.2	21.2	28.3	29.4
250,000	500,000	4.9	5.8	6.2	106.0	141.3	147.2
500,000	1,000,000	9.8	11.5	12.5	212.0	282.7	294.5

Note: Total N = Solid N + Dissolved N.

Fish size at startup is 5 g and at harvest is 500 g (market size).

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Table A-8. Annual production capacity of aquaculture operations and daily total P wastes at startup and at harvest.

		Total P Waste (TW_P) (kg/d) at Startup			**Total P Waste (TW_P) (kg/d) at Harvest**		
Total Fish Production (kg)	**Total Number Fish Produced**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5,000	10,000	0.02	0.02	0.02	0.34	0.45	0.47
50,000	100,000	0.16	0.18	0.20	3.40	4.53	4.72
250,000	500,000	0.78	0.92	1.00	16.98	22.64	23.58
500,000	1,000,000	1.57	1.85	2.00	33.95	45.27	47.16

Note: Total P = Solid P + Dissolved P.

Fish size at startup is 5 g and at harvest is 500 g (market size).

E

HWE Preliminary Analysis Dredge Spoils Processing

DRAFT

Memorandum

To:	Mike Foget, PE / SHN Consulting Engineers and Geologists, Inc.		
From:	Brian Hemphill	Project:	Redwood Marine Terminal II
CC:			
Date:	January 15, 2016	Job No:	
Re:	Preliminary Analysis Dredge Spoils Processing in Microfloc System		

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INTRODUCTION

This memorandum presents a concept for managing dredge spoils in the existing Microfloc water processing facilities at the Samoa site. Details on existing treatment facilities are presented in a separate memorandum.

SYSTEM DESIGN CONCEPT

A preliminary operating scheme was developed for management of the dredge spoils. A summary of the basic system operating parameters is presented in Table 1.

Under this concept the dredge will pump directly to the treatment system site, and the slurry will be directed to one of the two clarifiers. The clarifier basins will be modified by installing a porous base/underdrain system that covers the existing floor, preventing dredged soil from entering the solids hoppers in the floor while allowing drainage of water. The drained water will be pumped away using the existing waste pumps, supplemented with new vertical can pumps equipped with telescoping valves, installed in clarifier. These will allow pumping of supernatant over soils in the event of slow drainage to the floor.

The operating clarifier will be alternated each week. While one is in service processing the pumped spoils, the other will be allowed to drain free water and then excavated using conventional mobile machinery. Spoils will be trucked to the final destination.

Free water will also be allowed to overflow the tank via the existing weirs. The overflowed water will be combined with the pumped drain water in the clarifier effluent sump in the filter building.

There appears to be sufficient storage in each clarifier basin to hold a week's production with adequate freeboard. The total depth of accumulation is estimated at just under nine feet measured at the tank center, and about 2.7 feet above the floor at the tank wall, well within the available space. Even with consideration of an 18 inch underdrain, this leaves about four feet from the top of the sediment surface to the top of the effluent launder, as depicted in Figure 3.

TABLE 1. DREDGE SPOILS PROCESSING DESIGN CONCEPT	
DREDGE SPOILS	
Solids pumping rate	150 CY/hour
Solids content of pumped slurry	10%
Total slurry pumping rate	5,000 gpm
Water flow	4,500 gpm
Hours/day of pumping	5
Days/week of operation	5
Weekly solids processed	3,750 CY
SLURRY PROCESSING	
Overflow rate in one clarifier (150')	365 gpd/sf
Depth of soil in one clarifier/week	5.7 ft
Filter rate in three filters (if needed)	4.1 gpm/sf

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The water quality standards for the outfall call for a maximum discharge turbidity of 75 NTU (nephelometric turbidity units). For most types of water this is roughly equivalent to 75 mg/l TSS. It's not possible to speculate whether or not the discharge from the dredge spoils tank will meet that standard without additional treatment. It is highly likely that it will if it is filtered, possibly with the aid of a low dose of coagulant. To be safe, it is prudent to plan to use three of the existing filters for this purpose.

SYSTEM MODIFICATIONS

Besides renovations needed to get the filters operable, it will be necessary to also install a new system to provide backwash water. The existing filtration system was designed to use what is known as "internal backwash", in which treated effluent is routed directly from other operating filters into the effluent/backwash supply line to the filter being backwashed. To ensure sufficient flow for backwash, this method relies on at least four filters being in operation while another is being backwashed. That will not be the case for the proposed system. The backwash requirement for each filter will be a flow rate of about 5,700 gpm and a total volume of about 56,000 gallons.

The proposed scheme for accomplishing this is to use the existing seawater filtration storage tank, which has a capacity of 100,000 gallons. New pumps would be installed to supply the required backwash flow. These will be in the range of 75-100 hp. A new line will be installed to the storage tank from the filter effluent line with an automatic valve to keep the backwash storage tank filled,

This scheme will also require modifications to the piping manifold serving the filters. An 18" backwash supply line will be installed, with automatic valves serving each filter.

Other minor modifications will be made to the treatment complex:

- A new line will be installed to direct collected underdrain water from the clarifier waste sump to the clarifier effluent sump.
- The filter backwash waste line will connected to the existing flash mix basin, which feeds both clarifiers by gravity. In this way filter backwash will be recycled to the clarifiers, where the solids will settle and be removed with the dredge material.

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FIGURE 1. DREDGE SPOILS LIQUIDS PROCESSING SCHEMATIC

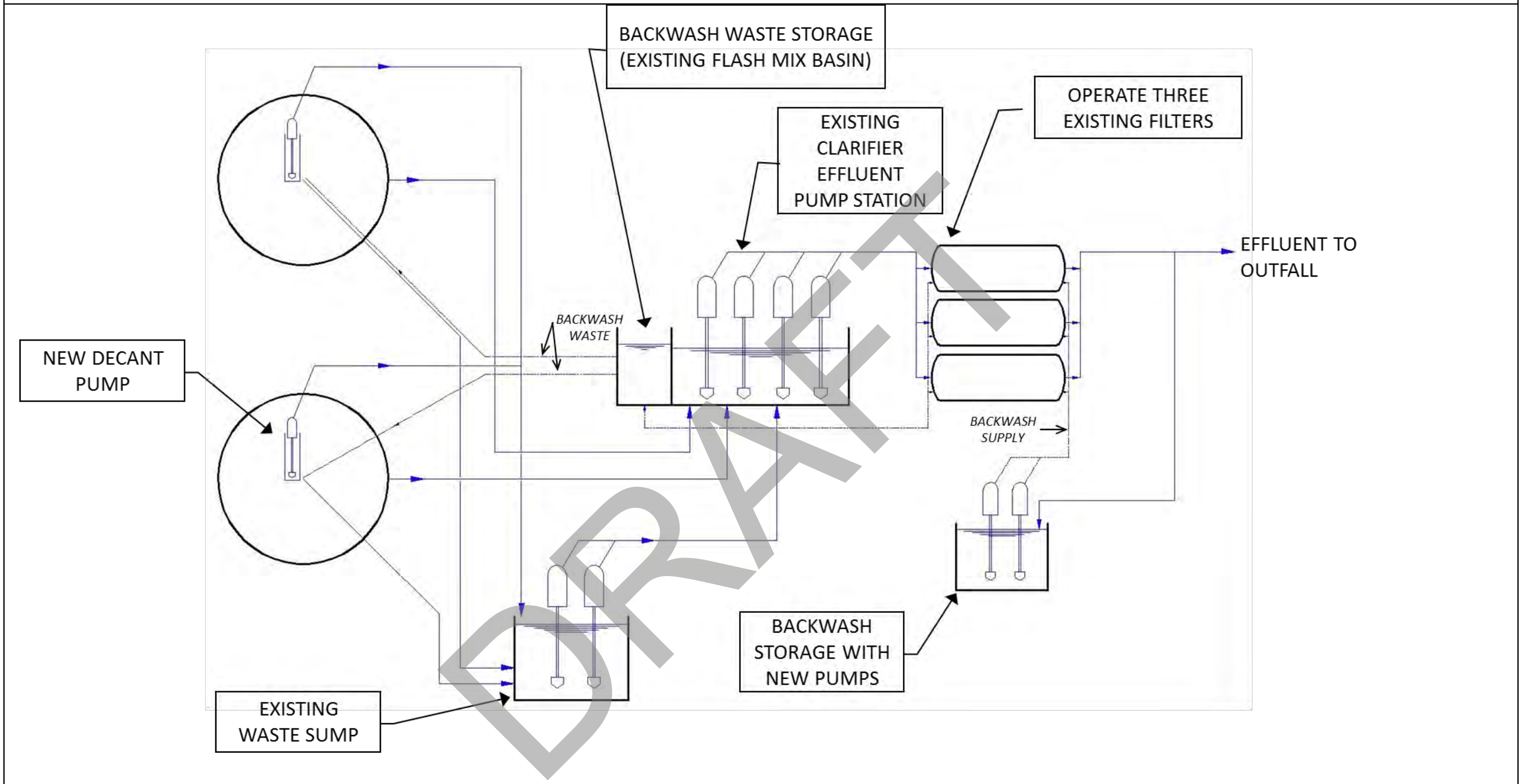

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FIGURE 2. PLAN OF CONVERTED CLARIFIERS

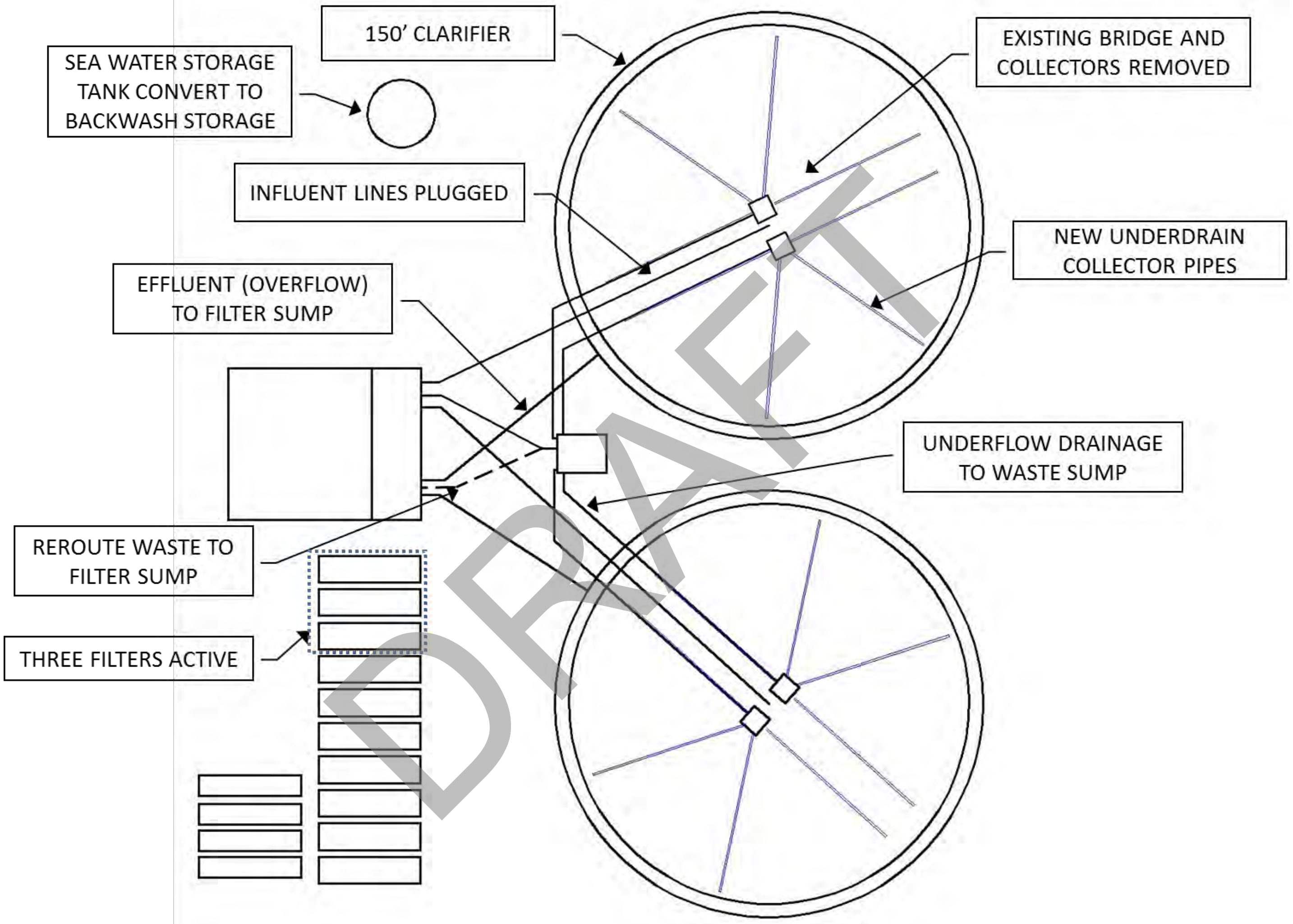

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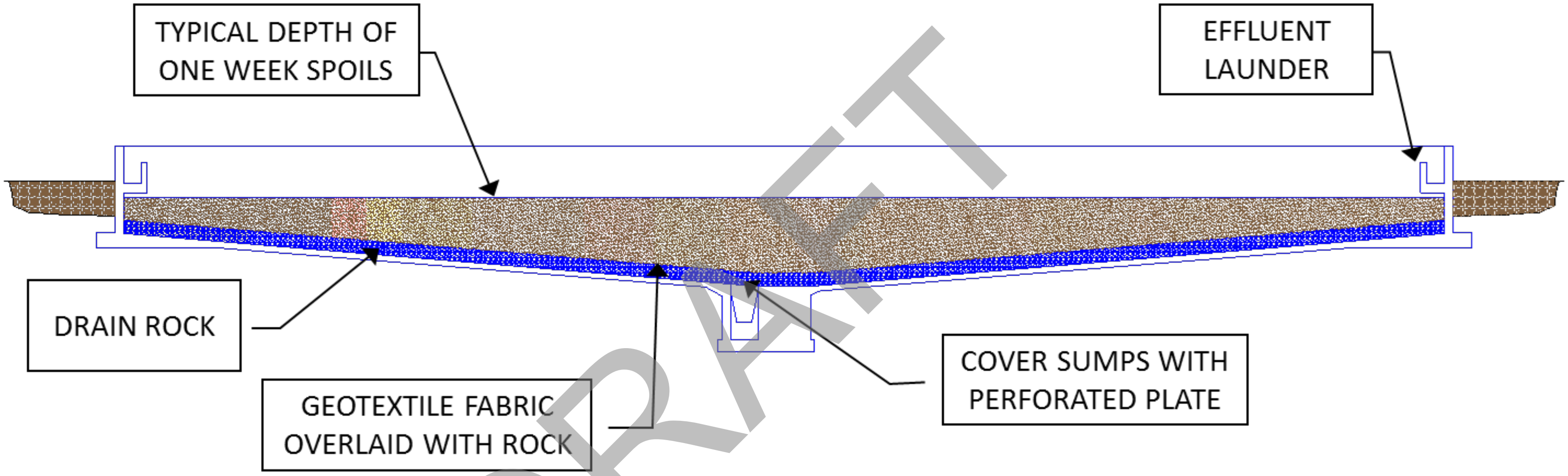
FIGURE 3. SECTION OF CONVERTED CLARIFIER



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Harbor District Freshwater Aquaculture Site Evaluation

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Professional Aquaculture Services

Humboldt Bay Harbor Recreation and Conservation District Freshwater Aquaculture Site Evaluation

Contact: tvaught@proaqua.com

Tony S. Vaught

PROFESSIONAL
AQUACULTURE
SERVICES

Contents

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Introduction

The interest in the production of fisheries products through aquaculture has seen unprecedented growth over the past 20 years. This is due to many factors which include: increased worldwide consumption, low supply due to environmental impediments to wild harvest, and the domestication and production of new species.

In 2013 the percentage of aquaculture produced fisheries products will exceed 50% of global supply. The challenge is to keep up with the demand created by population growth and the reduction of wild caught fish while keeping environmental and financial sustainability in balance. This satisfies the hunger for providing nutritious food product to high-end consumers and resource poor areas that have a protein deficit.

Recently, the number of commercial fish farms, both land-based and offshore, in almost all other areas of the world has out stepped the growth in the United States. This is largely due to regulatory impediments, financial constraints, and the lack of federal and state funding support. Until recently the price and availability of seafood has been fairly stable with inexpensive imported product making up the bulk of the fish available. This is changing with increased worldwide demand and the narrowing of profit margins between fish sold close to production areas and fish exported to the U.S.

As a result, the supply of domestically produced fish must increase so that prices stay within reach of the consumer. To accomplish this, the U.S. must significantly intensify aquaculture research, identify environmentally responsible resources appropriate for fish and shellfish production, and support private business through research grants and low interest loans. The integration of aquaculture with the commercial wild caught industry, conventional food production, and academia is necessary to establish a secure and safe supply of fishery products. Food production has become a national security issue, with instability, population growth, and resource limitations outside the U.S. reducing imports. Progress can be made by not only utilizing known production techniques and research that has been done elsewhere but to look to new species and methods using the vast resources available.

The question remains, where and how is this to be done? Every site evaluated for aquaculture has limitations and assets specific to the production of product. Primarily they are political, economic or environmental in nature. The technology exists to solve environmental concerns; however the challenge is often financial. Political opposition has stopped environmentally and economically sound projects even at the expense of improved prosperity of the community. Involving the community in the project is essential.

Integrating a variety of environmentally different production areas, species, and research projects can help to focus on the production of food, the creation of satisfying jobs and the security of our food supply.

Site overview

Evaluation of a retrofitted or decommissioned site for aquaculture requires the same knowledge base used to evaluate a potential new site for aquaculture. Information is reviewed to identify the site potential, resources and problem areas. Several key areas determine the success, profitability, and longevity of an aquaculture business. Each one is linked to the other by financial, managerial, and biological components. Tying these components together creates a clearer picture of the business and assists in improving efficiency and developing plans for growth. Key components include location, permitting, water quality and quantity, water discharge and waste removal, appropriate species, stock sources, physical security and bio-security, and most importantly, financial sustainability with sound marketing and business practices.

Location

The Humboldt Bay pulp mill site has the components to support commercial aquaculture. Environmental risks, traffic and other negative impacts associated with the proposed aquaculture production and Research Park are significantly less than historic uses for the property. The sustainability of aquaculture is well documented. Production of clean, healthy, local product with valuable byproducts on the site will improve the property aesthetically, while stimulating commerce.

Industrial power service is provided with a substation on site. Power distribution centers are located on the property to accommodate different requirements. Backup power generation equipment is in place. Transportation infrastructure accommodates large truck as well as access to a deep water port. A secure and sound dock is available for servicing offshore production areas and to house seed and larval production hatcheries.

Aquaculture and fisheries related businesses are in close proximity to the site offering support and services for both supplies and for processing and marketing of product.

Humboldt State University and The College of the Redwoods are in the area. They both have a long history in fisheries and aquaculture and are an asset to any aquaculture business, providing cooperative research projects as well as trained labor.

Cleanup is underway at the site. Removal of toxic and harmful compounds is essential to attract food production businesses. Consumer confidence is essential to marketing. Consumers and seafood suppliers want to know the origin of product so that they can evaluate the purity and safety of food they eat or sell for consumption. Certification and regular testing for contaminates needs to be complete and transparent. An in house laboratory for testing with third party verification is suggested. This component may be coupled with other research and testing of product from other food products to create additional business opportunity.

Existing Infrastructure

The buildings on the site are well constructed with steel showing only surface rust and expected weathering. Portions of the pulp processing building have services and plumbing to accommodate an indoor aquaculture facility. Water movement is an integral part to paper production; the building has deferent levels to facilitate water flow and reuse that may be integrated into an aquaculture or aquaponics operation.

The warehouse facility is sound and appears to have no problems with roofing. Interior wiring in some portions of the building have been removed for salvage and may need to be replaced. All incoming wiring and power distribution facilities look to be intact and operating. This area could be subdivided for multiple uses as well as utilized for common product processing and shipping.

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Water storage is useful for water treatment, fire protection and backup water. These tanks need to be evaluated structurally and possibly resurfaced or installed with inert bladders to facilitate use for aquaculture and aquaponics. Water delivery systems are intact and operating. A full review of material used in construction of the delivery system is prudent, to avoid contamination of metals and other contaminates that may be present.

Facilities are in place to perform common services such as maintenance of equipment, fabrication, manufacturing, processing and packaging. These services should be bundled to create other small business opportunities. Support business can be housed on the property.

Office space and laboratories are also available to be remodeled and upgraded to serve the project. Other related businesses could utilize this space such as academic, marketing and management companies.

Risk Protection

The site is in a tsunami zone and the area has experienced seismic activity in the past. Tsunami evacuation plans for the community are in place. The facility has sustained no apparent damage from past seismic activity. Full inspection of the existing buildings is recommended to identify any structural damage.

The site is subject to offshore weather events including high winds and rain. Storms can be intense in the area during winter months. Appropriate safeguards must be in place to protect outdoor areas and buildings against these events with appropriate backup power for extended outages. Power, water, and the movement of water are the lifeblood of any aquaculture facility. The facility must run independent of any interruptions of power and water.

Facility and stock insurance is available for catastrophic events, however, without proper risk management costs can be high for protection. The aquaculture industry is relatively new to the insurance community and has unknowns related to disease and other business interruption factors. These are in the process of evaluation; however, risk factor multipliers are not available due to the diversity of products and sites. Protection can be either expensive or unavailable for certain components of risk. The land owner, on one hand, must be protected, but can also play a role with general underwriting of manageable and identifiable risk for startups and small business.

Permitting

The permitting process is undoubtedly the most expensive, unpredictable, and time consuming portion of any coastal aquaculture site. The process involves many different and overlapping agencies, often with conflicting agendas and regulations. The site has several advantages in this arena that may expedite the process.

I. A business community familiar with the permit processes needed to establish an aquaculture facility.
II. A community awareness of aquaculture and the need for economic development.
III. Local, state, and federal government approval and encouragement to pursue aquaculture uses in coastal zones.
IV. Approved uses for the site that include aquaculture.
V. Approved permits for existing shellfish businesses and approval for expansion well along in the process.

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After economic and marketing studies have been positive, the final determination for moving forward with a new facility often comes down to the time and expense of agency, environmental, and land use permit approval. When this process is extended and costly, other sites that are environmentally and regulatory friendly are considered. A site PEIR (Programmatic Environmental Impact Report) or master permits helpful to attract anchor businesses as well as small complimentary business to an aquaculture production and Research Park. Work is being completed on the Marine PEIR for California. It is currently in final review and will clear the way for marine aquaculture permitting. The cost development of a site PEIR for aquaculture may be shared through local, state, and federal economic development funds. Since this is the largest impediment to aquaculture development in the U.S., an approved site plan will attract tenants due to ease of entry and reduced cost and risk of permit denial late in the process.

Water Supply

Water quantity, quality and cost is what often draws the attention of a site for aquaculture, although during a site evaluation it may be that other impediments overshadow the lure of abundant high quality water. The site has several water sources available. I will address each separately.

I. Untreated freshwater. The untreated freshwater is undoubtedly the most abundant and available source for the site. The infrastructure is sound and the supply is relatively stable. The cost of the water is several times the cost (see table x) of other surface water sources such as irrigation water from the California aqueduct system or the Colorado River water sources. Delivery systems of valley and southern irrigation districts are extensive and deliver water to a variety of climates and agricultural land. These sources are used for conventional freshwater, open pond, and semi intensive aquaculture production facilities. Surface water poses several risks not associated with well or purified water, including disease from fish in the wild, contamination from upstream activities, temperature variation, and turbidity. Changes in supply agreements due to unforeseen environmental changes (drought, fisheries, and endangered species impact) can occur. Although many State and Federal facilities rely on surface water, the problems associated with water treatment often are cost prohibitive in a for-profit business. Most flow though surface water facilities need extensive water treatment and disinfections processes to operate. The most successful flow-through farms use spring water that is excellent quality and consistent in temperature and flow. These sites, however, are difficult to find and secure.

II. Treated water. Treated water provided by the water district is the second source of freshwater on the site. Again, supply and delivery infrastructure is sound and is a good choice for the low use makeup water for recirculating aquaculture systems (RAS), semi intensive flow through, and aquaponics. All three of these systems require disease-free water at a consistent temperature to operate. The introduction of a pathogen or contaminate in an intensive production operation is extremely damaging and can lead to a total crop failure and the need for facility disinfection and a restart of the production cycle. The treated water has the associated risk of chlorine, which is added for the domestic use of the water. Reliable systems must be put in place to remove the chlorine since it is lethal in very small amounts. Again, the cost of this water higher than the cost of pumped

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ground water plus the associated cost of removing chlorine. The added risk of system failure makes this option less attractive than ground water.

III. Ground water. Wells are present on the property and water quality tests and monitoring is underway to identify contamination levels from historic uses of the property. Preliminary reports show that contamination is not harmful for mariculture due to the dilution factor but has not been evaluated for single use. The quantity, quality, and temperature of this source are unknown and need to be investigated. The aquifer may contain areas of fresh, brackish, and even salt water that can be evaluated for quality and cost.

IV. Salt water. The outfall that extends out 1.5 miles into the open ocean is unique in its existence at other marine sites and may be more important for its ability to draw water than its discharge function. Several problems remain such as the use of the same infrastructure for intake and discharge. Most marine sites have separate outfalls for discharge that are away or up current from the intake. It may be possible to extend a small intake that extends past the outfall and still provide the discharge and drainage component of the outfall. This may require pumping of the discharge and storm water during high tide or if sea level increases occur. The possibility to mix fresh and sea water for brackish tolerant species may reduce water costs of the fresh water. Species such as striped bass will not only tolerate but thrive on saline and brackish water if temperatures are adequate.

V. Rain water. The freshwater available may be adequate for a semi-intensive tank system coupled with a large aquaponics garden where water costs can be spread between fish and produce. An outdoor system with sturgeon that requires less flow may be useful in providing nutrients for cool water vegetable production. Outdoor systems actually serve to collect fresh rain water that is contained in the system. The large roof areas may serve as collection areas for fresh water when available from rain events. Treatment of roof areas would be needed to ensure that no contaminates leach from roof areas. Other catch basins and the existing tank storage could be constructed to supplement and store rain water. One inch of rain falling on 200,000 square feet generates 128,500 gallons of water. This is not significant considering the make-up water requirements of an RAS system however may supply the needs of an aquaponics system during certain periods of the year. Water conservation grants may be available to supplement development costs. A full cost and maintenance review of capture and delivery systems needs to be completed.

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The current fresh water supply is costly and contains several risk factors for private flow-through fish production. These factors are not associated with irrigation and well water sources in other areas of California. The main factors associated with the untreated fresh water are the direct and indirect costs, the costs of treatment and filtration, and the burden of those costs falling on a single user.

There are many freshwater systems that require smaller amounts of water. Costs could be shared by multiple community users such as other industrial uses, conventional agriculture, recreation, wetlands, and resource mitigation. The system could be operated similar to other irrigation districts that charge for metered water with no other distribution or maintenance costs.

There may be promise in the production of fresh water fish for enhancement. It may be more cost effective for the California Department of Fish and Wildlife (DFW) to produce fish at a managed aquaculture facility with better distribution, feed, power, and electrical costs. Cost assessment on existing trout operations is underway. Decommissioning antiquated and environmentally sensitive State facilities may be prudent. The State is required by state law to spend 33.33% of sport fishing license revenue on the Hatchery and Inland Fisheries Fund. Out of these funds DFW is required to produce and stock 2.75lbs/year of fish per licensed fisherman in the state; of which, 2.25lbs are to be catchable size. The Department is approximately 30% below this production due to water shortages, disease, and elevated discharge requirements. The DFW has researched intensive and semi-intensive systems to supplement its flowthrough systems. Private contractors have been shown to produce fish for significantly less than State and Federal hatcheries by opening up the site for privately contracted fish production for enhancement. Producing fish for enhancement and recreation may be a catalyst for negotiations to reduce the cost of untreated water.

Waste Management

Waste management and discharge permit requirements are becoming a larger concern in production than water supply. In many places in the nation flow through systems are limited due to water discharge limitations. The amount of feed into a system determines the waste out. Limiting feed limits growth. If water is inexpensive and plentiful, the scale of an operation can be reduced to the point of being unprofitable.

In the case if the proposed pulp mill site, the collective waste of the entire facility must be evaluated. All growing aquatic animals produce waste, whether it be freshwater, marine or for research and aquaponics. Many of the waste products can be reduced by treatment processes and permitted for discharge. Again, the cost of this treatment may become the limiting factor in profitability. Freshwater solids may have value as fertilizer and may be incorporated into neighboring soil enhancement products. Marine solids must be discharged or removed from the site and disposed. If inexpensive heat is available these solids can be dried and bailed for use or disposal.

Discharge via the outfall is permitted with certain limitations and testing requirements. If this outfall is to be used for intake then its use may be limited. Discharge into the bay is not permitted due to environmental concerns and nearby existing aquaculture operations. Meeting discharge requirements that can be related to pounds of fish produced on the site will clear a path for anchor farms. At this time, runoff water from the tank area goes into the outfall, which complicates the total discharge of the outfall. Other run off drains to the bay. Historical contaminates from surface water may show levels of contamination that limit discharge from aquaculture. In addition, if the outfall is used for seawater intake, do surface runoff and other current uses impact the intake water quality? Even subtle amounts of contaminates can compromise production of fish and shellfish larvae. A site specific discharge plan will aid in attracting business. This can be incorporated in the site PEIR.

Executive Summary

In conclusion the resources of the site are impressive in nature with the possibility of several components coming together to make the site a successful production, research and training center. However, the cost of untreated fresh water and the cost of filtering and disinfection of the water are too high for a profitable freshwater flow through system.

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Using a smaller amount of metered untreated or treated water for a recirculating aquaculture system (RAS) or for aquaponics is worthy of further investigation. In addition I recommend these further actions:

I. Negotiate a lower cost for untreated water. Assist the water district in finding further uses for the water. This will allow the cost of pumping and delivering Mad River water to be spread among users reducing costs.

II. Test existing well water further and obtain costs for test wells in other areas of the property to determine quantity and quality. If adequate amounts of clean well water are available costs can be reduced and treatment becomes unnecessary.

III. Investigate all aspects of saltwater fish and shellfish production.

IV. Evaluate the site for commercial aquaponics. The low requirement of water and the relatively low density of fish needed to drive a production of a high value aquaponic vegetable farm make the site attractive. Include salt water aquaponics for the culture of marine fish and plants.

V. Pursue the possibility of cooperative production of fish for recreational enhancement both salt and fresh water. State and Federal agencies are charged with the task of satisfying demand for recreational fish.

VI. Engage in discussion with private fish growers who could work under contracts to provide recreational fish.

VII. Develop a plan to improve the property to engage the public with recreational fishing facilities (fee fishing lakes), and an aquaculture and fisheries farmers market as well as educational and training facilities for aquaculture and fisheries. These can be an integral part of increasing the draw for tourism in the area by transforming an industrial site aesthetically and environmentally

VIII. Contact existing coastal research and production organizations and businesses to expand or enhance existing successful ventures. Hubbs Sea World Research has been actively engaged in California coastal aquaculture. Successfully producing a variety of salt water fish for consumption and resource enhancement. Several private fish and shellfish growers are actively evaluating where to grow more products.

IX. Contact international businesses and organizations to investigate transfer of technology that may be available for application at the site.

X. Host a symposium to draw together business, academia and researches from a variety of institutions to develop an academic and research plan for the area.

XI. Invite representatives from the seafood suppliers, restaurateurs, and from the culinary arts to discuss world seafood supplies and demand.

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Conclusion

Although most input costs are higher than other areas of California, higher operating costs may be offset by the benefits of a multidimensional facility that has common goal of producing jobs, transforming a blighted property and producing a clean, sustainable food source for the future. The site offers diversity due to the proximity to the coast, the large supply of fresh water, the local academic and aquaculture community and a seasoned work force accustomed to fish and fish products. If costs can be reduced or shared, opportunities open up for further development. Aquaculture, the fastest and most promising sector of food production today will continue to grow. The two most significant impingements on the growth of aquaculture are the shortage of available sites and the protein deficit that the world faces. Securing resources and sites for aquaculture is important to meet the growing demand for sea food.

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Appendices

Freshwater Species

Rainbow Trout *(Oncorhynchusmykis)*

Rainbow trout are raised privately in northern and central California. State hatcheries are spread throughout the state, located at sites established for recreational enhancement. Although a small portion of privately grown fish are marketed as food fish, the majority of public and private fish are produced for stocking. A change in the product of fish to exclusively triploid fish has taken place over the past three years in order to satisfy environmental requirements and genetic comingling of wild and hatchery raised fish.

Steelhead *Salmogairdneri*

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Steelhead have been raised in aquaculture facilities in California in the past with good market acceptance. Hatchery and other husbandry challenges place this fish in the transition area.

Atlantic Salmon (Salmosalar)

Salmon aquaculture production grew over ten-fold during the 25 years from 1982 to 2007. Leading producers of farmed salmon are Norway with 33 percent, Chile with 31 percent, and other European producers with 19 percent.

Chinook Salmon (Oncorhynchustshawytscha)

The Chinook Salmon is a popular fish produced in hatcheries for resource enhancement and for food.Chinook are anadromous fish native to the North Pacific Ocean and the river systems of western North America ranging from California to Alaska.

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Channel Catfish *(Ictalurus punctuates)*

Channel catfish are produced from the northern reaches of the San Joaquin valley to the Imperial Valley of Southern California. The fish are sold almost exclusively live for the Asian fish markets and state and private recreational fishing.They are produced in open ponds, often in combination with tank culture of other fresh water fish. The use of water from tank culture can be used to supplement water needed for ponds. The water is then used for conventional agriculture, reducing discharge permit requirements.

Tilapia*(Oreochromismossambicus)*

Mosambique is the primary species raised intensively in tanks with oxygen supplementation and geothermal water. Areas include geothermal sites both in northern and southern California. It is only permitted south of the Tehachapi Mountains and in North Eastern California. There are several operating indoor tilapia operations in the U.S., however none in California. Markets include live and processed fish with the majority going to Asian fish markets. These fish grow best at temperatures ranging from 25 degrees Celsius to 30 degrees Celsius. Fish are also seasonally used in Southern California recreational lakes for fishing.

White Sturgeon (Acipensertransmontanus)

White sturgeon is produced in central California for meat and for the production of caviar in intensive, semi intensive tank systems and in raceways. They are a mid-temperature water fish with optimum temperature at 20 degrees Celsius. A portion of the production is needed in colder water for the finishing of caviar production. Often valley production sites have cold and cool water sites for holding fish prior to caviar harvesting. These fish are often raised in conjunction with Channel catfish and other cool and warm water species.

Largemouth Bass

Largemouth bass are produced for the live Asian fish markets and for recreation. A mid to warm water fish, they grow well on high protein feed and capture a premium price in the markets. They are raised in tanks and in ponds, often in conjunction with other warm water freshwater fish.

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Striped Bass (Moronesaxatiltis)

Striped bass have been cultured in California since 1980. They were first raised for stocking in the Sacramento, San Joaquin River Delta by the State of California and then by private industry. The stocking program ended in the early 1990s but the fish continued to be raised as a food fish in Chico, California. A domestic broodstock was developed and fish are sold live and to restaurants. The fish, with its ability to be raised in both fresh and salt water, was tested by Hubbs Sea World Research Institute for cage culture in Mexico. Development of cage culture production sites in Mexico have initiated interest in California as a fingerling and seed source for Mexican marine farms. The Chico Strain Striped Bass was developed over a twenty year period as an emerging species witha wide range of temperature and salinity tolerance.

Hybrid Carp

This cross between a common carp and a goldfish was developed to fill a market for carp in the Asian live fish markets. It shows the same characteristics as Asian carp, which are not allowed to be cultured in California, providing an excellent table fish. They are a mid to warm water fish, thriving in ponds that use enriched water from tank culture of other fresh water fish.

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Alternate Aquaculture Related Businesses and Uses

Attracting complementary business in one location can serve to not only to increase income for the site but to promote cooperative research. Tying together production, research, and marketing components will strengthen productivity.

I. Saltwater Research Park for the study of Aquaculture and the wild fish population.

II. Anadromous fish center. Salmon, Steelhead, Sturgeon.

III. Laboratory for the study of compounds derived from marine animals for medical research. Peptides, toxins and pharmaceuticals

IV. Shellfish research and seed production facility.

V. Water quality and environmental monitoring center.

VI. Public fishing and recreation.

VII. International aquatic learning center.

VIII. Corporate testing facility for feed and equipment.

IX. Seafood testing and culinary school.

X. Recirculating aquaculture and aquaponics center.

XI. Pathology lab and quarantine area for fresh and salt water fish.

XII. Fabrication shop for aquaculture related structures and equipment.

XIII. Freshwater and Saltwater Algae production for feed and oil.

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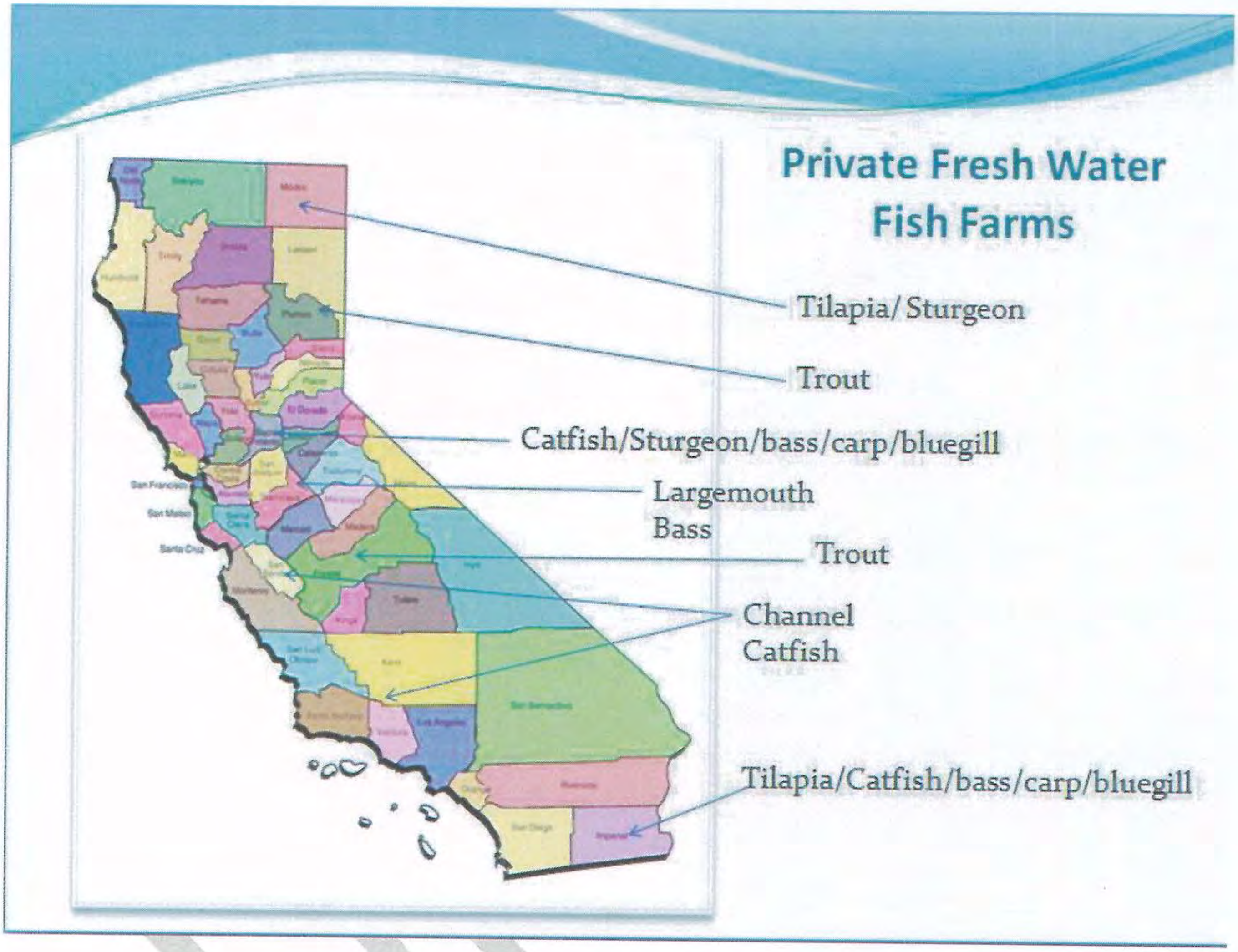
Primary Private Freshwater Production Areas



Private Fresh Water Fish Farms

Tilapia/ Sturgeon

Trout

Catfish/Sturgeon/bass/carp/bluegill

Largemouth Bass

Trout

Channel Catfish

Tilapia/Catfish/bass/carp/bluegill

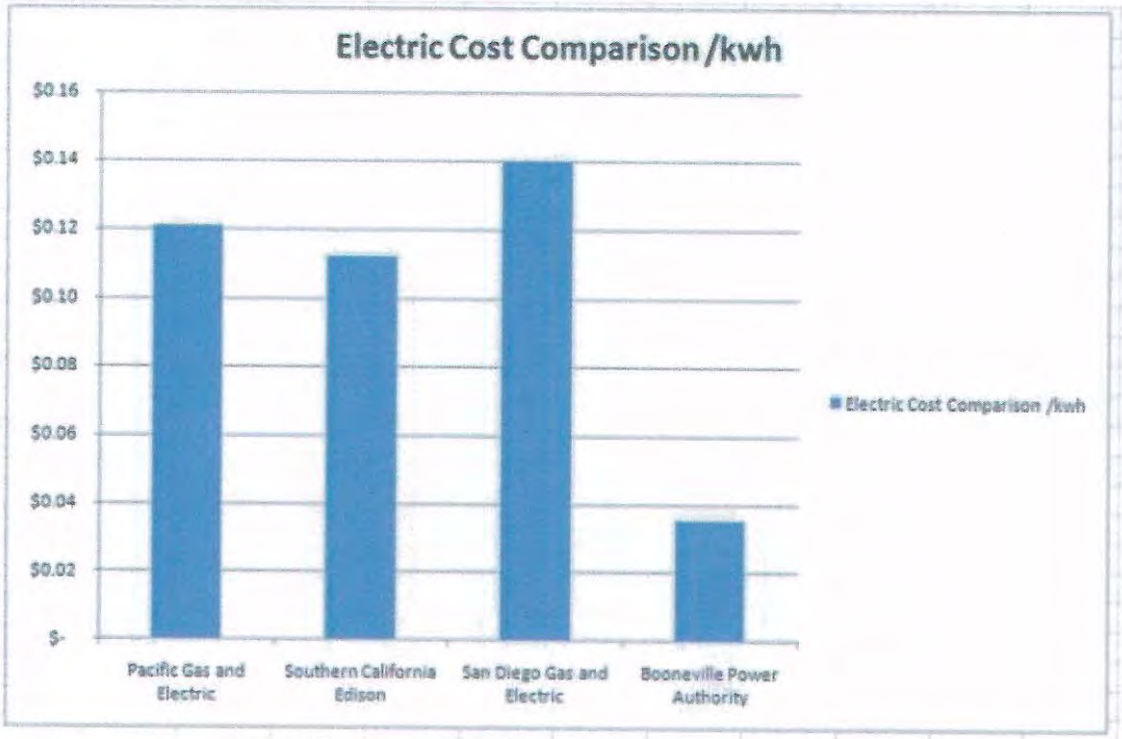
California Department of Fish and Wildlife Hatchery System

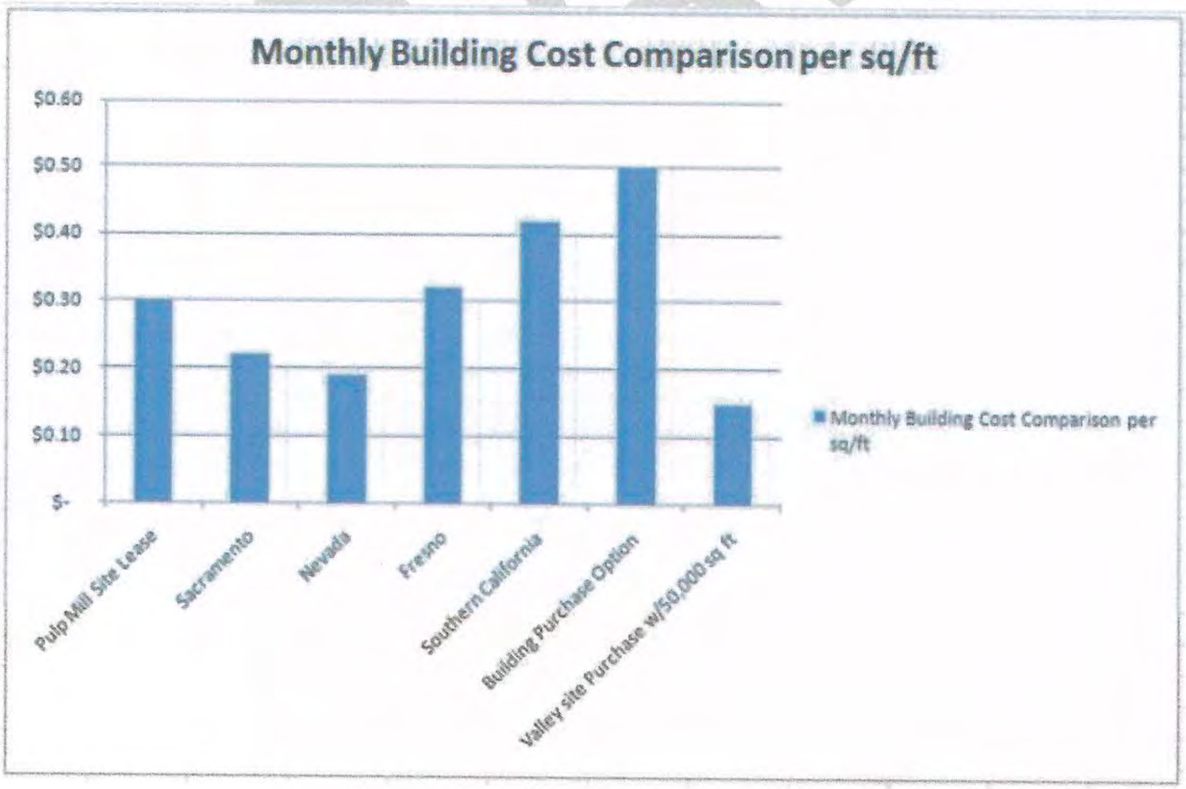
Hatchery Overview | Fish Planting | Fish Counts

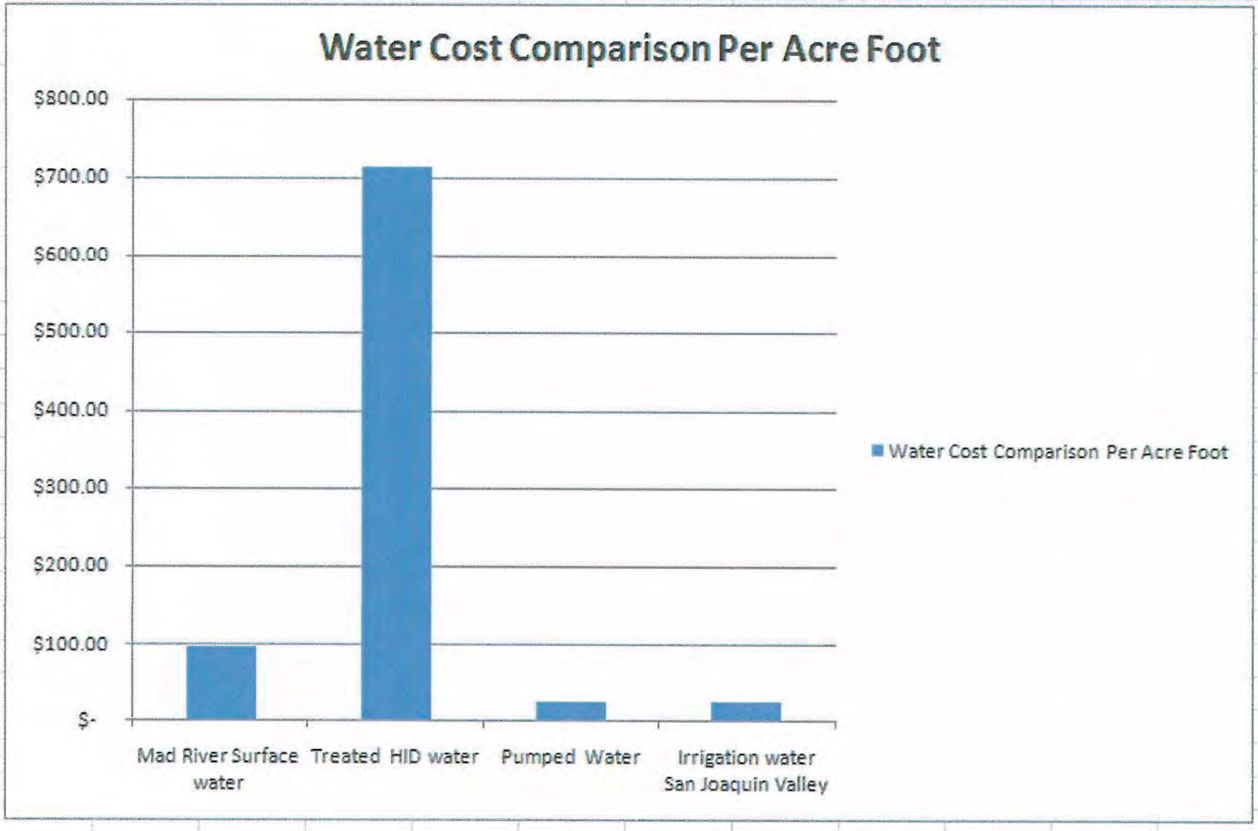
Hatcheries 1 - 8 raise Salmon or Steelhead
Hatcheries 9 - 21 raise Trout

1. Iron Gate Hatchery
2. Mad River Hatchery
3. Trinity River Hatchery
4. Feather River Hatchery
5. Warm Springs Hatchery
6. Nimbus Hatchery
7. Mokelumne River Hatchery
8. Merced River Hatchery
9. Mount Shasta Hatchery
10. Darrah Springs Hatchery
11. Crystal Lake Hatchery
12. American River Hatchery
13. Silverado Fisheries Base
14. Moccasin Creek Hatchery
15. Hot Creek Hatchery
16. Fish Springs Hatchery
17. Mount Whitney Hatchery
18. San Joaquin Hatchery
19. Kern River Hatchery
20. Fillmore Hatchery
21. Mojave River Hatchery

Cost Comparisons






Water Cost Comparison Per Acre Foot
$800.00
$700.00
$600.00
$500.00
$400.00
$300.00
$200.00
$100.00
$-
Mad River Surface water
Treated HID water
Pumped Water
Irrigation water San Joaquin Valley
Water Cost Comparison Per Acre Foot

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Aquaculture Facility Planning for Freshwater Tissue Pulp Mill

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THE CONSERVATION FUND

FRESHWATER INSTITUTE
1098 TURNER ROAD
SHEPHERDSTOWN, WV 25443
PHONE: 304-876-2815
FAX: 304-870-2208

MEMORANDUM

Date: 5 February 2013

To: Jack Crider

From: Brian Vinci

cc: Ted Kuiper

Re: Aquaculture Facility Planning for Freshwater Tissue Pulp Mill

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Project Summary

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The Humboldt Bay Harbor Recreation and Conservation District is interested in using the Freshwater Tissue Pulp Mill site to attract a commercial aquaculture enterprise that could utilize the existing site infrastructure. To complete a feasibility analysis of this endeavor a site visit to assess the potential of the Freshwater Tissue Pulp Mill site as a location for a commercial aquaculture enterprise was conducted. The site visit included discussions with site representatives regarding the source water issues, effluent requirements, available building space, electrical and mechanical infrastructure, and the costs of doing business at the site, as well as a physical inspection of the proposed project area and associated infrastructure.

Existing Conditions

Source Water

The Freshwater Tissue Pulp Mill site has immediate access to two existing water supplies, Industrial water and Domestic water. Industrial water is a surface water supply from the Mad River that is delivered to the mill site from a secondary reservoir and pump station approximately one mile from the mill site (Figure 1). Industrial water was the primary water source for the mill while in operation. The Humboldt Bay Municipal Water District maintains the Industrial water supply, but currently has no users for this water supply. The approximate cost to use Industrial water for even small quantities is in excess of $100,000 per month. This cost is not feasible for an aquaculture enterprise, even one that uses a small quantity of water. It is possible to divert infiltration galley well water from the Mad River into the existing Industrial water pipeline to the secondary reservoir for use at the mill site, however the cost remains the same.

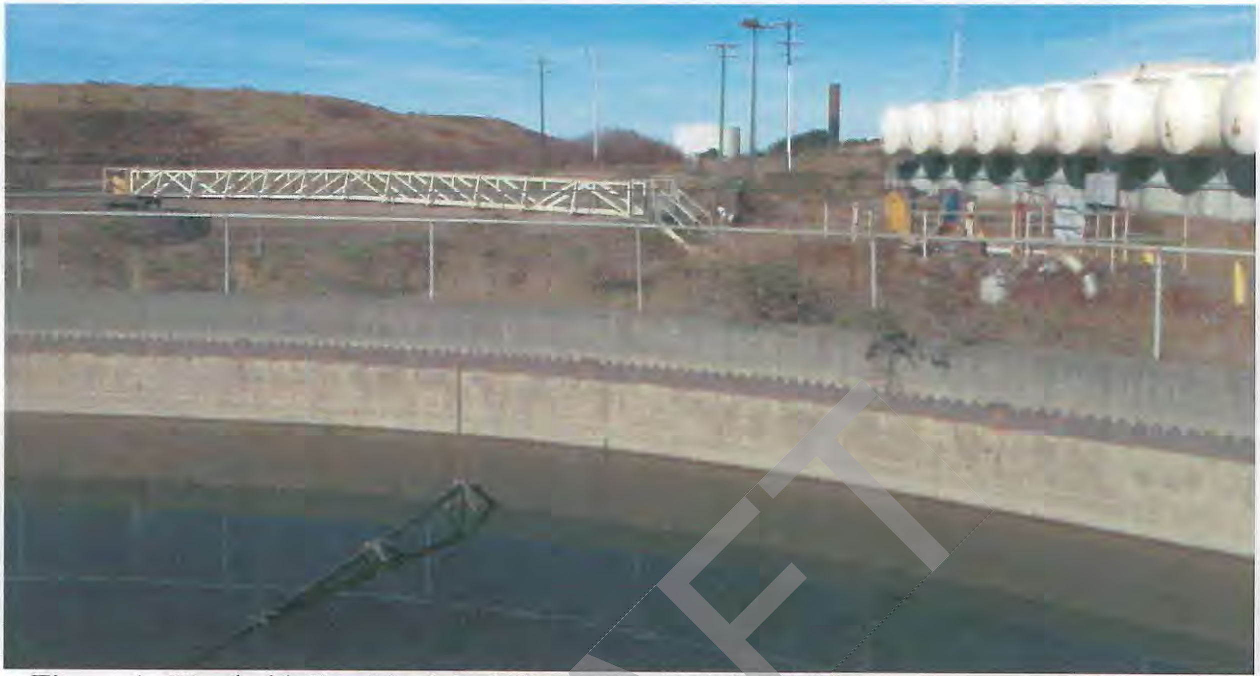

Figure 1. Humboldt Bay Municipal Water District Industrial Water Reservoir (white tank in distance) as viewed from the Freshwater Tissue Pulp Mill site water treatment plant.

The other existing water source to the mill site is Domestic water; Domestic water is infiltration galley well water from the Mad River that is chlorine-treated at the Humboldt Bay Municipal Water District Essex Water Treatment Plant. Domestic water is delivered to the mill site from a small secondary reservoir and pump station approximately one mile from the mill site. Domestic water was the primary potable water source for the mill while in operation. The Humboldt Bay Municipal Water District actively maintains the Domestic water supply, as it currently has users for this water supply, including the fire suppression lines at the mill site.

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The approximate cost to use 200 gallons per minute (gpm) of Domestic water is $7,600 per month. This cost is not typically considered feasible for an aquaculture enterprise, even one that could amplify 200 gpm to 20,000 gpm in a fully recirculating system. Cost of water at an aquaculture facility would be the cost to pump well water from a well field to the facility point of use. The cost of well water is directly related to the cost of electricity and well pump efficiency by a version of the water horsepower equation presented below:

$$\text{\$ per hour} = \frac{\text{Flow (gpm)} \times \text{Head (feet)} \times 0.746 \text{ kW per Horsepower} \times \text{Electric Cost per kWh}}{3960 \times \text{Pump Efficiency} \times \text{Electric Motor Efficiency}}$$

Assuming an electric cost of $0.10 per kWh, the cost to pump 200 gpm from a 100-ft deep well can be calculated by the following:

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$$\$\text{ per hour}=\frac{200\times 100\times 0.746\times 0.10}{3960\times 0.75\times 0.93}=\$0.54\text{ per hour or }\$389\text{ per month}$$

The yearly cost of water from a 200 gpm well is $4,668 plus the cost of ownership. This total is an order of magnitude lower than the cost of the Domestic water. If the Domestic water were to be a viable water source for an aquaculture enterprise the cost would have to approach $5,000 per year for 200 gpm.

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Figure 2. Domestic water 6-inch diameter source pipe on the Freshwater Tissue Pulp Mill site.

Source Water Quality

In-depth water quality data of Domestic water taken from the onsite source pipe is not currently available. It is recommended that water quality sampling be completed according to parameters summarized in Table 1 and Table 2. These results will determine if Domestic water quality is suitable for fish culture or if it requires treatment prior to use. Water quality parameters that might be a concern with the Domestic water supply are residual chlorine, iron and aluminum. These parameters would require treatment before use in a fish culture facility.

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Parameter	**Domestic**	**Fish Culture Standards**[1]
Alkalinity (as $CaCO_3$)		10–400
Hardness (as $CaCO_3$)		10–400
pH (in situ)		6.5–8.0 SU
Total Dissolved Solids		<400
Total Ammonia-Nitrogen (NH_3-N)		<0.02
Nitrate-Nitrogen (NO_3-N)		0–3.0
Nitrite-Nitrogen (NO_2-N)		< 0.1 in soft water
Aluminum (Al)		<0.01
Arsenic (As)		<0.05
Barium (Ba)		<5
Beryllium (Be)		<0.01
Cadmium (Cd)		<0.0005[2]
Calcium (Ca)		4–160
Chromium (Cr)		0.03
Copper (Cu)		<0.006[2]
Iron (Fe)		<0.1
Lead (Pb)		<0.02
Magnesium (Mg)		<15
Manganese (Mn)		<0.01
Nickel (Ni)		<0.1
Phosphorus (P)		0.01-3.0
Potassium (K)		<5
Selenium (Se)		<0.01
Silver (Ag)		<0.003
Sodium (Na)		75
Sulfate (SO_4)		<50
Sulfur (S)		<1
Vanadium (V)		<0.1
Zinc (Zn)		<0.005
Hydrogen Sulfide (H_2S)		<0.003

[1] Source: Wedemeyer, 1997; U.S. EPA, 1979–80, Piper et al., 1982

[2] For alkalinity < 100 mg/L

Table 1. Water quality testing required to ensure use for fish culture (ppm except where noted).

Water Source	**Temp. (°C)**	**TDGP (%)**	**N_2 Sat. (%)**	**O_2 Sat. (%)**	**DO (ppm)**	**CO2 (ppm)**
Domestic Water						

Table 2. Dissolved gas measurements (in situ) required to ensure use for fish culture.

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Available Property and Infrastructure

The Freshwater Tissue Pulp Mill facility is currently undergoing demolition and a Phase I environmental assessment in preparation for sale to the Humboldt Bay Harbor Recreation and Conservation District. Overall the site was in poor condition with significant environmental liabilities present in the form of thousands of gallons of spent pulp mill liquors stored in above ground tanks (Figure 3).

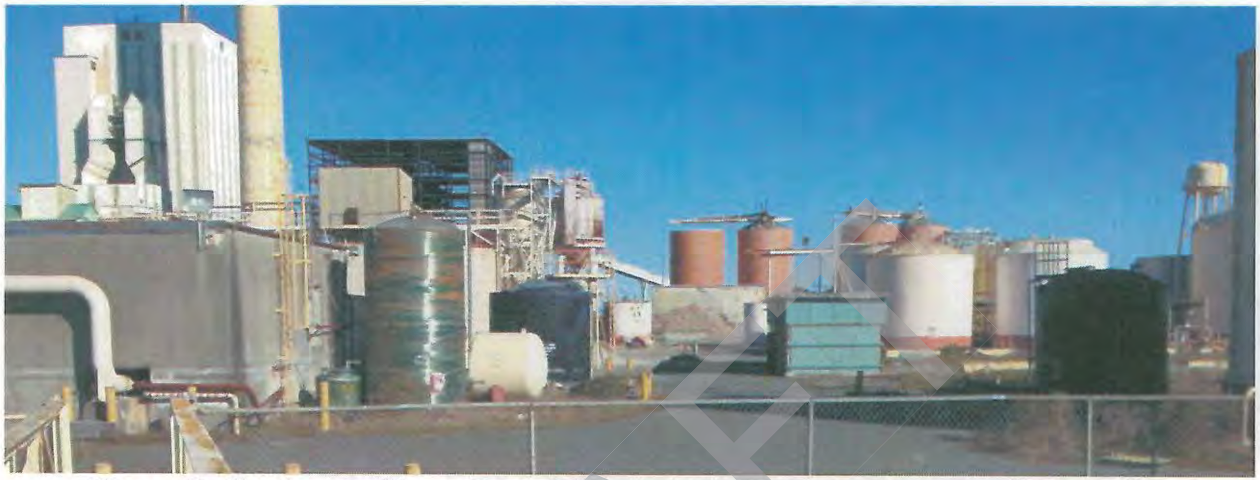

Figure 3. Freshwater Tissue Pump Mill site including numerous spent liquor tanks.

Physical inspection of the water treatment infrastructure including outdoor clarifiers, outdoor tanks, mixed media filters, pumps, piping and valves indicated that while some equipment was in good condition, the majority of the infrastructure was badly deteriorated. In addition some key pieces of equipment were missing, likely taken for sale or scrap (Figure 4).

Figure 4. Missing vertical turbine pump in the influent water treatment plant.

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One of the most promising areas for re-use is the Warehouse area located on the harbor-side of the property. The combined dimensions of the two Warehouses together are estimated to be 330-ft wide and 270-ft long. The ceilings in the Warehouses are high enough to allow for installation of large equipment (Figures 5 & 6). Unfortunately the construction of the Warehouses is primarily wood. Wood construction is generally not used in fish culture facilities because the high moisture load from fish tanks can cause deterioration of the wood, and wood cannot be adequately disinfected for pathogens because moisture can penetrate the wood and provide a safe harbor for pathogens. Steel and concrete is typically considered suitable construction for fish culture operations, which have a high moisture load to the air space. In contrast to wood construction, steel and painted concrete block can be adequately disinfected for fish pathogens.

Figure 5. Interior of Warehouse #1.

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Figure 6. Interior of Warehouse #2.

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Feasibility for Aquaculture Projects

Large Scale Aquaculture

The Warehouse area has the potential to house large pieces of equipment required for a large-scale aquaculture project. The Freshwater Tissue Pulp Mill Site Plan highlighting the Warehouse area is presented in Figure 7.

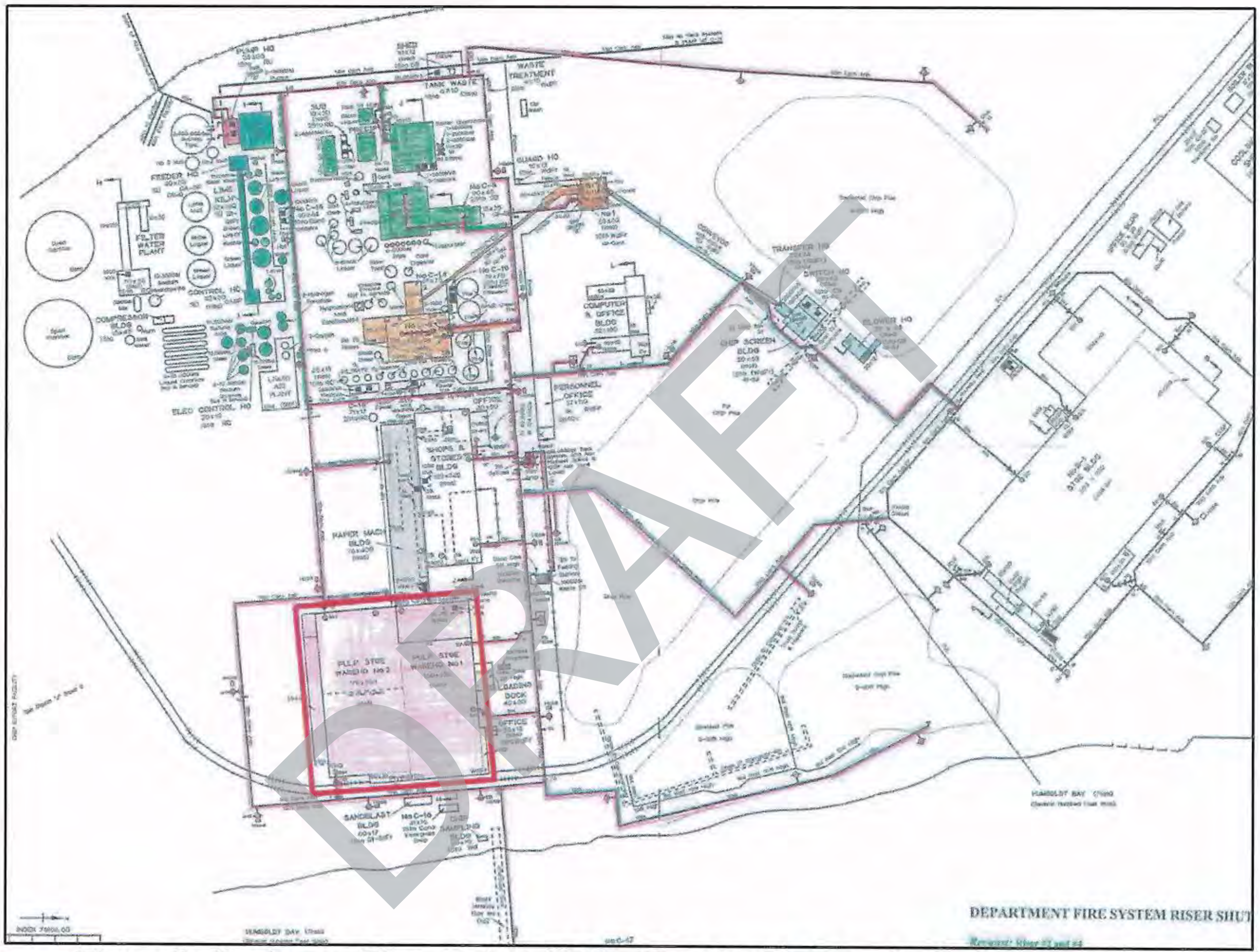

Figure 7. Freshwater Tissue Pulp Mill Site Plan Showing Area Under Consideration.

The Warehouses' structural supports appear to be in good condition and this entire indoor area has the potential to be renovated for re-use. Utilizing recirculating aquaculture system technologies this space could be configured to house fish production systems that might produce as much as 500,000 kg of fish per year (Figures 8, 9 & 10). The water required for a venture of this size could range from 200 gpm to 400 gpm depending on the species raised and need for purging the fish of off-flavor. Recirculating aquaculture systems utilize their own wastewater treatment equipment to treat the water after the fish have used it and return it back to them as clean as needed for good fish growth, health, and welfare. This equipment treats and controls waste solids, ammonia, carbon dioxide, and oxygen. In Figures 8 and 9 this equipment is positioned along the dividing wall between the two Warehouses. Major support systems required for a large aquaculture operation include feed delivery systems and feed silos, backup power generators, and liquid oxygen and/or oxygen generation systems. These systems could feasibly be located outside, near the Warehouses.

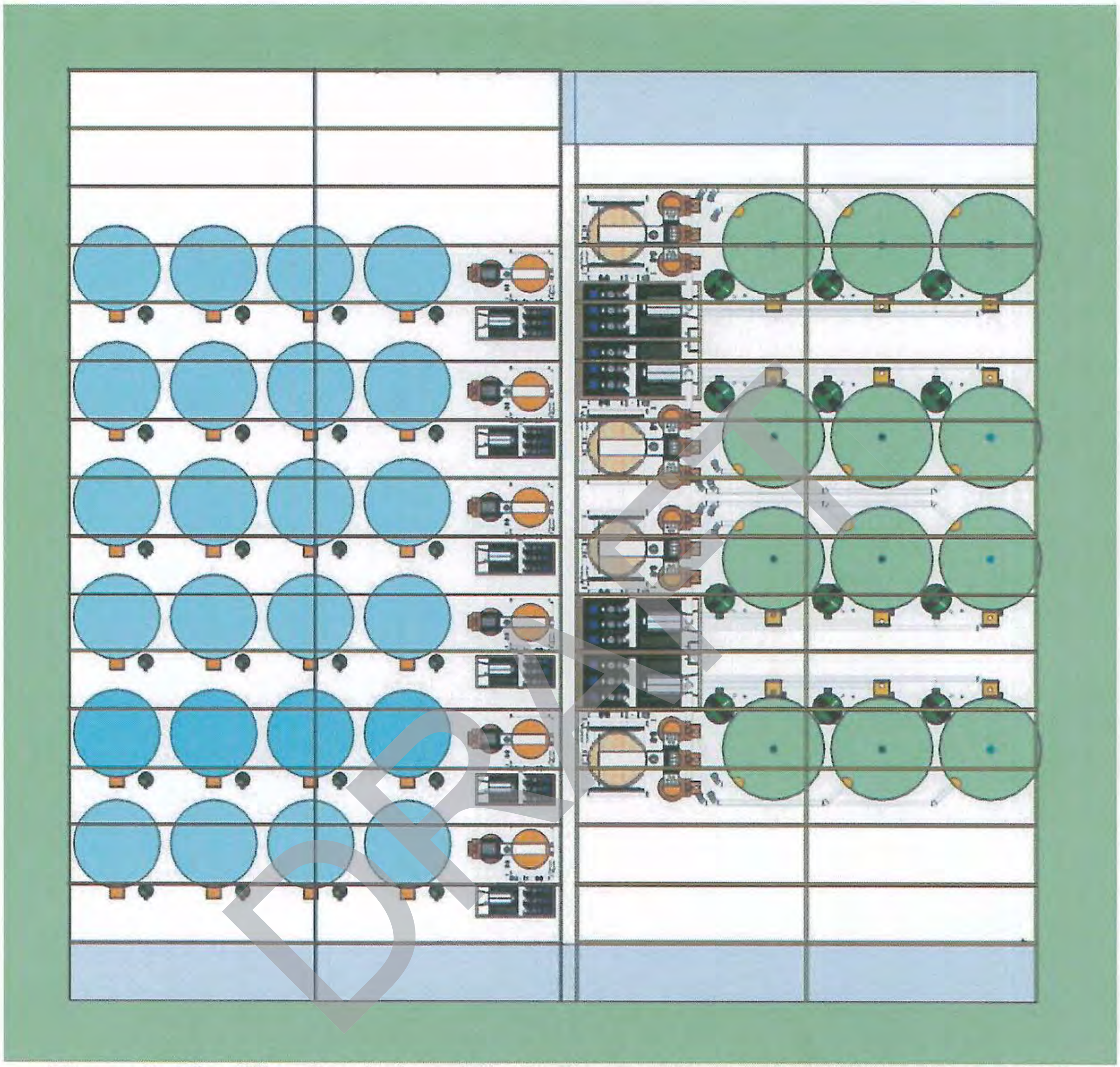

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Figure 8. Plan View Rendering of the Freshwater Tissue Pulp Mill Warehouses with Recirculating Aquaculture Systems to produce 500,000 kg of fish per year.

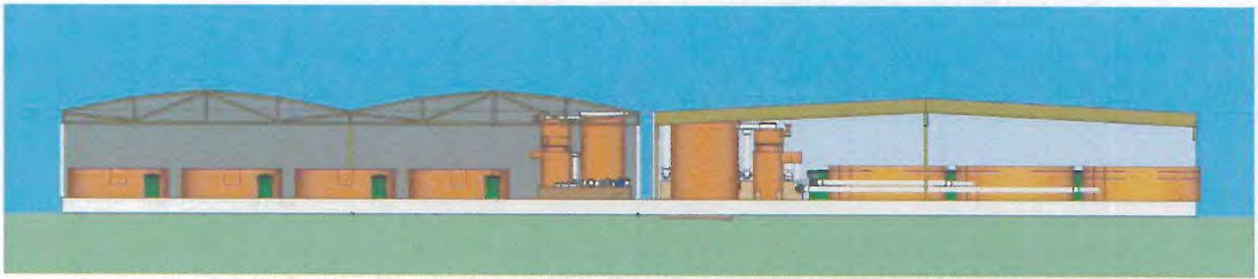

Figure 9. Profile View Rendering of the Freshwater Tissue Pulp Mill Warehouses with Recirculating Aquaculture Systems to produce 500,000 kg of fish per year.

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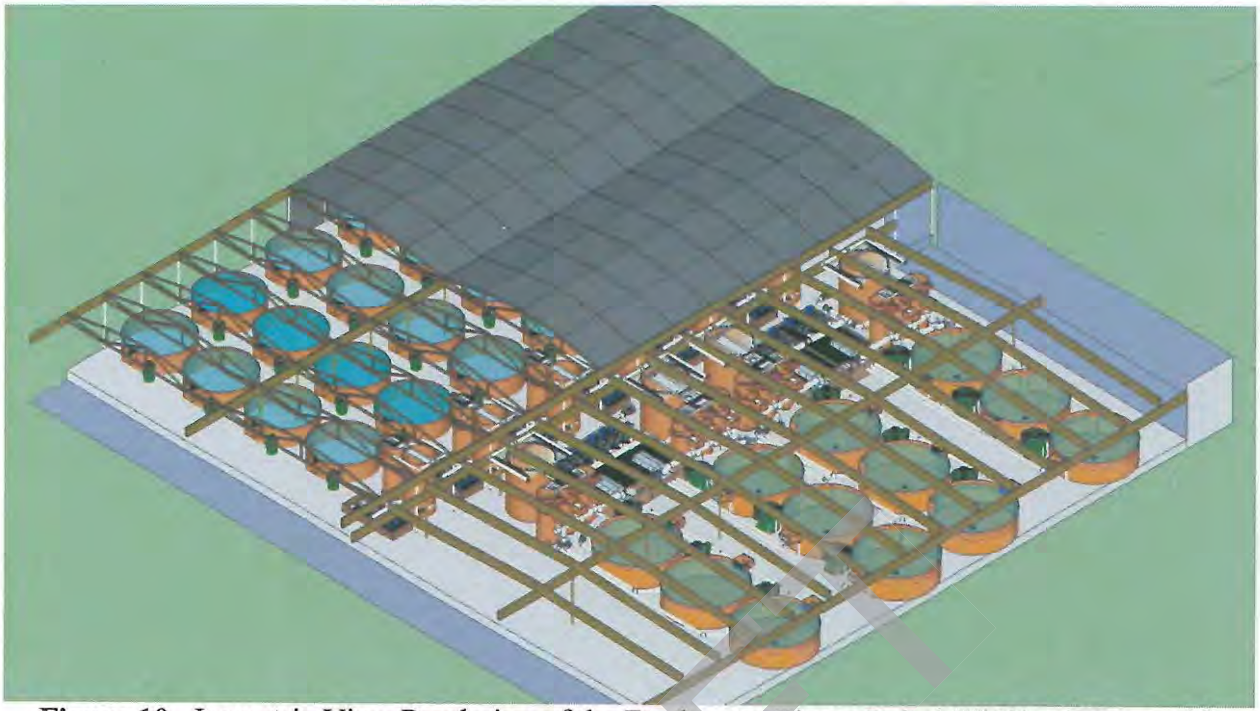

Figure 10. Isometric View Rendering of the Freshwater Tissue Pulp Mill Warehouses with Recirculating Aquaculture Systems to produce 500,000 kg of fish per year.

Fish processing for a facility of this size could be completed onsite or offsite. Onsite processing would require the construction of a FDA-approved food processing area and the ability to deal with the offal and high-strength wastewater. Discharge of fish processing bloodwater and wastewater to the ocean outfall may be an option. Alternatively, processing could be contracted to the local fish processing plant in Eureka. In the short-term this is likely the preferred option.

The most important factor for the feasibility of a large scale aquaculture operation, like the one proposed here, is the water supply. Both the existing water supplies are not feasible at their current costs. Either the Domestic water supply cost must be negotiated lower or a well water supply should be developed. Aquaculture business ventures must have complete certainty on the water supply and the existing conditions at the Freshwater Tissue Pulp Mill are not favorable with respect to water supply.

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Summary

The Freshwater Tissue Pulp Mill site has the potential to become a site for an aquaculture enterprise but currently has significant issues that need to be addressed. First, the cost of the existing water supplies is too high for a commercial fish farm; it is recommended that a lower cost be negotiated for the Domestic water supply and that a well water investigation be started to determine the feasibility of developing a well water supply. Second, the Warehouse structures are feasible for a large-scale recirculating aquaculture facility, but they are not ideal for long-term operation and biosecurity because of their wood structure. The Warehouse interiors could be coated with spray-on foam insulation to provide a moisture barrier and insulation to address this issue.

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Eco-Industrial Park Analysis

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Eco-Industrial Park Analysis

Prepared For

**Humboldt Bay
Harbor, Recreation and Conservation District**

Prepared By:

Aqua-Terra & Associates

February 2013

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Executive Summary

Humboldt County's recently released Prosperity 2012, "Comprehensive Economic Development Strategy, 2013- 2018", after 3 years of public meetings, with participation of 450 people including business owners, elected officials, tribes, community leaders, and citizens, developed a list of priority infrastructure public works projects.

Prosperity 2012 public meeting participants listed: (1) Acquisition of the" Freshwater Property, (2) Development of the Samoa industrial waterfront, and (3) Development of a bio solids to energy project in the top 15 projects out of 46 listed priorities. The CEDS further identified seven development Strategies to encourage an Action Plan for economic development including:

A) Focus resources on the challenges and opportunities of the 8 Target industry clusters
B) Build a community culture that understands, welcomes and nurtures business.
C) Stimulate and nurture entrepreneurship with continuing access to expertise, markets, capital and support.
D) Decrease regulatory complexity and increase certainty.
E) Build an "infrastructure of connectivity" to move people, goods and information into the global marketplace.
F) Plug leaks where we are now importing, products and services.
G) Improve regional capacity to train, attract and retain quality workforce.

In the Action Plan from these Strategies, several tangible actions were given priority that applies directly to the proposed development of an "Eco-Industrial Park":

- Complete environmental assessment and clear concerns on Brownfield sites; provide loans and grants to assist property owners.
- Simplify permitting policies to encourage creative reuse of historic and existing structures.
- Complete regulatory review and permitting for a section of the bay so that shellfish farmers can begin cultivation.
- Complete pre-permitting steps for land based facilities for aquaculture development.
- Encourage business incubation programs for target industries.

Humboldt Bay Harbor Recreation and Conservation District has identified the Freshwater Tissue Company property as part of their long term strategy for harbor economic development. Historically, the Samoa/Fairhaven waterfront has been the focus of industrial development; including several saw mills, two pulp mills, drying kilns, ship building, plywood manufacturing, biomass energy, liquid/break bulk shipping and chip export. In the last twenty years, both pulp mills and lumber mills have shut down resulting in serious job losses. New industries including, aquaculture, recreation, tourism, lumber storage, soil amending, and cold storage have replaced some of the prior uses in the Samoa/Fairhaven area. The Samoa pulp mill started by Georgia Pacific in 1965 has changed ownership and a portion of this property is being offered for sale to the public's representative, Humboldt Bay Harbor Recreation and Conservation District.

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The Humboldt Bay Harbor, Recreation and Conservation District is presently engaged in an "Exclusive Right to Negotiate" the purchase of a 71.78 acre portion of the former Samoa Pulp Mill currently owned by the Freshwater Tissue Company (FWTC). Once the property been cleared and all salvaged material, hazardous waste, and ground contamination if present is remediated; and basic upgrades and site improvements have been made to the property; and all of the necessary permits and approvals have been obtained to repurpose the facility for a diversity of business clusters, Aqua Terra & Associates (ATA) feels that the creation of an economically sustainable Eco-Industrial Park will be a feasible endeavor.

There is no question that the current value of the property and the assets that will come with it are well worth the purchase price. ATA has very conservatively estimated that the current value of the real estate and the infrastructure of the property at over $32M. This estimate does not include the value of the 42MW electric power plant.

ATA feels that the property has tremendous potential as a location where academia, government and private industry can form strategic partnerships in a business park setting, where concepts can evolve from research and development phases, through incubation and prototyping, to commercialization all in the same location. ATA has chosen to model the Eco-Industrial Park after a successful facility in Hawaii called the Natural Energy Laboratory of Hawaii Authority (NELHA), where ATA's president, Mr. Jan War has been employed for 34 years. It is often stated that NELHA's success is due to its ability to sign up and accommodate new business and research tenants very quickly (<1 year). This ability is primarily due to fact that the facility has been appropriately zoned; master permitted and is strongly supported by the State of Hawaii government. A business park of this type is a very unique situation that should be very attractive to local universities and colleges, National Laboratories, economic development agencies and private industry.

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The re-purposing the property for a diversity of economic development opportunities will involve several challenges. The most significant challenges that ATA has recognized are as follows:

- A complex, cumbersome, and somewhat undefined regulatory process that presently creates barriers for commercial and industrial development
- High startup and monthly costs to reactivate the industrial water system
- Relatively high cost of electricity
- Known hazardous waste that must be removed at a high cost ($5M)
- Unknown potential environmental impacts (soil, groundwater contamination)
- Isolation from the mainland and outside support services
- An inefficient regional transportation system
- Lack of high speed, broadband Internet access and telecommunications network

Despite these and other challenges that will need to be faced, it is ATA impression that the assets and potential development opportunities for the Park far outweigh any of its negative ramifications. A few of the most obvious assets and opportunities that will come with the purchase of the property are as follows:

- Readymade, turnkey property and support facilities
- Excellent location for business incubation and development
- Strong potential to partner with local universities and colleges
- Strong potential to collaborate with neighboring property owners
- High potential for the Park to be an economic driver for the revitalization of the local economy
- High potential to create a synergy between academia, government and private sector
- High potential to attract support from National Laboratories and Federal Government
- Creation of a diversity of high quality, long lasting, well-paying jobs
- High potential to expand on the needs of the existing aquaculture, agriculture, timber, fishing and shipping industries
- Strong support from the local community

The purchase of this property must involve a long term commitment, community support, and not rely on any particular business category for survival. A revenue stream from aquaculture alone cannot support the necessary upgrades and operation & maintenance costs of the facility. There must be a diverse mixture of tenants so that the decline or impact to any one sector will not impact the viability of the rest of the business cluster.

ATA estimates that it will take a minimum 2-3 years to obtain all of the necessary capital improvement funds and approvals to make the Park fully functional and available to a diversity of business opportunities. Until necessary facility upgrades, permitting and other approvals can be obtained, it is recommended that the Park initially be allowed to accommodate non-conforming, non-coastal dependent tenants. Tenants in this category can be given year by year use agreements. Temporarily allowing non-conforming uses at the Park will create a quick source of revenue to cover basic site improvements and utilities. If this is allowed, the initial occupation of the facility is expected to be a mixture of passive storage, small scale hydroponic and aquaponic ventures, and tenants tied to the local fishing, timber, food processing and shellfish industries. It is expected that the first step towards bringing the local shellfish industry closer to the facility will involve siting of existing companies in this industry around the ship dock known as Berth 2. The evolution of the shellfish industry onto land and into the Park will initially require that it be totally self-contained with zero chlorinated effluent. The construction of a seawater distribution system to allow the shellfish and other mariculture tenants to develop within the Park will most likely take a minimum of three years to approve and develop. There is

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a strong need to provide additional oyster seed to the west coast region of the US and Canada; the Park should capitalize on this immediate opportunities.

The Parks development should be focused on energy efficiency, environmentally conscious design applications, sustainable industries, and the attraction of green, low carbon requiring businesses. The diversity of tenants should further foster opportunities for collaborations, synergies and cascading uses of resources. The waste from one type of business should be considered as potential resource or positive opportunity for another. Emphasis must be focused on maintaining the pristine natural resources and beauty of the surrounding area and the quality of life. The Park should create a business culture and sense of entrepreneurship that everyone can be proud of and support. In order for all of this to happen, regulatory authorities must agree to cooperate towards the development of a fast track permitting and approval process.

ATA feels that in order for the Harbor District and the community to feel comfortable about making the decision to purchase the property, more information and details should be obtained to determine the actual costs (and potential revenue) and the process of removing hazardous waste and materials from the property and to assess unknown conditions that may exist, such as potential soil and groundwater contamination. Once this due diligence process has been completed or understood, ATA recommends that the property be purchased and quickly be brought on line as a business incubator.

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Disclaimers

ATA has chosen not to address in detail any liabilities that may exist at or tied to the property such as hazardous or environmental waste, obligations or legal matters. ATA has also not addressed in this analysis opportunities that may exist as are related to the timber or shipping industry. Limited time has likewise been spent on the possibilities for re-establishing the huge (15-30mgd) allocation of industrial grade freshwater for the property from Humboldt Bay Municipal Water district or recirculating freshwater aquaculture systems, which will be covered by other consultants. These are topics that ATA has limited knowledge of or has not been fully briefed.

1 Natural Energy Laboratory of Hawaii Authority (NELHA)

The NELHA business park concept is being used as a model of a type of "Eco Industrial Park" that could serve as an innovative development at the Freshwater Tissue Company property on the Samoa Peninsula. An aerial view of the NELHA's primary aquaculture development area is portrayed in Figure #1 below.

Figure #1- Aerial View of NELHA's Main Aquaculture Development Area

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The Natural Energy Laboratory of Hawaii Authority is a master permitted marine science and technology park operating on 870 acres of land in north Kona, on the Island of Hawaii. NELHA's mission is to "develop and diversify the Hawaii economy by providing resources and facilities for energy and ocean-related research, education, and commercial activities in an environmentally sound and culturally sensitive manner". The organization is administratively attached to State of Hawaii's Department of Business, Economic Development and Tourism and is a totally self-sustaining government entity with respect to operating and maintenance costs.

NELHA was founded in 1974 to initially serve as a facility for the research and advancement of the Ocean Thermal Energy Conversion (OTEC) process. The OTEC process utilizes the temperature differential between warm, surface seawater in the tropical regions of the oceans and the cold, deep seawater at depths between 2,000-3,000 feet to operate a heat engine to produce electricity, freshwater and other by-products.

It was quickly realized after NELHA began distributing both warm, surface seawater and cold, deep, nutrient rich seawater onshore in 1982 that these resources, together with the high solar insolation and winterless climate at Keahole Point were of great value to the expanding US aquaculture industry. In the past 38 years, the State of Hawaii has invested $110M in the facility to develop the infrastructure and unique resources that are found nowhere else in the world. A recently released economic impact analysis shows that the State of Hawaii's investment has been matched by $225M from the private sector and has created 41 private and public enterprises on the property.

NELHA's economic development is also the source of 70% of Hawaii's aquaculture products and the location of Hawaii's largest export commodity (desalinated, bottled deep seawater). NELHA offers opportunities for rapid development under an umbrella of master permits, unique energy resources, a research and incubation campus, and reasonable short and long term land use agreements.

1.1 Road to Self Sufficiency

In the early stages of NELHA's evolution, all emphasis was placed on attracting research and development projects related to the organization's original intended purpose, the advancement of OTEC related technologies. All of these initial interests in the usage of the facility were funded by the US Federal and the State of Hawaii governments. Since much of the federal government's investment was in the cost sharing of infrastructure (seawater systems, buildings, etc.), only minimal fees were charged to them for the use of the facility. Although initially set up as a corporation under the Research Corporation of the University of Hawaii (RCUH), NELHA has always been a government controlled entity. The charter that created NELHA in 1974, originally only allowed for research, development and demonstration projects.

Shortly after the deep seawater (DSW) was pumped ashore, NELHA realized the commercial potential of this and its other unique resources. In 1984, a bill was submitted to the legislature to amend NELHA's original charter to include, "commercialization, education and outreach" activities. Soon after this act became law, NELHA obtained two federal grants from the US Sea Grant Program through the University of Hawaii. The purpose of the grant funding was to determine the commercial potential of land based aquaculture at NELHA using DSW as the primary resource.

Banking on the success of these initial experiments, NELHA began to actively market the use of its property and the sale of its unique resources to the burgeoning US aquaculture industry. Marketing of the facility was through articles in industry magazines, presentations at trade shows and conferences, and through a private marketing firm. It was during this time (~1985) that NELHA developed the basic use fees and land use agreements that continues to be its land use strategy and source of operating revenue today.

Since all of the basic utilities were concentrated within the original 6 acre Research Campus (RC), this is where all of the initial tenants were located. Basic utilities (water, telephone, electricity) and access to both surface and deep seawater were made available at convenient locations within the RC. A variety of rental space and services were provided

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such as small tracts of graded land, outdoor concrete pads, covered storage areas, wet and dry laboratory space, office space, and meeting and conference rooms. Other support services were also made available to incoming tenants such as access to full service repair, metal and wood working shops, industrial and business labor services, and the rental of small tools and equipment.

A market appraisal was conducted to determine the rate at which the land and support services should be charged using nearby commercial and industrial park rates for comparison. Basic short and long term use agreements were then created as a contract between NELHA and its tenants. It was decided that tenants should pay the going rate for basic utilities and that space, business support services, and seawater would initially be subsidized. The basic philosophy was to attract a core group of anchor tenants to the facility to demonstrate to a larger group of investors that opportunities at NELHA offered an advantage for their businesses

Before long, it became obvious that larger tracts of land would be needed outside the Research Campus for expansion of the existing projects and to accommodate larger companies on their own property. All of NELHA property is owned by the State Department of Land & Natural Resources and is leased to NELHA. All of NELHA's land use leases with its tenants are therefore sub-sub leases of this government land. No fee simple or private property ownership is available at NELHA.

Much more can be learned about NELHA and how to become a tenant from the organizations website at: http://www.nelha.org . The tenant proposal and acceptance process can be found on the "Become a Tenant" page of the website by downloading the Project Initiation Packet (PIP) documents at the bottom of the page.

1.2 Master Permits

Aside from the unique resources that NELHA has to offer, one of the main attributes of the organization that attracts investors to the facility is the fact that property is master planned and permitted for rapid development. This is a major advantage to prospective tenants as it allows companies and research organizations interested in establishing their projects at the facility to establish themselves much faster (<1 year) and with less capital investment.

1.3 Land Uses

There are four types of land uses at NELHA: extractive, productive, energy and other. Land uses are defined by the type of activity or seawater use that takes place on the property.

1.3.1 Extractive Use

The intended use of the land and the seawater delivered to an extractive user is to extract either the water or some other marketable product contained in the water and export the water or product generated from the site. An example of an extractive user would be a company involved in desalination or the production of salt from DSW.

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1.3.2 Productive Use

The intended use of the land and the seawater delivered to a productive user is to produce a product in the seawater as a growth medium. Aquaculture tenants are examples of productive users.

1.3.3 Energy Use

The intended use of the land is to produce energy or an energy related product on either an R&D or commercial basis. The intended use of the seawater delivered to an energy tenant could be to produce an energy product (such as biofuels), to provide low cost cooling or as an integral part of the energy production (OTEC).

1.3.4 Other

This category is for any use that does not fit into the other three categories (energy, extractive and productive). This may include education, outreach, research and commercial projects or any other type of project that is considered appropriate for the mission of NELHA. Projects developed within NELHA's offshore corridor would fall within this category.

1.4 Project/Tenant Categorization

NELHA classifies projects types into four categories: research, pre-commercial, commercial and other.

1.4.1 Research

A basic research project is concerned with contributing to the knowledge base of science and technology. It may have no immediate commercial application. These are often university or government projects.

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1.4.2 Pre-Commercial

Pre-commercial tenants are those with projects that have demonstration or commercial potential but which still require a period of research, development and demonstration to solve production problems or optimize production methods. A pre-commercial project has ultimate commercial goals in mind, but may still be at an R&D phase of development.

1.4.3 Commercial

Commercial tenants are those with technical and production expertise and a proven business plan that is ready to go. They may be pre-commercial research tenants who have completed the research and development phase and are now ready to move on to commercialization. NELHA seeks commercial tenants with realistic, forward-thinking business plans for production of high-value products or services aimed at local, state, and/or global markets.

1.4.4 Other

This category includes non-profit projects such as education, outreach, or conservation which are considered appropriate for the mission of NELHA but do not fit in the other three categories.

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1.5 Economic Benefits of NELHA

NELHA recently contracted the University of Hawaii Economic Research Organization (UHERO) to estimate its economic impact for the State of Hawaii. Specifically, this study determined NELHA's contribution to local business sales, employee earnings, tax revenues, and the number of jobs created in Hawaii from the expenditures of its tenants in 2010.

To estimate expenditures made by NELHA tenants in 2010, UHERO researchers developed a survey where expenditures were broken down into 11 named categories and respondents were asked to provide total expenditures and the share of these expenditures that were paid to Hawaii vendors. UHERO received responses from 23 NELHA tenants (out of 41). These expenditures represented 85% of total expenditures made by NELHA tenants in 2010. Expenditure levels for the survey's non-respondents we estimated using various techniques. Total NELHA tenant expenditures were estimated at $81.0 million, of which approximately $49.6 million (or 58%) were paid to Hawaii entities.

Following a standard approach, UHERO defined economic impact to be the direct, indirect, and induced economic activities generated by the tenant's spending in the Hawaii economy. The estimated impact of NELHA's in-state expenditures on the State's output (sales), earnings, and tax revenues was estimated to be $87.7, $24.7, and $4.5 million, respectively. Furthermore, not only do NELHA tenants employ hundreds of people but their expenditures also contribute to hundreds of other jobs in the larger Hawaii economy (583 total, including NELHA employees).

NELHA receives on average about $2 million per year from the State for capital improvement projects such as the development of new roads, buildings, expansion of the seawater distribution system, etc. One way to look at the State's return on these expenditures is to consider what the state's investment has provided in terms of the net impact from NELHA. Each dollar the state invests yields a leverage of about $42.8. In other words, every dollar the State spends on NELHA generates $42.8 of output in the Hawaii economy.

NELHA provides additional benefits to the state of Hawaii that the UHERO study does not capture but are important to consider when evaluating NELHA's overall contribution to the economy. Over a quarter of NELHA's tenants are involved in research activities. The research activities and in some cases education components contribute to Hawaii through investment in human capital and knowledge spillovers, which are important in a budding technology and innovation community. An increase in the research intensity has a large impact on the share of high value added occupations in a community. Hence, an important payoff from research activities is the types of jobs it creates within the economy. These are highly skilled, highly productive, engaged citizens that benefit the community.

NELHA currently accommodates 41 tenants ranging from companies bottling deep sea water to solar and biofuel companies. These tenants pay close to $4 million annually in rent, royalties and pass through expenses directly to NELHA. In addition, they employ hundreds of people, purchase goods and services from local businesses, and invest in capital improvements at NELHA.

1.6 Sources & Types of Revenue

NELHA receives no operating funds from the State of Hawaii and has been totally self-sufficient for the past five years. All of the funds that NELHA requires to operate come from tenant revenue. The organizations primary sources of revenue are shown in Figure 2:

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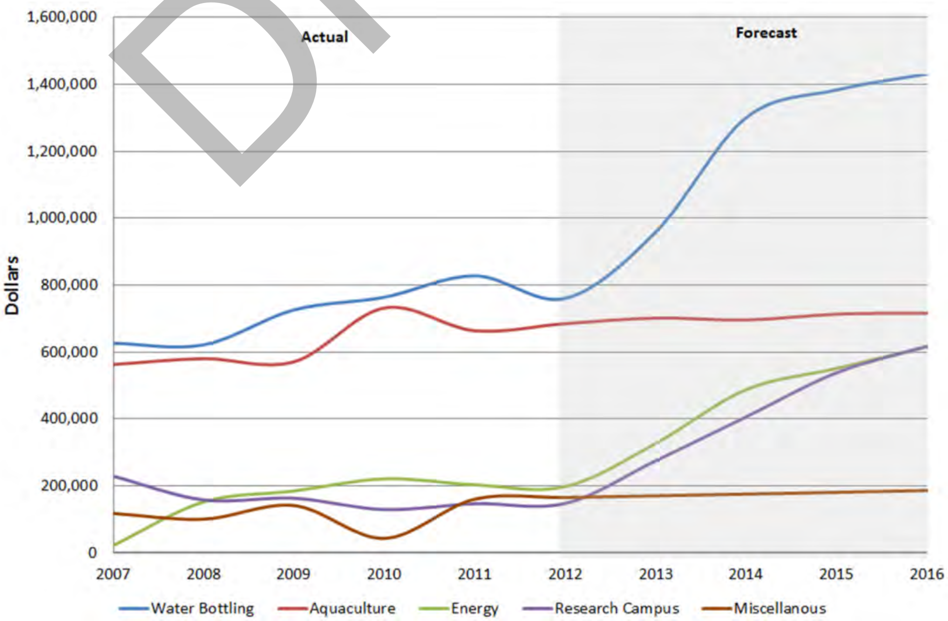

Figure 2 – Present & Forecasted Sources of NELHA Revenue

NELHA forecasts that future sources of revenue for aquaculture and miscellaneous applications will be flat and has decided to focus on expanding its tenant base in the fields of desalinization, renewable energy and attraction of more R&D projects to the Research Campus.

1.6.1 Land Use

NELHA's source of land revenue is generated from the rental of space in the Research Campus or the lease of larger tracks of land in the Technical Park of NELHA property. Space in the RC is rented by the square foot and land outside the RC is rented per acre.

1.6.2 Utilities

Utilities are charged on a pass through basis, plus a 10% overhead charge. Since NELHA's goal is to maintain self-sufficiency and not necessarily to make a profit, the cost of electricity in the Research Campus and potable water everywhere within the park is passed on to the tenant as charged by the local public utility, plus an overhead charge or percentage. Tenants everywhere in the park are required to establish their own telephone service directly with Hawaiian Telecom Company. Electrical service outside the RC is also established directly with the local public utility, Hawaii Electric Light Company (HELCO). The current rate for potable (fresh) water is $4.33/kilogallon and for electricity $0.38/kilowatt hour.

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1.6.3 Seawater Rates

Seawater rates are determined by adding the cost of electricity required to pump the seawater throughout the entire facility, plus related labor and material costs. The established rates are the same for either deep seawater or surface seawater and charged on a per thousand gallon (kilo-gallon) basis. In addition to the fixed seawater rates, NELHA charges tenants a fuel adjustment surcharge. The total fuel adjustment charge is determined monthly and charged according to each tenant's percentage use of the total volume of seawater pumped throughout the park for the current billing period (month). The surcharge is needed in order to account for the fluctuating cost of fuel oil (i.e. price of oil). The current rate for seawater at NELHA is $0.2062/kilogallon.

1.6.4 Percentage Rent

When two percent (2%) of the tenant's gross sales (as defined in the NELHA sublease) for any calendar year exceeds the fixed land rental fee, then a "percentage rent," or 2% of gross sales less the fixed rental fee, is due to NELHA. This is a method of sharing in each tenant's financial success.

1.6.5 Royalties

Royalties are charged to tenants who choose to use NELHA's trademark on their product labels. Use of NELHA's trademark certifies that the source water is from NELHA and that the water has been tested by the State of Hawaii, Department of Health. Royalty agreements are categorized on a per unit or volume basis and negotiated with tenants on a case by case basis. An example of a Royalty is the charge of $0.01 per bottle for desalinated deep seawater.

1.6.6 Capital Improvements

As a government entity, NELHA is able to apply for capital improvement funding through the Hawaii legislature for large capital developments such as roads, buildings, seawater pipelines, etc. In addition to CIP funds, NELHA is able to draw from its own Special Fund reserve to internally finance the development of small business parks or large repair/maintenance projects. In 2011, NELHA's Special fund totaled $1.8M.

2 Current Status of Land, Infrastructure and Utilities

The FWTC property being offered for sale consists of 71.78 acres of fee simple real estate containing open space, buildings, infrastructure and other assets. Roughly 62 acres of the real estate is taken up by the former Samoa Pulp Mill facility. The remaining 10 acres consists of sand dunes and coastal habitat just west of the fenced facility. The 10-acre coastal part of the property should probably be restored to its natural condition, preserved, and conserved. An aerial view of the layout of the purchase property dated August 23, 2012 is shown here as Figure #3.

There is currently limited electricity, fire suppression water or domestic water connected to the buildings or warehouses. These utilities were originally connected to the buildings and warehouses by overhead service lines that were torn out during the course of salvaging equipment and materials from the mill. A 2" plastic water line has been connected to the fire suppression plumbing and water storage tank at the southeast corner of the facility that can be extended as needed for a temporary domestic water service. An electric generator can also be connected to existing electric switchgear that services all buildings on a temporary basis. Eventually, a new domestic water line and permanent electric service will need to be installed to reconnect the buildings to these utilities.

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Figure 3 – Freshwater Tissue Company Property

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Is should be noted that an installation designed for a specific purpose, such as the FWTC property is often less attractive and more difficult to market for other uses. In ATA's experience it if often much more advantageous to remove all of the above ground improvements that cannot be readily utilized and start from "scratch" (i.e. with just graded land and utilities). As can be seen in Figure 3 most of the above ground improvements that cannot serve a useful purpose in the future have already been removed.

2.1 Outdoor Open Space

As shown in aerial view of the purchase property (Figure 3), the majority of the site is outdoor, open space. This open space can be further broken down into three sub-categories; graded raw land, asphalt or concrete paved surfaces, and surfaces where demolition work has either been completed or is yet to be completed. The demolished areas consist of various types of rough surfaces where tanks, buildings, machinery, and other installations were formerly located and have since been removed. The aerial photo shows that these demolished surfaces still contain remnants of concrete foundations of the structures that were once built upon them. In order for these partially demolished surfaces to be useful in the future, further grading and resurfacing should be performed to obtain a final elevation ideally 1-2 feet below the average grade of the property. This way, these areas can be utilized again without much further preparation.

The open space areas that are yet to be demolished contain various types of tanks (steel, concrete, brick, etc.), machinery, piping, miscellaneous structures at multiple levels. Most of the above ground infrastructure on the property that is yet to be demolished will probably not be useful for the Eco Industrial Park development and should be sold as scrap and removed. ATA understands that all of the Property is currently zoned for Industrial, coastal dependent development.

In order for the open space to serve a wide array of future coastal dependent industrial tenants in the future, additional capital improvements such as further site grading, service roads and access ways, utilities and other improvements will need to be made. At the very least, electricity, domestic water, fire suppression water, and telephone utilities should be made available.

2.2 Warehouses (140,000 sq. ft.)

The warehouse buildings on the property are some of the most readily available and useful assets for re-purposing and generating a quick source of revenue. Most of the warehouse space is in good condition and can be easily partitioned into separate bays and usage areas for a variety of uses. The ceiling height (+20 ft.) in the warehouses can easily accommodate the construction of second floor mezzanines or the installation of tall structures and equipment such as header tanks, cooling, heating or aeration towers, and internal building. The overall condition of the warehouse roofing appears to be in good condition and some are insulated. To ATA's knowledge, all of the warehouses have concrete flooring at or near the average grade of the property. Large vehicles and machinery can easily be driven into or out of all large covered warehouse buildings. A site map showing the main warehouse areas on the property and a photo of the inside of one of the warehouses is represented in Figure 4.

It is recommended that space inside the warehouses be divided into compatible usage zones (ex. aquaculture, passive storage, refrigeration/heating, food and feed processing, etc.) in order to situate complimentary businesses next to each other and to prevent potential use conflicts. Having complimentary tenants next to each should also foster cooperative and mutually beneficial relationships. Locating similar business clusters next to each other will allow for the consolidation of utilities and other support services in common areas. For biosecurity reasons, further consideration will need to be made so as to not to site like species aquaculture and agriculture users directly next to each. This potential impact can possibly be resolved by locating an agriculture project next to an aquaculture project and so on.

Each subdivided and actively used bay in the warehouse should be supplied with its own metered utilities and access to waste disposal to either the outfall, domestic waste water system or both. Passive storage within the warehouse should not require any support services other than access to the warehouse and parking. Ideally, each rental bay should be isolated from neighboring bays by wooden walls or partitions. Tenants should be allowed to construct their own capital improvements within their own divided areas as long as these improvements meet the development guideline standards of the Park. The Park operator should retain the option of requiring that tenant improvements that do not serve a useful purpose for future tenants be removed at the existing tenant expense. Rental deposits should be required by each tenant in order to create a reserve fund to return rental property to a usable condition in case of tenant defaults or bankruptcies.

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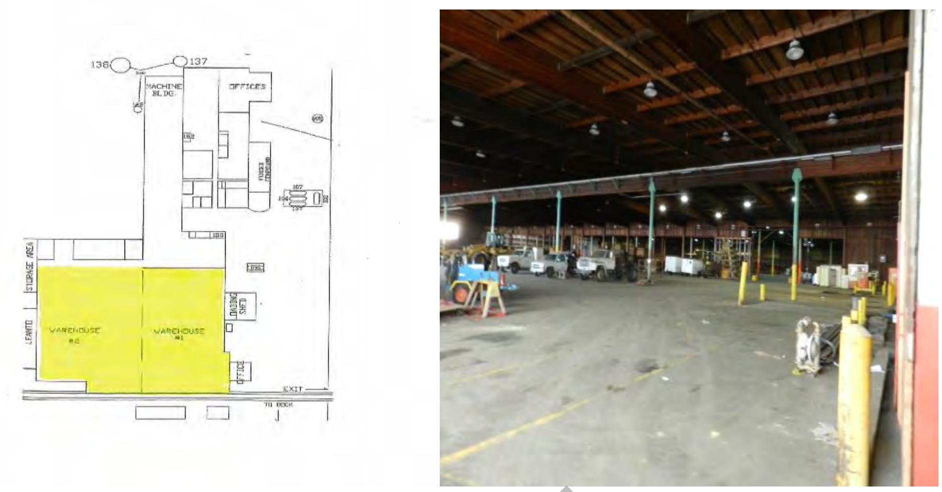

Figure 4 - Location Map and Photograph of Main Warehouses

2.3 Indoor Shop Areas (40,000 ft. sq.)

Indoor shop areas exist within or near to the warehouses, offices and laboratory space. These shop areas were formerly used to repair and maintain vehicles, heavy equipment and machinery used in the paper pulp milling process. The shop areas are on concrete surfaces accessible by large roll up doors, contain work benches, overhead hoists, and storage mezzanines with parts bins, shelving, cabinets, and multi-use surfaces that can be easily utilized multiple purposes. The shop areas appear to be in overall good condition and would be a great asset to the proposed Park. The two photographs in Figure 5 show two areas with the shop complex.

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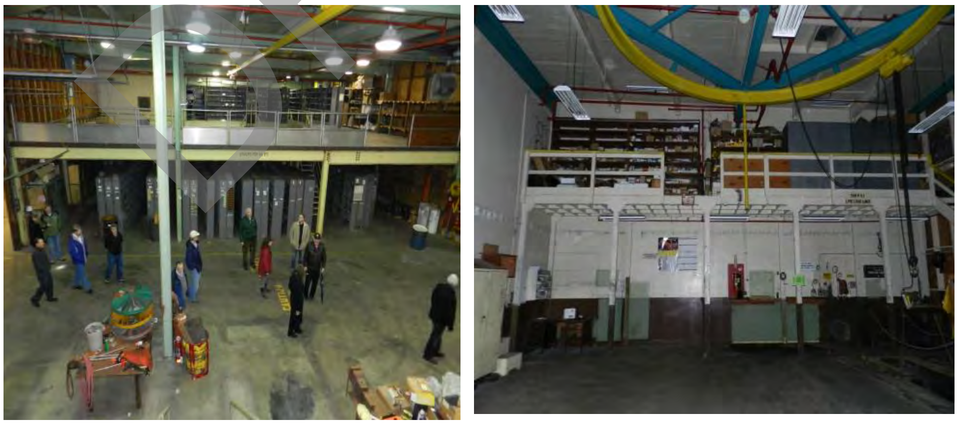

Figure 5 – Two Photographs of Main Shop Complex

2.4 Laboratory (14,400 sq. ft.)

A laboratory complex exists above the ground floor offices to the northwest of the large warehouses. The map in Figure 6 shows this location and a photograph of one area of the lab. As can be seen in the photograph, the lab space is in excellent condition and could be easily be created into rentable space for several tenants.

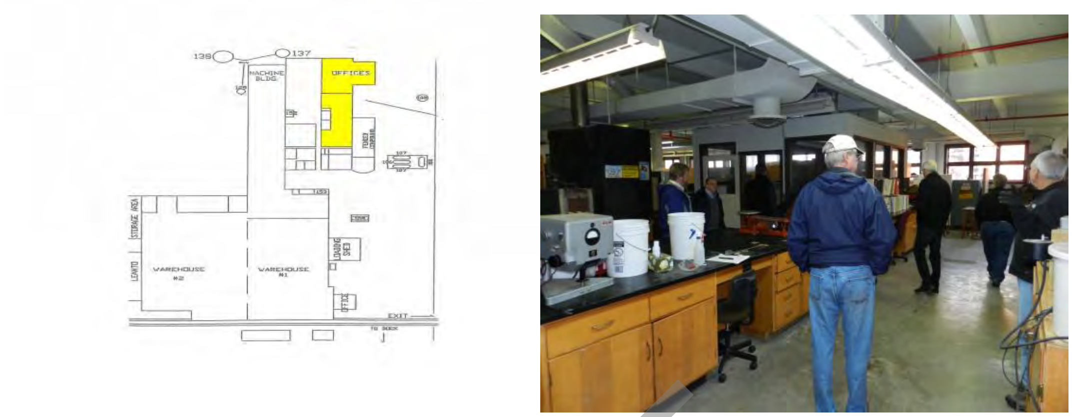

Figure 6 – Map and Photo of Laboratory Space above Offices

The laboratory complex contains work stations, storage cabinets, a fire sprinkler system, sinks, partitioned work and office areas, an exhaust ventilation system and may other attributes. It is unknown whether or not the lab space is heated or air conditioned.

2.5 Offices (3,200 sq. ft.)

Turn-key office space is available on the ground level of the same building that houses the laboratory. ATA understands that the office furniture and other existing inventory within the offices will be included in the purchase price of the property. As with warehouse and lab areas, the office space is immediately available as rental space and a potential quick source of revenue. An example of the type of office space and furniture available is shown in Figure 7.

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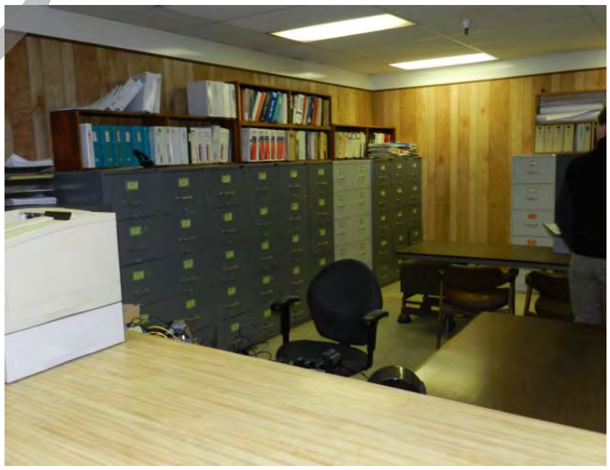

Figure 7 – Photograph of Office Space

2.6 Paper Machine Building (28,000 sq.ft.)

Compared to the other warehouse space currently available on the property, the Paper Machine Building is in the worst condition and would require upgrades and further improvements to utilize. Several of the roofing and side panels of this building were blown off in a storm and thus allow rain and moisture to enter the building. None the less, the building is considered another multi-purpose asset that could easily become a quick source of revenue. The building may be ideal location for a multi-level aquaculture and/or aquaponics facility or vertical agriculture. A map showing the location of the Paper Machine Building within the property is depicted in Figure 8. Two photographs of the south facing wall and within one portion of the building are shown in Figure 9.

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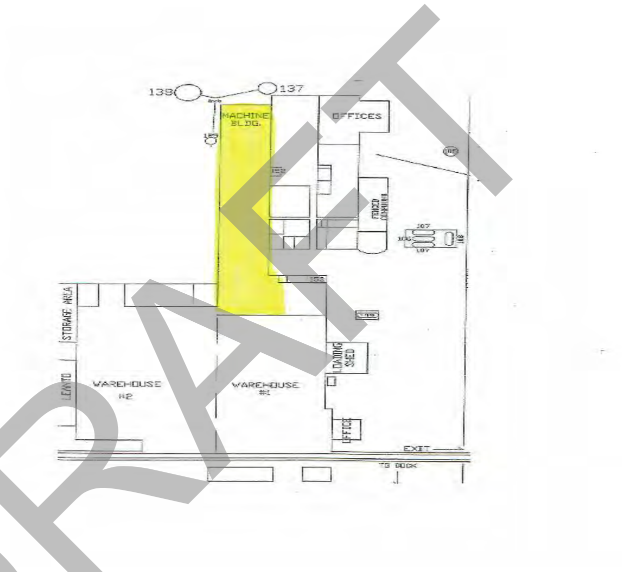

Figure 8 – Location Map of Paper Machine Building

Figure 9 – Paper Machine Building – Outside South Side and Inside

2.7 30 MGD Water Treatment Facility

The 30mgd water treatment facility on the property was originally utilized to remove silt, grit, sand, and other impurities from industrial grade freshwater delivered to the site from the Mad River. The treated river water was used to process the paper pulp at the mill and for other related applications. The treatment facility appears to be in to good condition and was last utilized in 2008.

The allocation of Industrial Water from the Humboldt Bay Municipal Water District's distribution system at volumes of 15-30 million gallons per day comes with a large upfront cost in the range of $108,000 –$113,000 per month, plus the cost of water (~$0.31/kgal). The high costs are the result of a commitment that must be made with the Water District to share the capital improvement and O/M costs of operating the distribution system. Unless an arrangement can be made to obtain this resource at a lower cost, the upfront expenses will probably not be attractive to many users. The use of water at these flow rates (10,000-20,000gpm) and of this large volume would require a tenant or group of tenants with a huge need for freshwater. This volume of freshwater could easily support a 500-1000 ton per year fish farm or companies with very large processing needs. It should be further noted that the discharge of these volumes of water through the outfall would require a substantial amount of additional energy and O/M costs to pump the water out to sea; let alone the capital improvement costs to refurbish and upgrade the outfall's existing booster pump station.

Unless a tenant or group of tenants can be found to utilize the water processing facility in its present configuration within 2-3 years of commencing operations at the Park, ATA recommends that the water treatment facility be offered for sale as a unit or in pieces, and all remaining components offered as scrap to the highest bidder. The two large concrete clarifier tanks and individual media filter vessels should be of interest to future aquaculture tenants. A layout drawing of the treatment facility is shown in Figure 10. Two photographs of the facility are shown as Figure 11.

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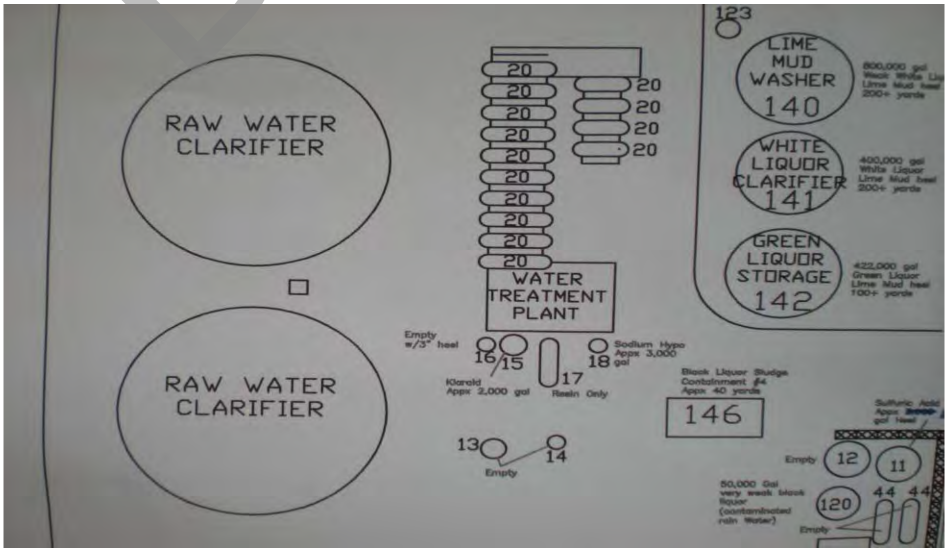

Figure 10 – 30MGD Water Treatment Facility Layout

Figure 11 – Photographs of 30MGD Water Treatment Facility

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2.8 Access Roads / Parking / Security Fencing / Storm Drainage

The purchase property is readily accessible to established roadways that can handle vehicles of any weight and dimension, has ample paved parking areas to accommodate many (>200) vehicles, is mostly enclosed by existing security fencing and access gates and installed storm drainage. All of these assets appear to be in good condition, although will need routine maintenance and possible upgrades to service the future needs of the Park.

2.9 1.5 Mile Offshore Outfall System

One of the most valuable assets on the FWTC property is its 42-inch diameter offshore outfall. The offshore concrete pipeline is 1.5 miles long, lined with a 36" OD high density polyethylene (HDPE) plastic pipe and discharges into the Pacific Ocean side of the property at a depth of 80 feet. The full capacity of the outfall system was originally rated at 30mgd. A full inspection of the outfall plumbing both offshore and on land should be made to determine its present condition, projected repairs and existing capacity.

The outfall is currently being used by the 23MW DG Fairhaven electric power plant approximately 2,500 feet to the south of the FWTC facility. The power plant is currently using timber industry waste as a biomass fuel source for firing its boilers. ATA understands that the power plant is currently using domestic water to condense the steam downstream of the turbine generators. The warmed (~72-80°F) effluent from the power plant is currently being pumped at a volume of 200,000 gallons a day to the FWTC outfall on an intermittent (tide dependent) basis to be discharged into the ocean at that location. This method of discharge is currently being allowed with permission from the North Coast Regional Water Quality Board. ATA understands the outfall is currently only permitted to discharge waste water from a pulp mill and the electric power plant. No other type of effluent is currently allowed.

ATA understands that it may be possible to obtain approvals to utilize the outfall for aquaculture and other types of effluent. Once this is obtained, the pathway for open system aquaculture development on the property should be able to proceed quickly. The purchaser of the FWTC property will retain exclusive rights to the use of the outfall.

As with other installed equipment on the property, the pumps currently installed to discharge large amounts of water through the outfall are probably too large to ever be used again. Although it may currently be possible to discharge upwards of 100-200gpm of water through the outfall by gravity flow (especially during periods of low tide), flow rates above this range will most likely need to be pumped. The installation of smaller discharge pumps will need purchased and retrofitted to the existing plumbing for this purpose. A photo the existing (200-300hp) electric motor driven pumps and a map of the plumbing on the property connected the outfall is shown in Figure 11. Access to the outfall plumbing on land appears to be strategically located to service most of the Park property.

Figure 11 – Existing Pumps and Shore Plumbing Layout Connected to Outfall

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2.10 Fire Suppression System / Water Tower

A fire suppression system exists on the property that is presently connected to a domestic water supply. The system is capable of delivering up to 1,500 gpm at 100 psi with the pumps that are currently installed. The fire system is connected to sprinklers in each of the buildings, all of the warehouses, and throughout the open space area with fire hydrants. The fire water line to the warehouses is presently shut down due to an underground leak. A 100,000 gallon water storage tower at the north end of the facility (across from the office/lab complex) is an integral part of the fire suppression system. The water tower serves to maintain a constant head pressure of 50 psi on the system to reduce constant pumping requirements and as a backup in case of electric power outages.

2.11 Multi-Purpose Dock (Berth 2)

The ship docking and berthing facility on the Humboldt Bay (east) side of the facility is already owned and operated by the Harbor District. The dock is a valuable complimentary asset to the purchase property as it can offer opportunities for both the import and export of goods and services. It should be noted that the dock does not currently contain any facilities (crane, hoists, gantry's, etc.) for loading or unloading vessels. An aerial photo of the dock in its present configuration is shown as Figure 12. Although the dock appears to be in good condition, it is unknown what types of repairs may be required.

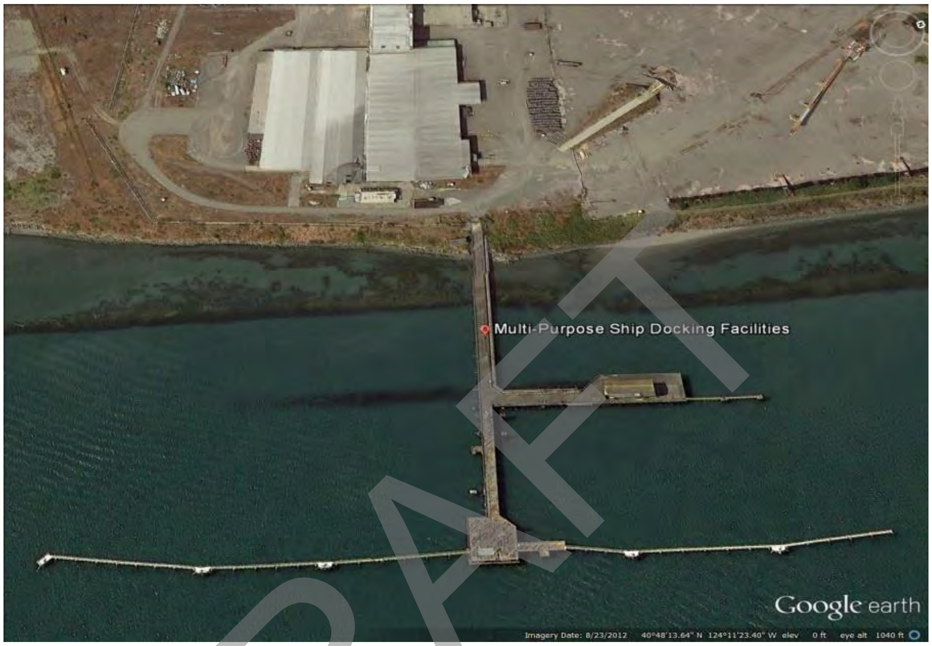

Figure 12 – Aerial View of Dock Berthing Facility

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Piping (and presumably electrical conduits) exists on the dock that are directly tied to the land portion of the property via surface plumbing. It is unknown what condition the existing plumbing is in or if any of it can be used again for other purposes. It is likely that all of the plumbing that was formerly used to transfer caustic chemicals to the pulp mill will need to be torn out and scrapped. An aerial view of the above ground plumbing between the dock and property is shown here as Figure 13. The above ground plumbing and utility corridor within the property should be useful for other purposes in the future.

The dock should prove useful for future tenants at the Park and could also serve as its own independent source of revenue as it is connected to established roadways and the federal highway system. Once the park is up and running, it may also be feasible and cost effective to create a shuttle service between the Park and the City of Eureka for the transfer of personnel, freight and tourists. ATA is aware of the interest of a large shellfish company currently operating in other locations within the Bay that desires to utilize some of the inner dock area as an expansion site for the raft culture of juvenile oysters. The Harbor

Figure 13 – Aerial Photo Showing Above Ground Plumbing Corridor

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District's Aquaculture Expansion Project is considering pre-permitting and then leasing an 8-acre bay site in shallow water at the south end of the pier for shellfish seed culture.

The area around the dock can also serve as a test site for wave, wind and ocean energy devices in their earliest stage of development and before they are advanced and durable enough to be tested in the ocean.

2.12 Miscellaneous Tanks / Structures

Although most of the existing storage tanks on the property should probably be demolished and removed, some of these vessels may serve a useful purpose to future Park tenants. The largest tanks in the best condition could be used to condition and store both fresh and saltwater for the Parks main distribution network or for individual tenants engaged in aquaculture, food processing and other enterprises. The two large concrete clarifier tanks that are presently part of the 30mgd water treatment facility would fall into this category. The large steel water storage tank at the southwest corner of the property and the 100,000 gallon water tower are part of the facility's fire suppression and domestic water delivery systems and would naturally need to remain on the property in operational status.

2.13 Available Utilities / Other Resources

The installed utilities on the property are another bonus towards rapidly re-purposing the facility for other uses. The basic utilities available at the site include electricity, municipal water, access to industrial water, and telephone service. It is not known whether or not high speed, broadband Internet access is available. The property also includes an onsite domestic wastewater (sewage) treatment system that consists of a septic tank and leaching field with a capacity to handle up to 400 people. ATA understands that a natural gas pipeline is also accessible from the property. Propane tanks can also be arranged for individual or groups of tenants as needed.

Due to the original large industrial scale of the pulp mill operations, much of the utilities at the site may be oversized and not individually metered. For example, much of the high voltage electrical system and switchgear may need to be ripped out and/or temporarily bypassed to lower parasitic loads. New transformers and other electrical equipment will probably need to be installed in order to provide lower voltage (480, 3ph) electricity to individual buildings and tenants. It is recommended that all pump motor controls be replaced with variable frequency (speed) drive units to lower electric operating costs and to provide the opportunity for adjusting flow rates as needed. The main electric substation appears to be located at the northwest corner of the property. Electricity appears to be distributed throughout the facility by overhead utility poles.

It will be necessary to install and connect an emergency electric generator to either the facility's main substation or to critical areas of the Park in order to provide backup electricity to all tenants in the event of power interruptions.

2.14 Future Utilities & Resources

In order for the Park to be attractive to the broadest range of potential tenants in the future, ATA recommends that the following additional capital improvements, utilities and resources be considered for developed:

2.14.1 Seawater Distribution System

To expand the existing shellfish industry that is presently operating in the intertidal zone and elsewhere in Humboldt Bay, a seawater distribution system will need to be developed at the Park to provide an opportunity for this industry to come ashore. Delivering seawater on the property as another utility for aquaculture and other saltwater dependent enterprises will greatly enhance the value of the facility and diversity the type of enterprises that can be developed there. At the present time a large shortage of oyster seed exists in the shellfish industry. There is an immediate need for larval setting and nursery facilities for juvenile shellfish, especially for oysters. This is a marketing opportunity that should be taken advantage of at the property.

There should also be opportunities for developing hatchery/nurseries for various saltwater finfish species such as Chinook and Coho salmon, Rainbow trout, Stripped Bass, Sturgeon, Sablefish, and other important seafood species. A freshwater recirculating or open system would be needed to grow the anadromous fish species in until they reach smolt size and can be weaned onto seawater. The Park would also be an ideal location for growing local marine finfish species for subsequent release into open waters to replenish natural populations of both inland and coastal fishery species. Opportunities may also exist for producing juvenile fish for sale and growout at other locations. ATA does not recommend that the Park attract aquaculture tenants who intend to culture genetically modified organisms (GMO) or will need floating net pens for fish culture. However, small broodstock management pens may be necessary adjacent to Berth 2.

In order to attract mariculture tenants to the Park, serious consideration should be given to installing a seawater intake in Humboldt Bay. It is recommended that two intake

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pipelines be installed so that one intake at a time can be shut down and cleaned of marine fouling organisms. ATA understands that the National Marine Fisheries Service will require that fine mesh (3/32”) screen be installed over the intake and established guidelines will need to be followed to maintain pumping velocities slow enough to prevent the entrainment and entrapment of fish larvae. The small intake screen mesh size will be a challenge to keep clean and free of fouling organisms and to maintain efficient pumping costs.

It should be noted that the water quality of Humboldt Bay and the Pacific Ocean offshore of the Park are quite different and seasonably variable depending the influence of natural upwelling, freshwater runoff, prevailing winds, ocean currents, and other influences. This may determine the type of mariculture operations that could be developed at the Park and/or the time of year in which various marine organisms could be cultured. Of the two potential sources of seawater for the Park, seawater from the Pacific Ocean is expected to be the most consistent in annual water quality.

2.14.2 Enhanced Outfall System

ATA understands that present approvals only allow the offshore outfall to be utilized for effluent discharge of a pulp mill and the DG Fairhaven electric power plant. Additional approvals and permits will be needed to utilize the outfall system for the discharge from salt and freshwater operations and other types of mixed effluent.

It is quite feasible to install smaller HDPE pipelines within the offshore outfall to serve as seawater intakes from the ocean at the same time that the outfall continues to operate to discharge effluent. The inlets pipes would need to be extended (100-200 feet) beyond the diffuser at the end of the outfall to prevent cross contamination from the effluent waters.

The outfall pipeline is presently sleeved with a 36” OD high density polyethylene (HDPE) plastic pipe; the inside diameter of this internal sleeve 31.5” (i.e. DR17). In order to maintain the highest possible effluent discharge volumes, the size of potential intake pipelines within the internal sleeve will probably be limited to pipes in the range 8”-10”. As mentioned earlier, it is recommended that two intake pipelines be installed within the outfall sleeve in order to allow one pipeline at a time to be shut down for cleaning and the removal of marine fouling organisms (barnacles, mussels, oysters, tunicates, etc.). This is the seawater management practice currently used at the Monterey Bay Aquarium and other locations where marine fouling is problematic.

Considering the length (1.5+ miles), of piping needed to reach open ocean conditions beyond the end of the outfall, operating one 8-10” intake pipeline at a time would limit intake flow rates to a range of 400-800 gpm. If the feasibility of installing two seawater intake pipelines within the outfall sleeve will limit Park development to small effluent volumes, the only alternative may be to exclusively bring in seawater from Humboldt Bay. Having seawater intake pipelines within the outfall plumbing may also reduce the options for cleaning the outfall of fouling organisms, silt, sediment, etc.

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Consideration has already been given to utilizing the offshore outfall as a conduit for telecommunications and electric power cables tied to offshore wind, wave or ocean current renewable energy installations. This would be a totally feasible and appropriate undertaking that would create another source of revenue for the park.

2.14.3 Groundwater / Injection Wells / Alternate Methods of Discharge

It is recommended that an exploratory drilling program be performed at the site or neighboring sites sometime in the future to determine what types of groundwater resources may exist beneath the property and at what depths. Consideration should also be given to creating a series of injection wells for the discharge of various types of effluent. The feasibility of using injection wells for effluent can be determined at the same time that exploratory wells are drilled on the property by conducting "push/pull tests to determine the permeability of the substrate.

It may also be feasible (if allowed) to discharge low volumes of effluent directly into the sand dunes or into ponds within the property. Installing intake pipelines within the outfall sleeve will definitely reduce the capacity of this discharge system. As such, additional prospects for effluent disposal should be considered for the Park. Permitting resource and injection wells on the property as an initial alternative may be a more expeditious process compared to the time and expense required for permitting a seawater intake or mixed effluent through the outfall. Developing a groundwater resource will again diversity the type and number of tenants that could be attracted to the Park.

If various forms of ground disposal will be allowed and feasible as a means of discharging effluent on the property, ATA recommends that settling ponds and underground leaching fields be permitted and approved for this purpose.

2.14.4 Waste Heat

Although it is unknown at this time whether the heated effluent from the DG Fairhaven electric power plant could be utilized as a waste heat resource, this potential opportunity should be further explored. At the present time the temperature of this effluent is estimated to be 72-80°F and flows on an intermittent basis to discharge 200,000 gallons a day out of the outfall.

It may also be feasible and cost effective to create a closed plumbing loop of seawater or freshwater between the DG Fairhaven power plant and the Park to capture waste heat at the source. This could be achieved by installing a plate and frame heat exchanger at the power plant location that is charged with pressurized hot water. The distance between the southwest corner of the FWTC property where the outfall begins and the electric power plant is estimated to be 1,500 feet. As mentioned earlier, a discharge pipeline between these two destinations is already in service.

Opportunities for heating applications could also be realized on a large industrial scale if their 42MW electric power plant on the property is ever brought back on line. Having

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a large quantity of waste heat available would dramatically diversify the types of enterprises that could be established at the Park. The development of heated greenhouses, hot houses, temperature controlled environments, and drying and cooking applications would certainly be possible as soon as an affordable source of hot water and heat becomes available. Aside from the space heating applications, it would also be feasible to control soil temperature and seasonal growing conditions for agriculture crops. This type of temperature control has proven to enhance productivity and create multiple harvest cycles per year.

2.14.5 Seawater / Freshwater Cooling

Once a seawater distribution system is operational on the property consideration should be given to using this resource as a fluid for cooling and temperature conditioning. Seasonal seawater temperatures from Humboldt Bay range from 48-68°F and from the Pacific Ocean (depending on depth) from 48-57°F. Seawater of this temperature range can be used as an energy saving opportunity in chill water air conditioning and space cooling applications. Refrigeration chillers could be used to reduce water temperatures as needed. A substantial savings in the amount of electricity or fuel needed for chilling and refrigeration would be immediately realized. Cold seawater can also be used to lower the water temperature needed to produce both saltwater and freshwater ice. A potential customer of this source of "cheap cold" would be a company like Humboldt Bay Packers, who is food distribution company currently operating at the Fairhaven Business Park.

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2.14.6 Renewable Energy Applications

All forms of renewable energy resources should be considered for installation at the Park. All sources of independent electric power production would also be a bonus to Park tenants. Consistent north and northwest winds are a potential resource during the spring and summer and south and southwest winds are available during the fall and winter. At some point in the future offshore wave and wind energy installations could be tied to the facility via cable(s) through the outfall plumbing. It is expected that the prospects for solar thermal or solar electric installations at the Park will be limited to only certain months of the year.

3 Proposed Management Structure and Stakeholder Mixture

The recommended management structure for the Park is to create a tenant balance partnership between academia, government and private business investments. This type of troika arrangement is likely to create the most productive, synergistic, and favorable balance between all entities and is a proven structure at the NELHA facility in Hawaii. Establishing this type of balance would be mutually beneficial to each entity.

3.1 Academic Investment (University / College Involvement)

The academic involvement at the Park could be from local and regional universities and colleges. Natural choices for this involvement in the Park would be Humboldt State

University and College of the Redwoods. The Park offers an excellent opportunity for academic institutions to use the property as a site for field testing and demonstrations to advance new technologies and for "hands on" vocational training. As an example, the shop area would be an excellent facility to teach students auto and heavy equipment mechanics, welding, machining, motor, and equipment testing. The existing laboratory space at the Park would be another facility where students could learn how to apply what they have been taught in the classroom in real world situations (ex. water quality, nutrition, food quality, respiration testing, etc.). Students would also have the opportunity to work as interns with government and private tenants working at the Park. This should also create summer and seasonal employment for students.

As mentioned earlier, lighting requirements in warehouse to support various types of mariculture, agriculture and freshwater culture (aquaponics & hydroponic) systems will be a challenge to keep costs as low as possible. This is a challenge that should be posed to the Schatz Energy Research Center of HSU and other academic institutions.

3.2 Government Investment

National labs and other government institutions should be very interested in the Park as a field testing location for the development and demonstration of new technologies in areas as renewable energy (wind, solar, hydrogen production, wave, ocean currents, etc.), waste management, hybrid and electric vehicles, fisheries management and stock enhancement; habitat restoration, and other emerging technologies. This would be very complimentary to the academic involvement at the Park and potentially offer future employment and intern opportunities for students.

3.3 Private Investment

Private investment at the Park will most likely be the largest component for future development opportunities. As mentioned earlier, the Park should of immediate interest as a site for storage of building materials and equipment, for operation of small to medium businesses in the aquaculture, agriculture, timber, food processing and fishing industries, as a location for energy saving opportunities in space cooling and heating (i.e. cold storage, refrigerated warehouse, temperature controlled environments, etc.) and many other types of private investment.

3.4 Property Management

The most obvious property manager for the operation of the Park is the Harbor District since this government institution already has an established leasing structure, staff and internal capabilities. Initially the HD could manage the Park through their offices at the Woodley Island Marina. As the Park develops and more tenants occupy the property, management of facility should be located on the grounds with additional staffing as needed. One alternative would be to eventually turn the operation of the Park over to a private property management firm or developer. Another possible management structure to consider would be have the Harbor District to manage the government investment at the facility, the academic investment managed through HSU and the private sector investments through a private developer.

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ATA recommends that a government institution such as the HD manage the Park since they would be in the best position to obtain capital improvement, grant and stimulus funding through the State of California and the federal government. This would also allow various aspects of the Park to be partially subsidized and maintain the lowest user fees. This setup would be very similar to the way that the NELHA facility operates in Hawaii. User fees at NELHA were initially subsidized to make the facility attractive to private and public investment. Fees were slowly raised over time to allow NELHA to become self-sufficient.

3.5 Master Permits

The most important structure for the Park will be for the managing agency to obtain all of the necessary zoning, master permits and approvals and to install all of the necessary utilities and resources for multiple usages and rapid development potential. Tenants will not be able afford the time and expense of navigating through this regulatory process and should only be required to obtain the necessary building and specific approvals needed for their individual businesses or R&D projects. Again, this structure has worked well and should be emulated after the success of NELHA.

Depending on local and state requirements, it may be necessary for an Environmental Impact Statement (EIS) or environmental assessment (EA) to be performed. If these types of statements or assessments are required, every possible type of future business or research activity possible on the property should be covered and approved.

A Phase I environmental study is currently underway and will be completed by the time ATA submits this analysis. The results of this study may suggest the need for a Phase II analysis. Educational institutions will probably not allow their students to work at the Park if unknown hazards and unsafe conditions of this type exist.

3.6 NELHA Model

Another aspect of the NELHA facility that should be emulated is the creation of three levels of site and project development. Initially, all projects attracted to NELHA were confined to what is now called the Research Campus. The NELHA RCs is a 6-acre compound where short term (<1-5 years) projects can quickly become established as soon as they arrive at the facility; often within one day. A wide assortment of utilities and use space are available in the RC “turnkey”. Various types of support services are also available to assist tenants in getting established. Examples of these are labor, small equipment and tool rental, heavy equipment services (backhoe, crane, forklift, etc.), business support services, conference and meeting rooms, free wireless Internet access, water quality and chemistry lab services, etc. The Research Campus also serves as an incubation area where tenants can test, model and prototype their concepts to determine if they will be successful and can evolve into viable businesses. The RC has also proven to

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be attractive to visiting scientists and research institutions for short term (2-3 weeks) projects.

The next level of tenant opportunity at NELHA is the creation of Small Business Parks. The Small Business Parks within the overall NELHA facility offer 1-2 acre lots that have been prepared with everything that a small business may need (i.e. basic utilities, seawater, and site grading). The Small Business Parks are attractive to businesses that already have sound and proven business plans, but have limited capital to get started.

The third level of tenant opportunity at NELHA is the Industrial Park. These areas of the facility are totally undeveloped (raw lava), are accessible to utilities along the main access roadway and require a much larger capital investment to get started. The minimum lot size in these areas of NELHA is 3 acres. Long term (20-30 year) lease agreements are offered in these areas of the facility.

A similar development strategy could be established at the Eco Industrial Park on the FWTC property.

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3.7 Incentives / Credits / Offsets

In order to make the Park as attractive for development as possible, incentives such as tax credits, capital improvement offsets, duty free, subsidized rates for government and academic institutions, free use of various support facilities (conference & meeting rooms, storage space, etc.) and other forms of attractions should be offered. The Park should be added to the neighboring property acreage that is presently Foreign Trade Zones.

3.8 Master / Strategic Plans / Development Guidelines

In order to assure that the Park is developed in a controlled and reasonable manner, it will be important to create a Master Plan, Strategic Plan and Development Guidelines. The master and strategic plans will be useful guidelines to keep the Park operator and governing entities focused at all times on the objectives and mission of the Park. Development Guidelines will be necessary to list and determine the parameters within which all developments must follow. Initially in the first 3-5 years, the Park may need to attract tenants that are non-conforming for the zoning of “coastal dependent” uses. Over time these uses will be phased out to comply with Park Development Guidelines.

3.9 Integration and Partnership with other Property Owners

To ATA’s knowledge, there are at least four other large property owners on the Samoa Peninsula besides the FWTC. These are the Harbor District (tidelands, ship berthing facilities), Samoa Township, the former Simpson Property, and the Fairhaven Business Park. Most of these properties were former pulp mills and timber processing facilities that have recently been demolished, repurposed or are striving to find to new opportunities for their property. Consideration should be given to partnering with these other land owners to exchange ideas, resources and development opportunities.

4 Business Potential and Prospective Tenants

ATA has analyzed the business potential for the property and feels that the categories of business enterprises and tenants listed below would be the most appropriate and offer best initial prospects for the Eco Industrial Park. These potential businesses, research, education and outreach opportunities are listed in bullet format and are consistent the with recently released "Prosperity 2012" – Comprehensive Economic Development Strategy public review draft developed for Humboldt County.

4.1 Renewable Energy

The proposed Park would be an excellent location for an Energy Laboratory or Energy Research & Development Center to serve as a test center for advancement of renewable energy concepts (wind, wave, biomass, hydroelectric, hydrogen, and ocean current applications), the development of hybrid and electric vehicles, the creation of smart and micro electric grids, testing of advanced electric motors and engines, and advancing other new technologies. There is a strong interest nationally and internationally for locations to service research and development needs and the Eco-Industry Park would be an ideal facility to fulfill these objectives.

Strategic partnerships should be developed between HSU, the College of the Redwoods, and the Department of Energy's Offices of Electricity (delivery and security), Energy Efficiency, and Renewable Energy and Office of Fossil Energy, as well as the following National Laboratories:

- Argonne National Laboratory (ANL)
- Lawrence Berkley National Laboratory (LBL)
- Natural Renewable Energy Laboratory (NREL)
- Pacific Northwest National Laboratory
- Sandia National Laboratory

State and Federal stimulus funding and grants are likely to be available to support these types of projects once suitable site improvements and approvals have been established at the Park. Renewable energy related R&D tenants are likely be interested in all of the assets that the Park has to offer (outdoor, warehouse, office and laboratory space). A good example of a university to emulate for the Park is Oregon State University's, Hatfield Marine Science Center and the Wallace Energy Systems and Renewables Facility (WESRF) program within it. HMSC has also recently been chosen as the home for the new Pacific Marine Energy Center with $4M in funding from the US DOE and matching donors. Harbor Branch Oceanographic Institute and their affiliation Florida Atlantic University is another good example of the type of relationship that can be developed at the

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Park between a local university and a marine science and technology institute. FAU's Center for Ocean Energy & Technology has just been chosen as a site for new national center for ocean energy research and development. The result of this will be the newly formed Southeast National Marine Renewable Center (SNMREC). The University of Hawaii at the Manoa campus is another location where a land grant National Marine Renewable Energy Center has been established. There are many existing marine science centers, laboratory's, programs and affiliations that should be used as examples of what can be established and created at the Park to serve local, regional and national interests.

Being able to use the offshore outfall as a conduit for electric, signal cables and piping connections between the Pacific Ocean and the land based Park should be very attractive to the types of energy developments envisioned. The Park should also be attractive as a location for a demonstration site for Humboldt State University's Schatz Energy Research Center.

ATA is not aware of how solid waste is presently handled in Humboldt County. If solid waste is currently being disposed of in a landfill(s) and landfill space is becoming a problem, serious consideration should be given to constructing a Waste to Energy (WTE) recycling and electric power plant on Park property. Fuel feedstock for the power plant could be a mixture of timber industry waste and combustible solid waste. ATA understands that a recycling facility has been built on neighboring property that currently sits idle. Consideration should be given to expanding this facility to process solid waste, a food waste digester for the production of methane/electricity, and direct combustibles to a WTC electric power plant.

If a WTE electric power plant were located on or near to the Park it may become a source of less expense electricity and waste heat. The waste heat component of this type of facility alone would be a very valuable resource to future park tenants and would once again diversify the types of projects that could be established. A solid waste problem in the County could be turned into an opportunity for the Park. Cold seawater can also be considered as a resource to condense steam at the electric power plant as an alternative to using cooling towers. The heated seawater used for this purpose would become another valuable resource.

Another renewable energy application that should be seriously considered for the Park is the use of cold seawater for creating space cooling applications for Data Centers and the Storage & Processing of Seafood. This may be especially beneficial to the West Coast Tuna Fleet. Data Centers require a large space cooling load to remove heat created by large rooms filled with computers, servers and other processing equipment. Using cold seawater in a heat exchange process to create a cold, recirculating loop of freshwater would be an

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energy saving advantage over using refrigeration chillers alone. Chillers would still be needed for conditioning the freshwater to ideal temperatures, although with much less electricity.

There is currently strong interest by the US Departments of Defense and Energy for developing large scale energy storage capabilities. The Park would be a suitable location for testing large capacity (1-2MW) batteries. One recent area of interest is the potential for storing energy as compressed air in large containment vessels (bladders, concrete caissons, etc.) located on the ocean bottom (which may conflict with traditional fisheries). This concept involves storing energy during off peak hours and releasing it when needed during peak hours of the day. Although this application may not be appropriate for the Park's location due to the cost of electricity, the property could serve as a site to determine the feasibility of this concept for other locations. This could be another application for using the ocean outfall as a conduit to the Pacific Ocean.

4.2 Agriculture / Aquaculture Potential

The government agency with the most immediate opportunity for rapid expansion of the existing aquaculture industry in the Humboldt Bay area is the Harbor District. The HD currently has active leases with several privately operated shellfish companies in the bay and is in the best position to expand the aquaculture industry into other low impact tidal areas and onto a land based facility. This would be consistent with the Harbor District's, Aquaculture Expansion Project. The primary reason for developing land based aquaculture operations as opposed to ocean based operations is the level of operator control that can be achieved. On land, all aspects of the culturing process can be closely managed and optimized. Land based aquaculture, especially open circuit, flow through systems are often less costly to operate and at the same time, more efficient and productive.

In the case of Humboldt Bay, the best immediate opportunities are with expansion of the existing shellfish industry. The seawater from Humboldt Bay already contains microalgae (phytoplankton) at suitable levels for filter feeding shellfish for most of the year. This is an important advantage that does not exist in seawater pumped to tenants at NELHA in Hawaii. At NELHA, all of micro and macro alga needed as feed for shellfish and mollusks (oysters, clams, abalone, etc.) must be cultured in separate systems requiring additional water, energy and labor.

Freshwater systems such as aquaponics and hydroponics can often be totally closed (i.e. no effluent) or partially open requiring very little (<10%) makeup water per day. Although totally closed seawater culturing systems are more of a challenge to manage compared to closed freshwater systems, it is possible (albeit usually more costly) with current effluent processing and conditioning technology. Opportunities currently exist for managing multiple aquatic species in a cascading, ecosystem approach whereby the discharge from one level can often be used again to supply beneficial resources and nutrients for the next level of the food chain. As an example, the effluent from a shellfish or fish culturing operation on land could be utilized again as a nutrient source for seaweed culture and the

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culture of other marine plants. The incorporation of a marine wetland environment in the ecosystem can often be the final stage to reconditioning the seawater or freshwater for final discharge or percolation into the ground.

As mentioned earlier, there is currently a shortage of oyster seed in the United States, particularly along the west coast. Humboldt Bay is also presently the only location in the State of California where shellfish can be certified as clean and disease free for export to other locations within the US, Canada and internationally. These are potential marketing opportunities that should be capitalized upon at the Park. In addition to the shellfish opportunities, the Park would be an excellent location for various types of hatchery and nursery operations for supplying certified disease free aquatic organisms for stock enhancement and growout at other locations.

Due to the Park's isolated location, it may also be an ideal site for a Food and Drug Administration (FDA) approved, Hazard Analysis and Critical Control Point (HACCP) export terminal and bio-secure storage facility for the interstate and international shipping of certified shellfish and other live aquaculture products. Since the shellfish growing in Humboldt Bay has been determined to be clean and free of pathogens and infectious diseases, this type of facility would certainly be compliment to the local aquaculture industry and create another marketing opportunity for existing and future shellfish operations in the bay.

The reduced annual solar insolation at the Park will limit the opportunities for the culture micro and macro algae outdoors. Due to this situation, the Park may not be a suitable location for the culture of abalone and other mollusks that require a large supply of seaweed as a food source.

The types of aquaculture ventures allowed to establish at the Park should be competitive, technologically appropriate, and targeted on achieving maximum opportunity for profitability and economic growth. They should be focused on meeting the increasing demand for seafood and products that are affordable and meet high standards for safety, quality, and environmental stewardship. To meet future needs and improve the human condition for food, neutraceuticals, pharmaceuticals, health care products, drugs, and energy, encouragement should be given to researchers who are on the fringe of developing breakthroughs in these areas to establish their development and testing programs at the Park. It is estimated that 25% of developments at the Park could easily be made up of a diversity of aquatic culturing enterprises.

The Humboldt area is considered to be one of the most productive agriculture regions and farming lands in California. Many of the agriculture businesses in the County should interested in the Park as a location where food processing and value added facilities can be established. Should waste heat become available at the Park as another resource, opportunities for heated greenhouses and temperature controlled soil can be realized.

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4.3 General Industrial Potential

The majority of the development within the park will most likely be comprised of mixed, general use in support of the established timber, fishing, agriculture, food processing, and the building and construction industries. The diversity of enterprises that could be established at the Park would achieve maximum benefit if it were initially allowed to establish non-conforming (non-coastal dependent) tenants. The general industrial use potential for the Park is expected to make up at least 50% of the businesses who chose to establish there.

4.4 Other Development Potential (R&D / Education / Outreach / Tourism)

The remaining 25% of tenants who are attracted to the Park are expected to fall within this category. The attraction for these types of tenants will be the potential for energy saving opportunities, to businesses who can offer support services to other tenants, as a location to test and advance new technologies, as a site for research institutions and marine labs and as a location for various types of learning centers, vocational schools, and public outreach. All of these types of park activities should also be of interest as tourist destination.

4.5 Open Outdoor Space Potential

ATA understands that the 72 acre parcel presently under consideration is only one of possibly three parcels owned by FWTC that may eventually be up for sale. A 20 acre parcel to the south and another parcel to the north (as yet to be described) may also be available at some point in the future. The original FWTC property size was 156 acres. Both of these future lots are contiguous with the purchase property and may offer expansion and other opportunities for the Park if they become available.

It is recommended that the open space areas within the Park be subdivided into separate development zones for specific applications, each offering lots of specific sizes, as determined by a yet to be created Master Development Plan. Each rental lot or space on the property should have easy access to utilities close by for minimal hook up costs.

The open space within the Park should be attractive to the following types of tenants:

- Aquaculture, Aquaponics or Hydroponic developments requiring more space than can be achieved or is cost effective indoors
- Renewable Energy Testing Installations (wave, ocean current & wind devices) for R&D and energy production at the Park
- Storage of Lumber, Wood Chips, Sawdust and other timber products
- Marine Bio Invasion / Alien Species Laboratory
- Production of Aquatic Plants for Habitat Restoration
- Green Houses / Hot Houses – for the culture of flowers, niche market agriculture produce, herbs, etc.
- General Industrial Applications
- Natural Habitat Restoration Center

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- Native Fish Production for food, research, release as stock enhancement, etc.
- Waste to Energy Electric Power Plant using mixed feed stock (biomass, solid waste)
- Space Cooling applications for Data Centers
- Containerized Technology (package energy production and processing, desalinization, ice, etc. for military, disaster & emergency relief).
- Wildlife and Marine Mammal Rehabilitation Center
- Production of Biodiesel from waste vegetable and motor oil

4.6 Warehouse Space Potential

The most readily available source of revenue at the Park will be the rental of warehouse space. Existing tenants are presently paying rent to FWTC for a minimal space in these warehouses. If further non-conforming, non-coastal development is allowed on the Samoa Peninsula and initially approved for the Park, a quick and substantial revenue stream can be achieved with minimal additional improvements. Much of what can be developed outdoors can also be set up within warehouse space on a smaller scale and in a more controlled environment.

The warehouse space within the Park should be attractive to the following types of tenants:

- Storage of Fishing Industry equipment and materials (boats, fishing gear, totes, etc.)
- Storage and Export Certified Disease Free Shellfish and other live seafood products
- Bait Production for the Crab Industry
- Freshwater Aquaculture Systems (open and closed)
- Food Waste Digestion to produce methane, feed, electricity
- Micro-Breweries and distillation of other liquors and spirits
- Production of Specialty Beverages
- Mollusk Broodstock Breeding Program
- Cold Storage of Seafood and Ice Production
- Hybrid & Electric Vehicle production and testing.
- Seafood Preparation, Processing, Cooking and Cold Storage
- Production of Feed for the Aquaculture Industry from waste fishing and food processing operations in the area
- Manufacture of Timber Industry Products…plywood, veneer, lumber, wood chips, wood pellets, etc.
- Mariculture Systems (open and closed) for finfish, shellfish hatcheries/nurseries, stock enhancement, feed production
- Production of Fertilizers and Soil Amendments
- Agriculture (heated greenhouses)
- Manufacture of niche market goods and services
- Thermal Transfer (Heated Water Systems & Greenhouses)

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- Natural Stock Enhancement (shellfish, sturgeon, stripped bass, salmon, seaweed, wetlands, etc.)
- Complimentary Businesses to Support Tenants…machine, welding, repair & carpentry shops

4.7 Shop Space

- Electric Motor, Engine Development and Testing
- Rental bays for tenants to use for their own purpose
- Repair and Maintenance Businesses to provide tenant support services and for their own purpose
- All forms of mechanic and repair businesses
- Vocational Training / Auto Tech School
- Vehicle and Heavy Equipment Repair
- Fabrication of Renewable Energy Equipment
- Repair of fishing industry equipment and gear

4.8 Office Space

- Tenant General Use
- Visitors & Learning Center
- Public Outreach
- Property Management – Head Offices
- Conference and Meeting Rooms
- Business Support Service
- Sea Grant Extension Office

4.9 Laboratory Space

- Marine Lab (HSU, Scripps, Hubbs Marine World, Bodega Bay)
- Support services to tenants by owner/operator
- Individual Tenant Rental Space
- Vocational Training
- Water Chemistry Analysis (private / public)

4.10 Machine Paper Building

- Multi-Level Aquaculture / Mariculture (RAS or open)
- Vertical Agriculture / Aquaponics / Hydroponics
- Plywood and other types of timber processing
- Storage

4.11 Offshore Outfall

- Discharge of Mixed Tenant Effluent

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- Seawater Intake
- Cable Route to Shore / Offshore

4.12 Multi-Purpose Dock

- Export / Import of goods and services
- Shuttle service between Park and Eureka
- Shellfish culture (rafts land side pier)
- Testing of ocean energy devices

5 Current Property Value / Proposed Space Rental Rates

Although ATA is not very familiar with property and real estate values in the Humboldt area, particularly for the Samoa Peninsula, it was felt that an effort should be made to estimate the current value (worth) of the property and the assets upon it; especially in light of the pending decision that must be made to purchase the property or not. The estimated values used in the table in Figure 15 on the following page are meant to be very conservative and to portray what may be considered, the worst case scenario.

An attempt has also been made to determine what the initial space rental use rates should be at the Park. The values used for this purpose are listed in the table of Figure 16. The values used are the result of information obtained from various local sources in Humboldt and ATA's "gut feeling" of what would be appropriate to initially get the Park up and running.

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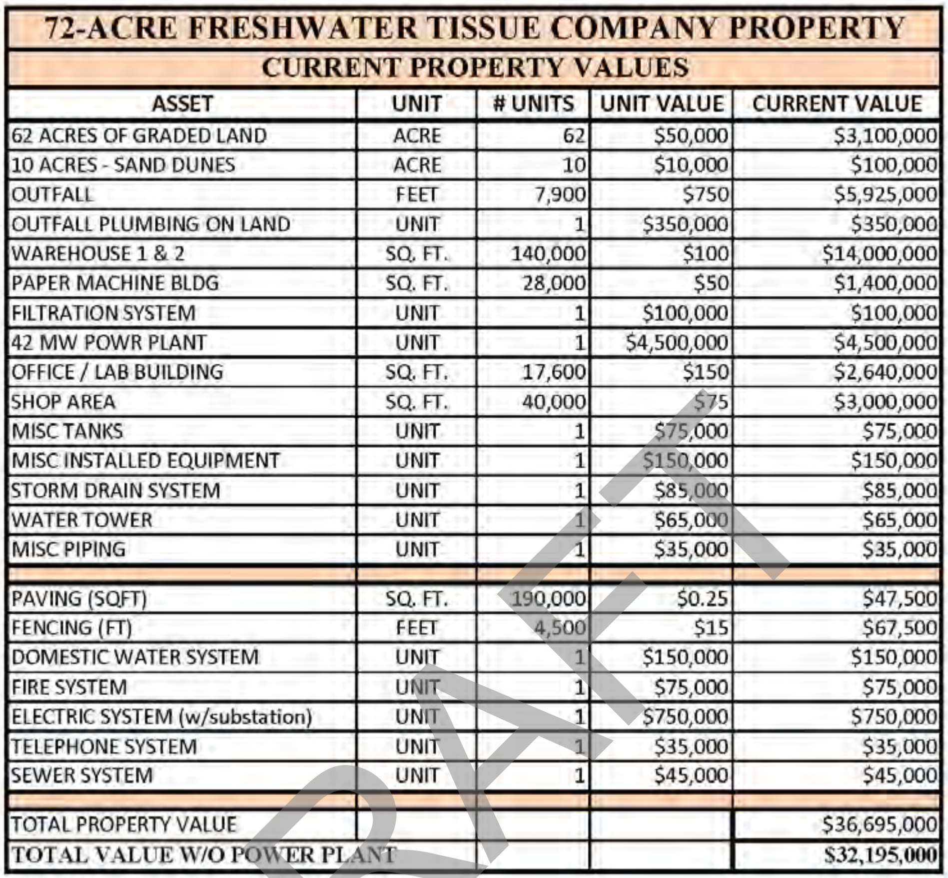

72-ACRE FRESHWATER TISSUE COMPANY PROPERTY				
CURRENT PROPERTY VALUES				
ASSET	UNIT	# UNITS	UNIT VALUE	CURRENT VALUE
62 ACRES OF GRADED LAND	ACRE	62	$50,000	$3,100,000
10 ACRES - SAND DUNES	ACRE	10	$10,000	$100,000
OUTFALL	FEET	7,900	$750	$5,925,000
OUTFALL PLUMBING ON LAND	UNIT	1	$350,000	$350,000
WAREHOUSE 1 & 2	SQ. FT.	140,000	$100	$14,000,000
PAPER MACHINE BLDG	SQ. FT.	28,000	$50	$1,400,000
FILTRATION SYSTEM	UNIT	1	$100,000	$100,000
42 MW POWR PLANT	UNIT	1	$4,500,000	$4,500,000
OFFICE / LAB BUILDING	SQ. FT.	17,600	$150	$2,640,000
SHOP AREA	SQ. FT.	40,000	$75	$3,000,000
MISC TANKS	UNIT	1	$75,000	$75,000
MISC INSTALLED EQUIPMENT	UNIT	1	$150,000	$150,000
STORM DRAIN SYSTEM	UNIT	1	$85,000	$85,000
WATER TOWER	UNIT	1	$65,000	$65,000
MISC PIPING	UNIT	1	$35,000	$35,000
PAVING (SQFT)	SQ. FT.	190,000	$0.25	$47,500
FENCING (FT)	FEET	4,500	$15	$67,500
DOMESTIC WATER SYSTEM	UNIT	1	$150,000	$150,000
FIRE SYSTEM	UNIT	1	$75,000	$75,000
ELECTRIC SYSTEM (w/substation)	UNIT	1	$750,000	$750,000
TELEPHONE SYSTEM	UNIT	1	$35,000	$35,000
SEWER SYSTEM	UNIT	1	$45,000	$45,000
TOTAL PROPERTY VALUE				$36,695,000
TOTAL VALUE W/O POWER PLANT				$32,195,000

Figure 15 - Current Property Values

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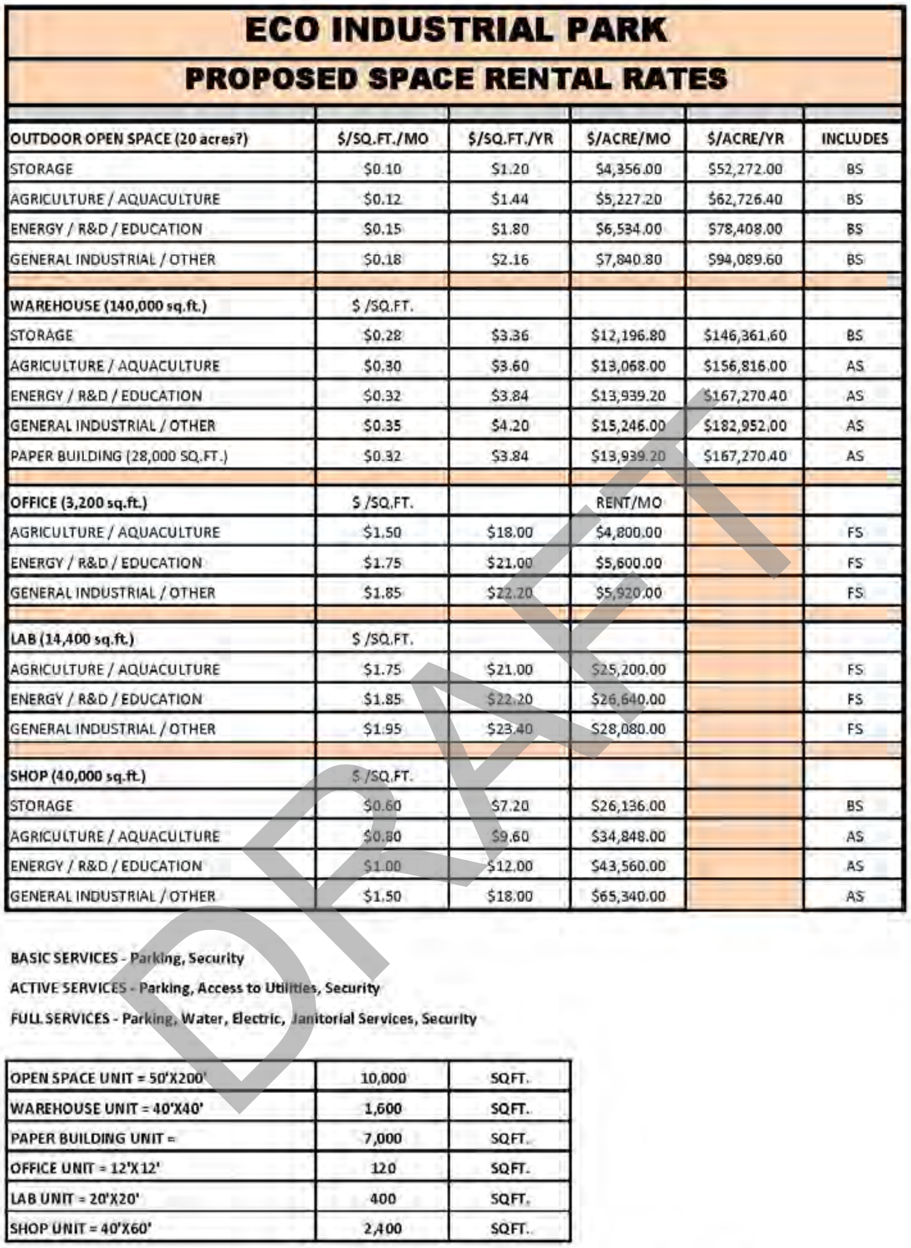

ECO INDUSTRIAL PARK

PROPOSED SPACE RENTAL RATES

OUTDOOR OPEN SPACE (20 acres?)	**$/SQ.FT./MO**	**$/SQ.FT./YR**	**$/ACRE/MO**	**$/ACRE/YR**	**INCLUDES**
STORAGE	$0.10	$1.20	$4,356.00	$52,272.00	BS
AGRICULTURE / AQUACULTURE	$0.12	$1.44	$5,227.20	$62,726.40	BS
ENERGY / R&D / EDUCATION	$0.15	$1.80	$6,534.00	$78,408.00	BS
GENERAL INDUSTRIAL / OTHER	$0.18	$2.16	$7,840.80	$94,089.60	BS
WAREHOUSE (140,000 sq.ft.)	$ /SQ.FT.				
STORAGE	$0.28	$3.36	$12,196.80	$146,361.60	BS
AGRICULTURE / AQUACULTURE	$0.30	$3.60	$13,068.00	$156,816.00	AS
ENERGY / R&D / EDUCATION	$0.32	$3.84	$13,939.20	$167,270.40	AS
GENERAL INDUSTRIAL / OTHER	$0.35	$4.20	$15,246.00	$182,952.00	AS
PAPER BUILDING (28,000 SQ.FT.)	$0.32	$3.84	$13,939.20	$167,270.40	AS
OFFICE (3,200 sq.ft.)	$ /SQ.FT.		RENT/MO		
AGRICULTURE / AQUACULTURE	$1.50	$18.00	$4,800.00		FS
ENERGY / R&D / EDUCATION	$1.75	$21.00	$5,600.00		FS
GENERAL INDUSTRIAL / OTHER	$1.85	$22.20	$5,920.00		FS
LAB (14,400 sq.ft.)	$ /SQ.FT.				
AGRICULTURE / AQUACULTURE	$1.75	$21.00	$25,200.00		FS
ENERGY / R&D / EDUCATION	$1.85	$22.20	$26,640.00		FS
GENERAL INDUSTRIAL / OTHER	$1.95	$23.40	$28,080.00		FS
SHOP (40,000 sq.ft.)	$ /SQ.FT.				
STORAGE	$0.60	$7.20	$26,136.00		BS
AGRICULTURE / AQUACULTURE	$0.80	$9.60	$34,848.00		AS
ENERGY / R&D / EDUCATION	$1.00	$12.00	$43,560.00		AS
GENERAL INDUSTRIAL / OTHER	$1.50	$18.00	$65,340.00		AS

BASIC SERVICES - Parking, Security

ACTIVE SERVICES - Parking, Access to Utilities, Security

FULL SERVICES - Parking, Water, Electric, Janitorial Services, Security

OPEN SPACE UNIT = 50'X200'	10,000	SQFT.
WAREHOUSE UNIT = 40'X40'	1,600	SQFT.
PAPER BUILDING UNIT =	7,000	SQFT.
OFFICE UNIT = 12'X12'	120	SQFT.
LAB UNIT = 20'X20'	400	SQFT.
SHOP UNIT = 40'X60'	2,400	SQFT.

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Figure 16 - Proposed Space Rental Rates

6 Forecasted Start Up Costs & Revenue (Years 1-5)

It is difficult to determine what the initial startup costs will be for the basic function of the Park. In the table of Figure 17, ATA has chosen to use values provided by the Harbor District and its own estimates to project initial startup costs. Also included in the Figure 17 are forecasted annual costs for additional improvements, operations and maintenance of the facility and basic utilities. ATA's cost figures have not been validated with local experts and are meant to establish parameters for developing comments, recommendations and conclusions of this analysis.

The proposed space rental rates were further used to forecast a potential stream of revenue that should be achievable in the first five operating years of the Park. This forecast is portrayed in the table in Figure 18, listed again in Appendix D.

Occupation of the Park in the first five years is projected to be for mostly passive storage applications with minimal active involvement from tenants engaged in freshwater aquatic system culture (aquaculture, hydroponics, and aquaponics), small agriculture and industrial applications, and minimal use of warehouse, office, lab and shop space. ATA recommends that the revenue projections be further scrutinized and adjusted as needed by local authorities.

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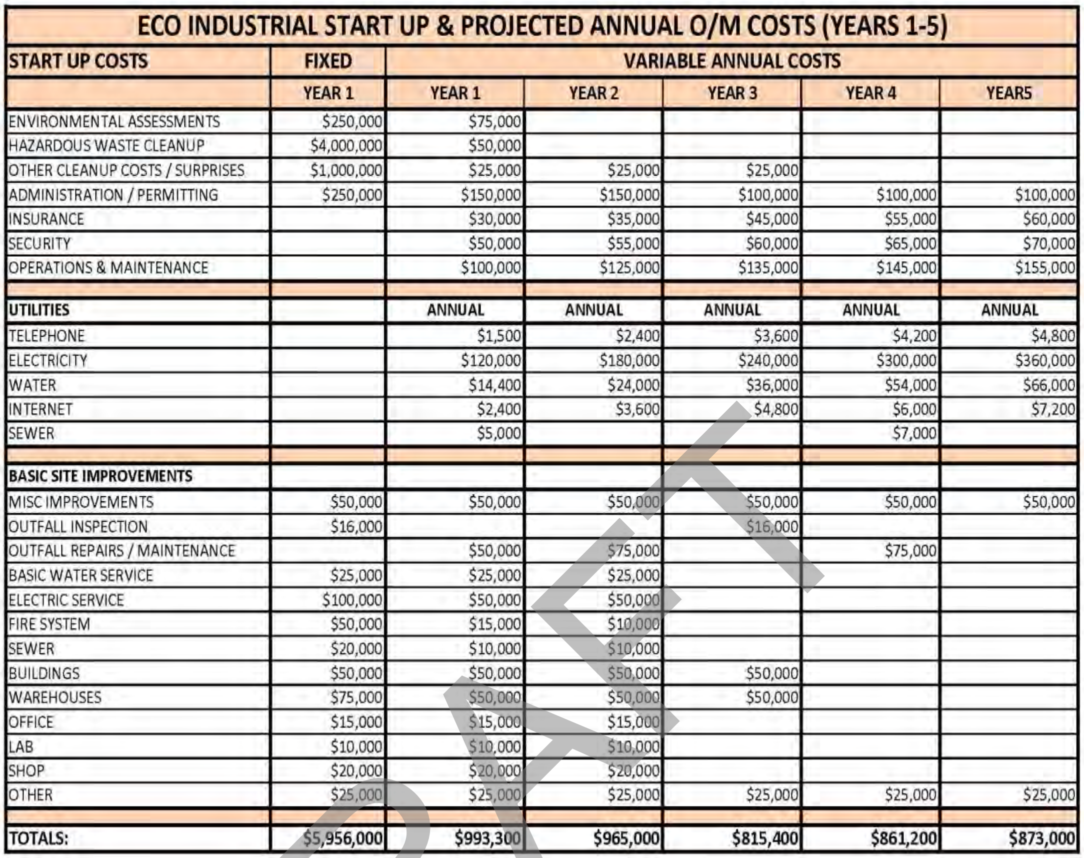

ECO INDUSTRIAL START UP & PROJECTED ANNUAL O/M COSTS (YEARS 1-5)						
START UP COSTS	**FIXED**	**VARIABLE ANNUAL COSTS**				
	YEAR 1	**YEAR 1**	**YEAR 2**	**YEAR 3**	**YEAR 4**	**YEAR5**
ENVIRONMENTAL ASSESSMENTS	$250,000	$75,000				
HAZARDOUS WASTE CLEANUP	$4,000,000	$50,000				
OTHER CLEANUP COSTS / SURPRISES	$1,000,000	$25,000	$25,000	$25,000		
ADMINISTRATION / PERMITTING	$250,000	$150,000	$150,000	$100,000	$100,000	$100,000
INSURANCE		$30,000	$35,000	$45,000	$55,000	$60,000
SECURITY		$50,000	$55,000	$60,000	$65,000	$70,000
OPERATIONS & MAINTENANCE		$100,000	$125,000	$135,000	$145,000	$155,000
UTILITIES		**ANNUAL**	**ANNUAL**	**ANNUAL**	**ANNUAL**	**ANNUAL**
TELEPHONE		$1,500	$2,400	$3,600	$4,200	$4,800
ELECTRICITY		$120,000	$180,000	$240,000	$300,000	$360,000
WATER		$14,400	$24,000	$36,000	$54,000	$66,000
INTERNET		$2,400	$3,600	$4,800	$6,000	$7,200
SEWER		$5,000			$7,000	
BASIC SITE IMPROVEMENTS						
MISC IMPROVEMENTS	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
OUTFALL INSPECTION	$16,000			$16,000		
OUTFALL REPAIRS / MAINTENANCE		$50,000	$75,000		$75,000	
BASIC WATER SERVICE	$25,000	$25,000	$25,000			
ELECTRIC SERVICE	$100,000	$50,000	$50,000			
FIRE SYSTEM	$50,000	$15,000	$10,000			
SEWER	$20,000	$10,000	$10,000			
BUILDINGS	$50,000	$50,000	$50,000	$50,000		
WAREHOUSES	$75,000	$50,000	$50,000	$50,000		
OFFICE	$15,000	$15,000	$15,000			
LAB	$10,000	$10,000	$10,000			
SHOP	$20,000	$20,000	$20,000			
OTHER	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
TOTALS:	**$5,956,000**	**$993,300**	**$965,000**	**$815,400**	**$861,200**	**$873,000**

Figure 17 - Projected Start Up and Annual O/M Costs

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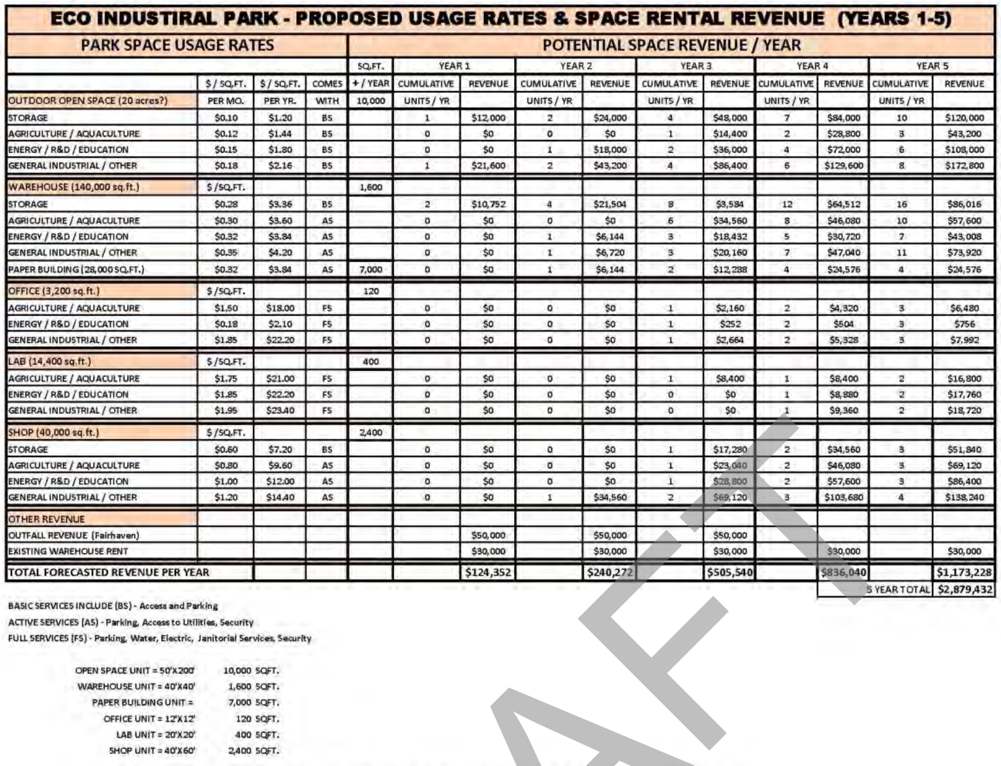

ECO INDUSTIRAL PARK - PROPOSED USAGE RATES & SPACE RENTAL REVENUE (YEARS 1-5)

PARK SPACE USAGE RATES				POTENTIAL SPACE REVENUE / YEAR										
				SQ.FT.	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
	$ / SQ.FT.	$ / SQ.FT.	COMES	+ / YEAR	CUMULATIVE	REVENUE	CUMULATIVE	REVENUE	CUMULATIVE	REVENUE	CUMULATIVE	REVENUE	CUMULATIVE	REVENUE
OUTDOOR OPEN SPACE (20 acres?)	PER MO.	PER YR.	WITH	10,000	UNITS / YR		UNITS / YR		UNITS / YR		UNITS / YR		UNITS / YR	
STORAGE	$0.10	$1.20	BS		1	$12,000	2	$24,000	4	$48,000	7	$84,000	10	$120,000
AGRICULTURE / AQUACULTURE	$0.12	$1.44	BS		0	$0	0	$0	1	$14,400	2	$28,800	3	$43,200
ENERGY / R&D / EDUCATION	$0.15	$1.80	BS		0	$0	1	$18,000	2	$36,000	4	$72,000	6	$108,000
GENERAL INDUSTRIAL / OTHER	$0.18	$2.16	BS		1	$21,600	2	$43,200	4	$86,400	6	$129,600	8	$172,800
WAREHOUSE (140,000 sq.ft.)	$ /SQ.FT.			1,600										
STORAGE	$0.28	$3.36	BS		2	$10,752	4	$21,504	8	$3,584	12	$64,512	16	$86,016
AGRICULTURE / AQUACULTURE	$0.30	$3.60	AS		0	$0	0	$0	6	$34,560	8	$46,080	10	$57,600
ENERGY / R&D / EDUCATION	$0.32	$3.84	AS		0	$0	1	$6,144	3	$18,432	5	$30,720	7	$43,008
GENERAL INDUSTRIAL / OTHER	$0.35	$4.20	AS		0	$0	1	$6,720	3	$20,160	7	$47,040	11	$73,920
PAPER BUILDING (28,000 SQ.FT.)	$0.32	$3.84	AS	7,000	0	$0	1	$6,144	2	$12,288	4	$24,576	4	$24,576
OFFICE (3,200 sq.ft.)	$ /SQ.FT.			120										
AGRICULTURE / AQUACULTURE	$1.50	$18.00	FS		0	$0	0	$0	1	$2,160	2	$4,320	3	$6,480
ENERGY / R&D / EDUCATION	$0.18	$2.10	FS		0	$0	0	$0	1	$252	2	$504	3	$756
GENERAL INDUSTRIAL / OTHER	$1.85	$22.20	FS		0	$0	0	$0	1	$2,664	2	$5,328	3	$7,992
LAB (14,400 sq.ft.)	$ /SQ.FT.			400										
AGRICULTURE / AQUACULTURE	$1.75	$21.00	FS		0	$0	0	$0	1	$8,400	1	$8,400	2	$16,800
ENERGY / R&D / EDUCATION	$1.85	$22.20	FS		0	$0	0	$0	0	$0	1	$8,880	2	$17,760
GENERAL INDUSTRIAL / OTHER	$1.95	$23.40	FS		0	$0	0	$0	0	$0	1	$9,360	2	$18,720
SHOP (40,000 sq.ft.)	$ /SQ.FT.			2,400										
STORAGE	$0.60	$7.20	BS		0	$0	0	$0	1	$17,280	2	$34,560	3	$51,840
AGRICULTURE / AQUACULTURE	$0.80	$9.60	AS		0	$0	0	$0	1	$23,040	2	$46,080	3	$69,120
ENERGY / R&D / EDUCATION	$1.00	$12.00	AS		0	$0	0	$0	1	$28,800	2	$57,600	3	$86,400
GENERAL INDUSTRIAL / OTHER	$1.20	$14.40	AS		0	$0	1	$34,560	2	$69,120	3	$103,680	4	$138,240
OTHER REVENUE														
OUTFALL REVENUE (Fairhaven)						$50,000		$50,000		$50,000				
EXISTING WAREHOUSE RENT						$30,000		$30,000		$30,000		$30,000		$30,000
TOTAL FORECASTED REVENUE PER YEAR						$124,352		$240,272		$505,540		$836,040		$1,173,228
													5 YEAR TOTAL	$2,879,432

BASIC SERVICES INCLUDE (BS) - Access and Parking

ACTIVE SERVICES (AS) - Parking, Access to Utilities, Security

FULL SERVICES (FS) - Parking, Water, Electric, Janitorial Services, Security

OPEN SPACE UNIT = 50'X200'	10,000 SQFT.
WAREHOUSE UNIT = 40'X40'	1,600 SQFT.
PAPER BUILDING UNIT =	7,000 SQFT.
OFFICE UNIT = 12'X12'	120 SQFT.
LAB UNIT = 20'X20'	400 SQFT.
SHOP UNIT = 40'X60'	2,400 SQFT.

Figure 18 – Projected Eco Industrial Park Revenue (Years 1-5)

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7 Conclusions

As the table in Figure 15 indicates, ATA estimates feels that the current worth of the property and assets upon it to be $32.2M. When the conservative value of the property is taken into consideration with the purchase price and the Harbor District's estimated cleanup and surprise costs ($5M), the purchase of the property appears to be "a good deal". When the potential economic development benefits and other opportunities for the Park are factored in and conservative revenue projections for the first five years (~$2.9M) are taken into consideration, the purchase of the property appears to be an "even better deal". So, why not proceed at full steam with purchasing the property? This decision appears to be a "no brainer"!

In ATA's opinion the missing pieces of the puzzle towards making a decision as to whether or not to purchase the property comes down to:

a. What the unknown additional environmental impacts (potential soil, groundwater contamination, additional hazardous materials) may be at the property.
b. What the unknown time and expenses will be to navigate through the regulatory and approval processes to repurpose the facility for the type of Eco Industrial Park that is being proposed in this analysis.
c. Where the source(s) of initial seed money and capital improvement funding will come from to get started quickly and to complete the necessary site repairs and improvements that will be necessary to market the Park to a diversity of potential clients.

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To solve the first piece of the puzzle, ATA recommends that a full site assessment and appraisal be made of the property. This process should include a general assessment of the current condition of all utilities, buildings, and structures. A Phase II Environmental Survey should be conducted if determined to be necessary to ascertain the condition of the soil and groundwater beneath the property. If time and funding allow, ATA recommends that a professional appraisal be made of the property and the assets being offered with the sale. Once these due diligence, assessment processes have been completed, the decision to purchase the property or not should be a much simpler process.

The second piece of the puzzle will be the most difficult to quantify and determine in ATA's opinion, especially considering the lack of knowledge that ATA has with the current regulatory and political processes in Humboldt County and the State of California. None the less and in order to make the Park all that it has the potential to be, it will be very important for every stake holder, agency and interest group involved in the approval process once the property has been purchased to understand the tremendous potential that the Eco Industrial Park can do to boost and diversity the economy of Humboldt County. ATA feels that the time is right for the development of this type of facility for the County, sees the potential risks of purchasing the property as being low compared to the opportunities that can be realized, and hopes that bureaucracy will not kill it.

When ATA first assessed the potential opportunities for an Aquaculture Innovation Center for the Samoa Peninsula in April 2012, it was told that it would take 8-10 years for a seawater intake and distribution system to be approved for land based mariculture. This news was very discouraging and felt to be unacceptable. ATA is not aware of any mariculture companies that have the financing and staying power to wait that long. A fast track process must be made to obtain all of the approvals necessary to establish the Park within a 3-5 year process.

ATA understands that the main concern is not with bringing seawater ashore, but where and how the mariculture effluent will be handled. Now that the focus is on the FWTC property rather than any of the other properties on the peninsula, the opportunity and potential to utilize the offshore outfall to discharge for a mixture of effluents away from Humboldt Bay, this matter of concern should be eased. The potential environmental impacts from effluent pumped to the ocean offshore from of any of the new industries and businesses being proposed for the Park can be planned and managed to be orders of magnitude less than anything that has historically ever been pumped out of the existing outfall. Emphasis in the Park should be on total waste management and low to no environmental impact.

To solve the third piece of the puzzle, ATA suggests that the initial seed money needed to get the facility up and running be financed mostly from the Headwaters Fund with matching sources of funding from other donors and public institutions. It is estimated that the initial funds needed to get the Park started on a basic level will be $6M. This should cover the costs operating the facility through the Harbor District; implementing the initial facility repairs and improvements and; cover preliminary expenses for obtaining the necessary permits and approvals. Ultimately and to bring the Park up to its full capabilities, ATA estimates that a capital investment of $15-20M over time will need to be committed. By the time this level of investment is made in the Park, it should be self-sustaining and perhaps even totally weaned off of the need for further CIP funding.

It is advisable to start small, with what you know will work to develop an immediate revenue stream to get the Park off the ground and when all of the pieces of the puzzle come together, expand the Park to fulfill all of the benefits and opportunities ATA feels can be achieved and realized. The property under consideration is not likely to be large enough to accommodate and fulfill all of the dreams and development opportunities that are possible at the Park. By the time the Eco Industrial Park faces this challenge, all of the stake holders should sitting back and proud of what they have accomplished for Humboldt County and the State of California.

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Appendices:

Appendix A: Figure 15 – Table of Current Property Values
Appendix B: Figure 16 – Table of Proposed Space Rental Rates
Appendix C: Figure 17 – Table of Projected Start Up & Annual O/M Costs

Appendix D: Figure 18 – Table of Projected Eco Park Revenue (Years 1-5)

Acknowledgements:

ATA is deeply indebted to Ted Kuiper, local shellfish expert for all of the time, guidance and information he has shared to produce this analysis. Thank you Ted…..

ATA would like to further acknowledge the following individuals and organizations for their input and support:

Jack Crider	(CEO - Humboldt Bay Harbor, Recreation & Conservation District)
Erika Blackwell	(President, Humboldt Abalone Company)
John Lund	(Consultant)

Humboldt County
Headwaters Fund
Humboldt Bay Harbor District staff
Humboldt Bay Municipal Water District
Humboldt State University

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Appendix A: Figure 15 – Table of Current Property Values

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72-ACRE FRESHWATER TISSUE COMPANY PROPERTY				
CURRENT PROPERTY VALUES				
ASSET	**UNIT**	**# UNITS**	**UNIT VALUE**	**CURRENT VALUE**
62 ACRES OF GRADED LAND	ACRE	62	$50,000	$3,100,000
10 ACRES - SAND DUNES	ACRE	10	$10,000	$100,000
OUTFALL	FEET	7,900	$750	$5,925,000
OUTFALL PLUMBING ON LAND	UNIT	1	$350,000	$350,000
WAREHOUSE 1 & 2	SQ. FT.	140,000	$100	$14,000,000
PAPER MACHINE BLDG	SQ. FT.	28,000	$50	$1,400,000
FILTRATION SYSTEM	UNIT	1	$100,000	$100,000
42 MW POWR PLANT	UNIT	1	$4,500,000	$4,500,000
OFFICE / LAB BUILDING	SQ. FT.	17,600	$150	$2,640,000
SHOP AREA	SQ. FT.	40,000	$75	$3,000,000
MISC TANKS	UNIT	1	$75,000	$75,000
MISC INSTALLED EQUIPMENT	UNIT	1	$150,000	$150,000
STORM DRAIN SYSTEM	UNIT	1	$85,000	$85,000
WATER TOWER	UNIT	1	$65,000	$65,000
MISC PIPING	UNIT	1	$35,000	$35,000
PAVING (SQFT)	SQ. FT.	190,000	$0.25	$47,500
FENCING (FT)	FEET	4,500	$15	$67,500
DOMESTIC WATER SYSTEM	UNIT	1	$150,000	$150,000
FIRE SYSTEM	UNIT	1	$75,000	$75,000
ELECTRIC SYSTEM (w/substation)	UNIT	1	$750,000	$750,000
TELEPHONE SYSTEM	UNIT	1	$35,000	$35,000
SEWER SYSTEM	UNIT	1	$45,000	$45,000
TOTAL PROPERTY VALUE				$36,695,000
TOTAL VALUE W/O POWER PLANT				**$32,195,000**

Appendix B: Figure 16 – Table of Proposed Space Rental Rates

ECO INDUSTRIAL PARK

PROPOSED SPACE RENTAL RATES

OUTDOOR OPEN SPACE (20 acres?)	**$/SQ.FT./MO**	**$/SQ.FT./YR**	**$/ACRE/MO**	**$/ACRE/YR**	**INCLUDES**
STORAGE	$0.10	$1.20	$4,356.00	$52,272.00	BS
AGRICULTURE / AQUACULTURE	$0.12	$1.44	$5,227.20	$62,726.40	BS
ENERGY / R&D / EDUCATION	$0.15	$1.80	$6,534.00	$78,408.00	BS
GENERAL INDUSTRIAL / OTHER	$0.18	$2.16	$7,840.80	$94,089.60	BS
WAREHOUSE (140,000 sq.ft.)	$ /SQ.FT.				
STORAGE	$0.28	$3.36	$12,196.80	$146,361.60	BS
AGRICULTURE / AQUACULTURE	$0.30	$3.60	$13,068.00	$156,816.00	AS
ENERGY / R&D / EDUCATION	$0.32	$3.84	$13,939.20	$167,270.40	AS
GENERAL INDUSTRIAL / OTHER	$0.35	$4.20	$15,246.00	$182,952.00	AS
PAPER BUILDING (28,000 SQ.FT.)	$0.32	$3.84	$13,939.20	$167,270.40	AS
OFFICE (3,200 sq.ft.)	$ /SQ.FT.		RENT/MO		
AGRICULTURE / AQUACULTURE	$1.50	$18.00	$4,800.00		FS
ENERGY / R&D / EDUCATION	$1.75	$21.00	$5,600.00		FS
GENERAL INDUSTRIAL / OTHER	$1.85	$22.20	$5,920.00		FS
LAB (14,400 sq.ft.)	$ /SQ.FT.				
AGRICULTURE / AQUACULTURE	$1.75	$21.00	$25,200.00		FS
ENERGY / R&D / EDUCATION	$1.85	$22.20	$26,640.00		FS
GENERAL INDUSTRIAL / OTHER	$1.95	$23.40	$28,080.00		FS
SHOP (40,000 sq.ft.)	$ /SQ.FT.				
STORAGE	$0.60	$7.20	$26,136.00		BS
AGRICULTURE / AQUACULTURE	$0.80	$9.60	$34,848.00		AS
ENERGY / R&D / EDUCATION	$1.00	$12.00	$43,560.00		AS
GENERAL INDUSTRIAL / OTHER	$1.50	$18.00	$65,340.00		AS

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BASIC SERVICES - Parking, Security

ACTIVE SERVICES - Parking, Utility Access, Security

FULL SERVICES - Parking, Water, Electric, Janitorial Services, Security

OPEN SPACE UNIT = 50'X200'	**10,000**	**SQFT.**
WAREHOUSE UNIT = 40'X40'	**1,600**	**SQFT.**
PAPER BUILDING UNIT =	**7,000**	**SQFT.**
OFFICE UNIT = 12'X12'	**120**	**SQFT.**
LAB UNIT = 20'X20'	**400**	**SQFT.**
SHOP UNIT = 40'X60'	**2,400**	**SQFT.**

Appendix C: Figure 17 – Table of Projected Start Up & Annual O/M Costs

ECO INDUSTRIAL START UP & PROJECTED ANNUAL O/M COSTS (YEARS 1-5)						
START UP COSTS	**FIXED**	**VARIABLE ANNUAL COSTS**				
	YEAR 1	**YEAR 1**	**YEAR 2**	**YEAR 3**	**YEAR 4**	**YEAR 5**
ENVIRONMENTAL ASSESSMENTS	$250,000	$75,000				
HAZARDOUS WASTE CLEANUP	$4,000,000	$50,000				
OTHER CLEANUP COSTS / SURPRISES	$1,000,000	$25,000	$25,000	$25,000		
ADMINISTRATION / PERMITTING	$250,000	$150,000	$150,000	$100,000	$100,000	$100,000
INSURANCE		$30,000	$35,000	$45,000	$55,000	$60,000
SECURITY		$50,000	$55,000	$60,000	$65,000	$70,000
OPERATIONS & MAINTENANCE		$100,000	$125,000	$135,000	$145,000	$155,000
UTILITIES		**ANNUAL**	**ANNUAL**	**ANNUAL**	**ANNUAL**	**ANNUAL**
TELEPHONE		$1,500	$2,400	$3,600	$4,200	$4,800
ELECTRICITY		$120,000	$180,000	$240,000	$300,000	$360,000
WATER		$14,400	$24,000	$36,000	$54,000	$66,000
INTERNET		$2,400	$3,600	$4,800	$6,000	$7,200
SEWER		$5,000			$7,000	
BASIC SITE IMPROVEMENTS						
MISC IMPROVEMENTS	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
OUTFALL INSPECTION	$16,000			$16,000		
OUTFALL REPAIRS / MAINTENANCE		$50,000	$75,000		$75,000	
BASIC WATER SERVICE	$25,000	$25,000	$25,000			
ELECTRIC SERVICE	$100,000	$50,000	$50,000			
FIRE SYSTEM	$50,000	$15,000	$10,000			
SEWER	$20,000	$10,000	$10,000			
BUILDINGS	$50,000	$50,000	$50,000	$50,000		
WAREHOUSES	$75,000	$50,000	$50,000	$50,000		
OFFICE	$15,000	$15,000	$15,000			
LAB	$10,000	$10,000	$10,000			
SHOP	$20,000	$20,000	$20,000			
OTHER	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
TOTALS:	**$5,956,000**	**$993,300**	**$965,000**	**$815,400**	**$861,200**	**$873,000**

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Figure 18 – Projected Eco Industrial Park Revenue (Years 1-5)

ECO INDUSTIRAL PARK - PROPOSED USAGE RATES & SPACE RENTAL REVENUE (YEARS 1-5)

PARK SPACE USAGE RATES | **POTENTIAL SPACE REVENUE / YEAR**

				SQ.FT.	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
	$ / SQ.FT.	$ / SQ.FT.	COMES	+ / YEAR	CUMULATIVE	REVENUE	CUMULATIVE	REVENUE	CUMULATIVE	REVENUE	CUMULATIVE	REVENUE	CUMULATIVE	REVENUE
OUTDOOR OPEN SPACE (20 acres?)	PER MO.	PER YR.	WITH	10,000	UNITS / YR		UNITS / YR		UNITS / YR		UNITS / YR		UNITS / YR	
STORAGE	$0.10	$1.20	BS		1	$12,000	2	$24,000	4	$48,000	7	$84,000	10	$120,000
AGRICULTURE / AQUACULTURE	$0.12	$1.44	BS		0	$0	0	$0	1	$14,400	2	$28,800	3	$43,200
ENERGY / R&D / EDUCATION	$0.15	$1.80	BS		0	$0	1	$18,000	2	$36,000	4	$72,000	6	$108,000
GENERAL INDUSTRIAL / OTHER	$0.18	$2.16	BS		1	$21,600	2	$43,200	4	$86,400	6	$129,600	8	$172,800
WAREHOUSE (140,000 sq.ft.)	$ /SQ.FT.			1,600										
STORAGE	$0.28	$3.36	BS		2	$10,752	4	$21,504	8	$3,584	12	$64,512	16	$86,016
AGRICULTURE / AQUACULTURE	$0.30	$3.60	AS		0	$0	0	$0	6	$34,560	8	$46,080	10	$57,600
ENERGY / R&D / EDUCATION	$0.32	$3.84	AS		0	$0	1	$6,144	3	$18,432	5	$30,720	7	$43,008
GENERAL INDUSTRIAL / OTHER	$0.35	$4.20	AS		0	$0	1	$6,720	3	$20,160	7	$47,040	11	$73,920
PAPER BUILDING (28,000 SQ.FT.)	$0.32	$3.84	AS	7,000	0	$0	1	$6,144	2	$12,288	4	$24,576	4	$24,576
OFFICE (3,200 sq.ft.)	$ /SQ.FT.			120										
AGRICULTURE / AQUACULTURE	$1.50	$18.00	FS		0	$0	0	$0	1	$2,160	2	$4,320	3	$6,480
ENERGY / R&D / EDUCATION	$0.18	$2.10	FS		0	$0	0	$0	1	$252	2	$504	3	$756
GENERAL INDUSTRIAL / OTHER	$1.85	$22.20	FS		0	$0	0	$0	1	$2,664	2	$5,328	3	$7,992
LAB (14,400 sq.ft.)	$ /SQ.FT.			400										
AGRICULTURE / AQUACULTURE	$1.75	$21.00	FS		0	$0	0	$0	1	$8,400	1	$8,400	2	$16,800
ENERGY / R&D / EDUCATION	$1.85	$22.20	FS		0	$0	0	$0	0	$0	1	$8,880	2	$17,760
GENERAL INDUSTRIAL / OTHER	$1.95	$23.40	FS		0	$0	0	$0	0	$0	1	$9,360	2	$18,720
SHOP (40,000 sq.ft.)	$ /SQ.FT.			2,400										
STORAGE	$0.60	$7.20	BS		0	$0	0	$0	1	$17,280	2	$34,560	3	$51,840
AGRICULTURE / AQUACULTURE	$0.80	$9.60	AS		0	$0	0	$0	1	$23,040	2	$46,080	3	$69,120
ENERGY / R&D / EDUCATION	$1.00	$12.00	AS		0	$0	0	$0	1	$28,800	2	$57,600	3	$86,400
GENERAL INDUSTRIAL / OTHER	$1.20	$14.40	AS		0	$0	1	$34,560	2	$69,120	3	$103,680	4	$138,240
OTHER REVENUE														
OUTFALL REVENUE (Fairhaven)						$50,000		$50,000		$50,000				
EXISTING WAREHOUSE RENT						$30,000		$30,000		$30,000		$30,000		$30,000
TOTAL FORECASTED REVENUE PER YEAR						**$124,352**		**$240,272**		**$505,540**		**$836,040**		**$1,173,228**
													5 YEAR TOTAL	**$2,879,432**

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OPEN SPACE UNIT = 50'X200'	10,000 SQFT.
WAREHOUSE UNIT = 40'X40'	1,600 SQFT.
PAPER BUILDING UNIT =	7,000 SQFT.
OFFICE UNIT = 12'X12'	120 SQFT.
LAB UNIT = 20'X20'	400 SQFT.
SHOP UNIT = 40'X60'	2,400 SQFT.

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Ocean Outfall and Diffuser Inspection

MM DIVING Inc.
UNDERWATER CONSTRUCTION
CA. Class A-General Engineering License # 817400
325 Sleepy Hollow Road
Crescent City, CA95531
Telephone: (707) 465-0909
Fax: (707) 464-5200

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Humboldt Bay Harbor District, Samoa Outfall 2016 Report

9/13/16: Fire One was loaded with diving equipment and made dive ready.

9/14/16: Divers located Section One and the inshore diffusers. Diver reported sediment was above the diffuser ports and effluent discharge could not be detected. Divers removed four diffuser plates and utilized an internal jet powered with Fire One’s pump to clear the pipe of sediment, sand, shell and sand dollars from adjacent open diffuser ports. The internal jet was continually manipulated and relocated from diffuser ports 1 to 2 to 3 to 4 and back to #1. Slight flow was detected at #1 at the end of the work day.

9/15/16: First diver detected flow at diffuser number one and continued internal jetting of diffusers 1, 2, 3 and 4. Second diver reinstalled the four diffuser plates and verified flow. Third diver headed inshore on Section One from the diffuser ports and attached one zinc anode on three anode bracelets where the zinc was depleted and the internal bar was exposed. Diver continued to Joint #4 and attached three zincs to two steel makeups of Joint #4 four flange makeups. The dive then continued inshore another 200-300 feet until out of bottom time. No damage or missing zinc was noted on the 200-300 feet of Section 2 inspected. Fire One then returned to port and was unloaded.

Summary

The outfall was left in good working order with confirmed flow, zinc anodes were attached at five locations. Divers observed the pipe breathing in and out with swell surge and sediment is expected to continually fill the cleared diffusers due to the low flow rate. Maintaining head pressure is of high priority to keep the pipe flowing.
Annual clearing of the inshore diffusers is highly recommended and the use of an internal (traveling) jet to clear sediment “inshore” of the diffusers should be considered next year as well as continually adding zinc anodes to joints, depleted anodes and any exposed unprotected steel.
Please do not hesitate to contact me with any questions or if I may be of further assistance.

Victor Markytan
President
MM Diving Inc.
Cellular (707) 954-0623

Figure 1 Exposed rebar in external concrete coating.

Figure 2 Assembling diffuser port after internal jetting.

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Figure 3 Anode bar exposed from depleted zinc bracelet anode.

Screenshot saved
The screenshot was added to your OneDrive.

Figure 4 Zinc anode attached with C-clamp to depleted ankle bracelet quadrant

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Figure 5 Diver Decompression Chamber


Figure 6 Diver exiting water

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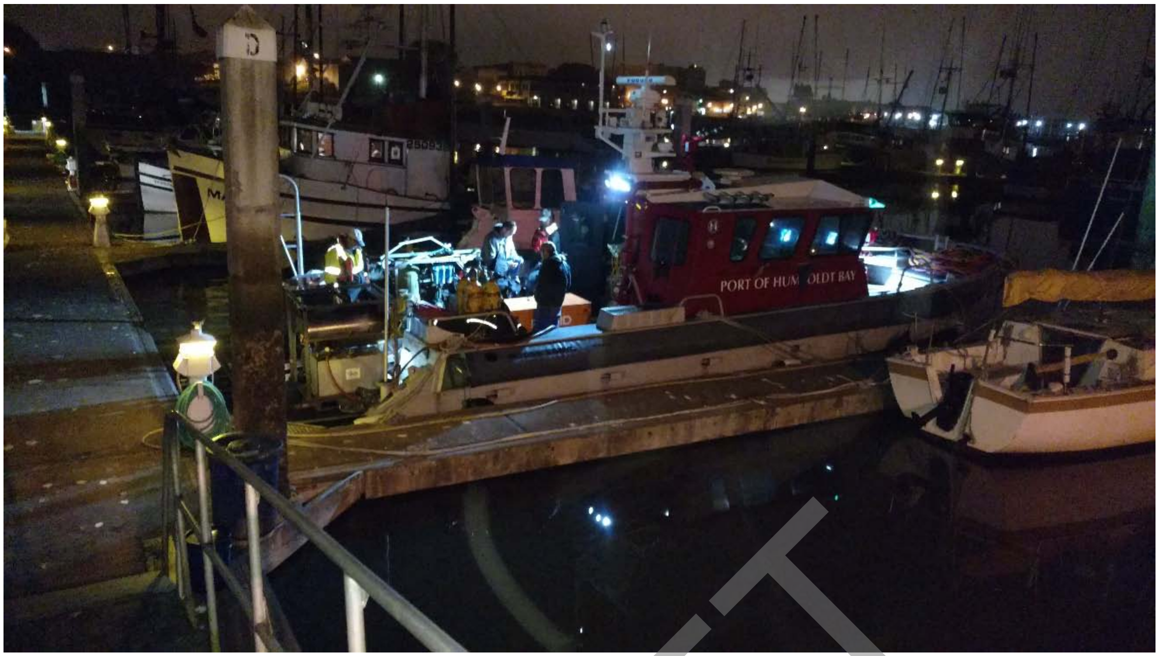

Figure 7 Fire1 0600 hrs

Figure 8 Flange deterioration (previous inspection)

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FDA-Approved Aquaculture Drugs

Approved Aquaculture Drugs

Return to Aquaculture page (/AnimalVeterinary/DevelopmentApprovalProcess/Aquaculture/default.htm)

Immersion

Chloramine-T

HALAMID® Aqua - NADA 141-423 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM408897.pdf) | | EA (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM409357.pdf) | | FONSI (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM409358.pdf) |

Formalin

Formalin-F™ - NADA 137-687 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM069881.pdf) |

Formacide-B - ANADA 200-414 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM243045.pdf) |

Parasite-S® - NADA 140-989 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM054898.pdf) | | EA (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM072318.pdf) | | FONSI (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM072320.pdf) |

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Hydrogen peroxide

35% PEROX-AID® - NADA 141-255 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM051418.pdf) | | EA (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM072399.pdf) | | FONSI (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM072398.pdf) |

Oxytetracycline hydrochloride

Oxymarine™ – NADA 130-435 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM132976.pdf) |

Oxytetracycline HCI Soluble Powder-343-ANADA 200-247 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM061679.pdf) |

PENNOX 343 - ANADA 200-026 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM252253.pdf) |

TERRAMYCIN 343 (oxytetracycline HCI) Soluble Powder – NADA 008-622 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM049519.pdf) |

TETROXY Aquatic - ANADA 200-460 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM061380.pdf) |

Tricaine methanesulfonate

Tricaine-S – ANADA 200-226 | FOI Summary (/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/ucm132992.htm) |

Injectable

Chorionic gonadotropin

Chorulon® - NADA 140-927 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM115909.pdf) |

Medicated Articles/Feeds

Florfenicol

Aquaflor® - NADA 141-246 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM051491.pdf) | | EA (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM072391.pdf) | | FONSI (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM072391.pdf) |
Original approval, enteric septicemia of catfish

Aquaflor® - NADA 141-246 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM051490.pdf) | | EA (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/Aquaculture/UCM143596.pdf) | | EA Appendices Index

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(/downloads/AnimalVeterinary/DevelopmentApprovalProcess/Aquaculture/UCM143598.pdf) | | FONSI (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/Aquaculture/UCM143599.pdf) |
Supplemental approval, coldwater disease in salmonids

Aquaflor® - NADA 141-246 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM051489.pdf) |
Supplemental approval, furunculosis in freshwater-reared salmonids

Aquaflor® – NADA 141-246 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM299146.pdf) | | EA (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM299435.pdf) | | FONSI (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM299438.pdf) |
Supplemental approval, streptococcal septicemia in freshwater-reared warmwater finfish; columnaris disease in freshwater-reared finfish; and increase the dose for enteric septicemia for catfish

Aquaflor® – NADA 141-246 | FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM396884.pdf) | | EA (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM397019.pdf)| | FONSI (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM397020.pdf) |
Supplemental approval to provide for an increase in the maximum daily dose for freshwater-reared finfish other than freshwater-reared warmwater finfish to provide a dosage range of 10-15 mg/kg body weight/day and to change the conditions of use to permit the use of florfenicol in recirculating aquaculture systems

Oxytetracycline dihydrate

Terramycin® 200 for Fish - NADA 038-439 | Supplemental FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM049542.pdf) (2006)| |Supplemental FOI Summary (/downloads/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/FOIADrugSummaries/UCM143044.pdf) (2008)| | EA (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM303588.pdf) | | FONSI (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM303589.pdf) |

Sulfadimethoxine/ormetoprim

Romet-30® - NADA 125-933 - original approval 1984 | EA (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM072083.pdf) | |FONSI (/downloads/AnimalVeterinary/DevelopmentApprovalProcess/EnvironmentalAssessments/UCM072084.pdf) |

Sulfamerazine - NADA 033-950- original approval 1967 - not currently marketed

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B

RMT II Samoa Effluent Pipeline Preliminary Planning Overview

SHN CONSULTING ENGINEERS & GEOLOGISTS, INC.
1062 G Street, Suite I • Arcata, CA 95521 • 707/822-5785 • FAX: 707/822-5786 •shninfo@shn-engr.com

Technical Memorandum

Reference: 015147 100
Date: **March 31, 2017**
To: **Mike Foget** MF
From: **Trever Parker**
Subject: **RMT II Samoa Effluent Pipeline Preliminary Planning Overview**

SHN completed a preliminary review of the proposed Redwood Marine Terminal II (RMT II) Samoa Effluent Pipeline that would connect the future Samoa wastewater treatment facility (WWTF) to the ocean outfall of RMT II (previously Samoa Pulp Mill). Our review was conducted from a planning and permitting perspective, and focused on the basic purpose and scope of the project, background and related developments, site reconnaissance and special studies, and future California Environmental Quality Act (CEQA) and permitting considerations. There are a number of large development and planning projects in various stages currently occurring on the Samoa Peninsula. This technical memorandum provides the status of some of the relevant projects, and discusses how they affect or apply to this pipeline. This should be helpful for understanding the current situation and for taking the next steps toward bringing this project to fruition if and when that occurs.

Project Overview

Description

Effluent from the proposed Samoa WWTF would be routed to the connection point with RMT II ocean outfall at Manhole #5 by approximately 3,500 feet of 4-inch diameter line (Attachment 1). A pump station consisting of a manhole/wet well with duplex pumps capable of pumping approximately 150 gallons per minute (gpm) would also be required. The proposed effluent line would be routed along the new alignment of Vance Road within the Samoa Town Master Plan (STMP) area (the northern approximately 1,500 feet of the pipe). The remainder of the pipe would be routed along the existing Vance Road, adjacent to a railroad right-of-way (Attachment 2).

Wastewater Flows

The town of Samoa is currently served by two disposal systems. The eastern system serves approximately 75 homes, the downtown retail area, and the Samoa Cookhouse, and has an average dry weather flow of 17,000 gallons per day (gpd), and an average wet weather flow of 32,000 gpd. The western system serves approximately 25 homes and has an average flow of 7,500 gpd. Following implementation of Phase 1 and Phase 2 of the STMP development, average influent flows are anticipated to be 61,000 gpd, with peak flows of approximately 131,000 gpd (SHN, 2016). After buildout of Phase 3 of the STMP, flows are expected to be 161,927 gpd (Humboldt County, 2007). The effluent would be generated by a mix of residential, commercial, and public/recreational uses.

Purpose

In 2013, the Humboldt Bay Harbor, Recreation, and Conservation District (HBHRCD) purchased the Samoa Pulp Mill, now referred to as RMT II. The HBHRCD has been analyzing the potential to reuse the existing wastewater and other industrial infrastructure located at RMT II site. Reuse of the existing infrastructure at RMT II can benefit communities on the Samoa Peninsula and Humboldt Bay through economic development and environmental health. Reuse of existing facilities limits the need for and costs of developing new facilities, and it provides a source of revenue for the HBHRCD. Disposal of treated effluent through the ocean outfall would also limit impacts to groundwater from existing and proposed onsite disposal activities.

In addition, the pipeline connection could help further the development of Phase 2 and Phase 3 of the STMP. The STMP envisions phased redevelopment of the historic Samoa company town to create a vibrant, mixed-use community. A master environmental impact report (MEIR) prepared for the STMP determined that enough land area had been provided to accommodate wastewater treatment for all 3 phases of proposed development. However, stringent agency requirements for land disposal may instead result in disposal through the ocean outfall for Phases 2 and 3, as a more economical option for the WWTF.

Existing Environment and Conditions

The project is located in Samoa, California, an unincorporated community within Humboldt County; United States Geological Survey [USGS] Eureka 7.5-minute Quadrangle, Township 5 North, Range 1 west, Sections 15, 16, and 17, Humboldt Meridian). The project area is located across 10 adjacent parcels; (Assessor's parcel numbers [APN] 401-031-039, -061, -067, -069, -070, -071, -072 and 401-112-021, -029, -030). However, the area of potential effects surrounding the proposed pipeline alignment is a more limited area. The area of potential effects (APE) includes a 100-foot wide linear path surrounding the proposed pipeline alignment, as well as 2 widened areas at each end of the pipe for staging (Attachment 2). The proposed pipeline has an approximate length of 3,500 feet with an APE of approximately 23 acres. The majority of the project occurs within the Vance Avenue and railroad rights-of-way. The 23-acre APE has a central location at latitude and longitude 40.811009° and -124.195243° (County of Humboldt GIS and Assessor data, 2017). The APE occurs approximately 250 feet east of New Navy Base Road at its nearest point, approximately 1,130 feet west of Humboldt Bay at its nearest point, and 1 air mile west of the City of Eureka.

The study area is situated at an approximate 15 to 32-foot elevation above mean sea level. The study area has been used for industrial purposes since the 1960s. Several lumber mills previously operated on the northern portion of the site, but have closed at different times within the last 20 years. These facilities have mostly been demolished leaving vacant industrial land. The southern portion of the project area has been the location of a pulp mill from the 1960s until 2008 when it closed. The area still contains structures from the shuttered mill; however, the majority of the site is composed of broad stretches of vacant asphalt with some small scale industrial use continuing on site. The western portion of the project area passes by an industrial recycling facility that will be skirted by the proposed effluent pipeline. Currently, the majority of the project area is covered in old asphalt, broken up concrete, compacted gravel, former log decks, and railroad infrastructure. Small areas of semi-natural dune habitat occur between the vacant industrial lands in areas that were used as drainages, or along property lines. The area is characterized by a mix of disturbance adapted, primarily non-native herbaceous species, along with shrub dominated regions. Areas with more native vegetation indicate a longer period since it was last disturbed. Vegetation encroachment has been limited within areas of concrete, asphalt, and compacted gravel. The entire project area has been manipulated at some point in the past, and continues to be manipulated as is evidenced by ongoing vegetation maintenance, equipment movement and some continued industrial use.

Samoa Wastewater

The only central sewer treatment system on the Samoa Peninsula is within the town of Samoa (Attachment 3) (Note that the map has the eastern and western systems mislabeled.) Two separate systems serve the existing houses. One system provides sewer collection, transport, treatment, and disposal to the majority of the houses and buildings located in the existing town. The second system provides sewer collection, transport, treatment, and disposal to approximately 25 homes and the Women's Club located along Sunset Avenue. Currently, the Samoa Pacific Group (SPG) owns, operates, and maintains both of the existing wastewater systems, which includes 3 large holding tanks, conveyance piping, pumping, a large holding reservoir/pond, and disposal percolation basin. As with the water system, future subdivision and development of the town of Samoa is planned. It is anticipated that a proposed community services district (CSD; see below) will acquire the new infrastructure as the various phases are completed. The new CSD would be responsible for ownership, operation, and maintenance of the wastewater collection, treatment, and disposal services as phased improvements are acquired (SHN, 2017a). As stated in Draft 3 of the MEIR,

> *Samoa is presently served by two existing wastewater collection, treatment, and disposal systems, which have been in operation for many decades. These systems currently serve a total of 99 single-family homes, a fire station, and the Samoa Cookhouse. They are referred to as the eastern and western systems and are described below. Community wastewater treatment systems, such as the Town of Samoa's system, are generally required to have wastewater treatment and disposal permits issued by State agencies. The existing wastewater treatment system is in need of an upgrade in order to meet current standards for treatment and disposal.*
>
> *The plan area's western wastewater system is presently governed by Waste Discharge Requirements Order No. 85-40, adopted by the North Coast Regional Water Quality Control Board (NCRWQCB) on March 27, 1985. The discharge of all wastewater from the western system shall be kept underground at all times. The eastern system is not regulated by a NCRWQCB order. However, a Draft Waste Discharge Requirements Order was proposed by the NCRWQCB for the eastern wastewater system. The NCRWQCB's Draft Waste Discharge Requirements Order also contains wastewater effluent limitations for the plan area's eastern wastewater treatment system* (Humboldt County, 2007).

Connected Actions and Facilities

Proposed Samoa WWTF

A WWTF is proposed to replace the two existing onsite wastewater treatment systems serving the town of Samoa, and to treat the additional wastewater from build-out of the STMP (Phases 1-3). The WWTF will be constructed in phases along with development under the STMP. Currently, the WWTF site and existing infrastructure is owned by SPG, which is the entity that developed the STMP. However, the plan includes the eventual formation of a CSD that will oversee the wastewater infrastructure in the future (see next section for more information).

The WWTF will be located on the recently created APN 401-031-069, which is zoned PF–Public Facility and was designed to accommodate this WWTF, as well as other facilities needed by the future Peninsula CSD, including a corporation yard and water storage tanks. Humboldt County is currently processing the various permits necessary for construction of Phase 1 of the STMP, including: the initial phase of the WWTF, reconstruction and realignment of Vance Avenue, 80 affordable housing units, and water storage tanks for fire suppression. The permits include a Coastal Development Permit (CDP), Conditional Use Permit (CUP), Special Permit (SP), and Planned Development Permit (PDP), Case Nos: CDP-16-064, CUP-16-209, PDP-17-01, and SP-17-008. Construction is expected to start in 2018. Additional permits will be necessary to expand the WWTF to accommodate future phases of the STMP. (Humboldt County, 2017)

The proposed Samoa WWTF is also subject to permit requirements under Draft Waste Discharge Requirements (WDR) Order No. R1-2014-0031. The standards included in the Draft WDR Order are stricter than what would be necessary to discharge the treated wastewater to the ocean outfall. Therefore, it may be more economical for the Samoa WWTF to connect to RMT II Ocean Outfall than to permit additional land disposal for future phases of STMP development.

Peninsula CSD

The Samoa Peninsula Fire Protection District (SPFPD) has applied to the Humboldt Local Agency Formation Commission (LAFCo) to form the Peninsula CSD to manage and operate new and existing water, wastewater, fire, parks, roads, stormwater, lighting and tsunami response facilities and infrastructure (Attachment 4). That process is currently ongoing with the initial review occurring at the March 15, 2017, LAFCo meeting. Final approval is anticipated for a November 7, 2017 Consolidated District Election (LAFCo, 2017). Once approved and constructed, the Peninsula CSD would take over ownership and responsibility for the Samoa WWTF.

RMT II Ocean Outfall

RMT II is the site of the Former Louisiana Pacific Pulp Mill located at 1 TCF Drive, Samoa, California. The site is a 72-acre parcel (APN 401-112-021) acquired by the HBHRCD in 2013. The existing ocean outfall serving RMT II is an approximately 1.5-mile long, 48-inch diameter steel pipe and anchoring system with a 32-inch diameter high density polyethylene (HDPE) sleeve and 800-foot long diffuser system at the ocean floor with 144 diffuser ports.

The capacity of the outfall is defined by pipe diameter, number of available diffuser ports, and port diameter. Available dilution capacity is controlled by effluent flow rate and density. Detailed modeling was performed by CH2M to assess dilution performance based on varying effluent flow, salinity, and temperature. Key findings include (SHN, 2016):

- Hydraulic assessment indicates the outfall can discharge up to 40 million gallons per day (MGD) based on 144, 2.4-inch ports. However, effluent with higher salinity content would reduce dilution.
- Dilution decreases with increase in flow, but target dilution of greater than 100:1 was easily achieved for flows up to 40 MGD for all conditions evaluated with the exception of effluent salinity of 30 practical salinity units (psu).
- Dilution increases with increased effluent temperature. Effluent temperatures approximating receiving water temperatures provided significantly lower dilution than temperatures above that of the receiving water when salinities were greater than 10 psu.
- Dilution decreases with increased salinity. The target dilution of 100:1 may not be met when effluent salinity is greater than 30 psu.

Historically, all industrial process water produced onsite of RMT II discharged to the outfall through Manhole No. 5 (MH-5), which in turn discharges into the ocean outfall. The effluent pumps at MH-5 consist of two 350-horsepower (hp) sump pumps. Wastewater discharged through RMT II ocean outfall would be subject to the Ocean Plan, and would be required to meet EPA secondary effluent standards (SHN, 2016).

CEQA Compliance & Permitting

Tiering from Samoa Town Master Plan MEIR

The northern approximately 1,500 feet of the project area, including the realignment of Vance Avenue, is part of the Samoa Town Master Plan. The County prepared, circulated, and adopted a series of environmental documents for the STMP including:

- Draft Master Environmental Impact Report (MEIR)—which also incorporated the County's Redevelopment Plan Draft Program EIR—and Appendices (January 2006)
- Final MEIR (April 2006)
- Recirculation Draft 1 MEIR (May 2006)
- Recirculation Draft 2 MEIR (March 2007)
- Recirculation Draft 3 MEIR & Appendices (October 2007)
- Final MEIR (February 2008)
- Draft Addendum to the MEIR (June 2014)
- Final Addendum to the MEIR (February 2015)

The MEIR was certified by the Humboldt County Board of Supervisors for use for redevelopment in 2009; it was certified CEQA-compliant in July 2012.

As described above, the STMP was analyzed in a Master EIR. An MEIR allows for tiering under CEQA, whereby general matters and issues like cumulative impacts for a large, phased project or plan are analyzed in a "first tier" EIR, such as, an MEIR. Subsequent projects that are consistent with and included within the scope of the MEIR can use a streamlined CEQA process. The Samoa WWTF is an example of a project within the scope of the STMP MEIR. However, RMT II ocean outfall and piping connecting to the WWTF is not within the scope of the MEIR, except to the extent that the northern portion of the pipe is within the physical area covered by the MEIR. Therefore the MEIR could possibly be used to support a portion of the analysis.

Connected Actions

CEQA does not allow piecemealing; in other words, a project can not be broken up into smaller pieces in order to make the impacts appear less. Although the Samoa WWTF is a necessary component of the proposed pipeline to connect to the ocean outfall, as a project it can stand on its own without the pipeline. The WWTF is currently being permitted to dispose of wastewater through an onsite leachfield. Therefore, the pipe is not necessary for the WWTF, and can be analyzed as a separate project.

However, the pipe itself is not a viable project without the WWTF and the ocean outfall. It is recommended that the pipe be permitted and analyzed under CEQA along with any necessary permits and analysis for the ocean outfall. The most likely final CEQA document for this project would be a negative declaration or mitigated negative declaration. However, depending on the final design and scope of the project, it may be possible that the pipeline would fall under a CEQA Categorical Exemption, such as, §15301 of the CEQA Guidelines allowing minor alterations to existing facilities, or §15304 exempting minor alterations to land. Another option may be to analyze the project under an addendum to the existing MEIR that would expand the project area to include the pipeline. Additional project detail and agency coordination will be needed to determine the appropriate CEQA process.

Permits

A more detailed project description, including construction methods, is necessary before the permitting process can begin. It is assumed that the pipeline will be installed using traditional trenching methods. But information is needed regarding the quantity of material that will be removed, where excess material will be disposed of, what material will be imported to line the trench, how material will be stored, how the site will be regraded, etc. At a minimum, a CDP from the County will be required to construct the effluent pipeline. However, as stated above, permitting for the pipeline should be included as part of any associated permits for the outfall. The most general permit required for the outfall, and the one that should include the pipeline is the CDP. Actual permitting requirements will depend upon detailed project information and additional coordination with the various agencies.

Special Studies

Wetland Delineation and Report

A wetland delineation was conducted and a full report prepared for RMT II Samoa Effluent Pipeline APE (SHN, 2017b). The wetland delineation found several wetland features within the APE, including within the proposed pipeline alignment. Appropriate wetland setbacks will need to be considered in the final alignment and design of the effluent pipeline. Temporary reduced setbacks during construction will likely be needed along with mitigation and/or best management practices to protect wetland areas during construction.

Natural Resources Assessment

Preliminary background research for a natural resources assessment was conducted, but the report is incomplete, therefore, it is referenced as a draft document (SHN, March 2017c). A table of listed, special status plant species with the potential to occur within the project area, as well as a table of botanical species observed during the wetland delineation were prepared (Attachment 5). Not all plants were able to be identified because the site visit occurred in late March 2017, outside of the blooming season for many species. A number of sandy areas in the study area could potentially provide habitat for rare and endangered species. However, due to the history of disturbance within the APE, the likelihood of sensitive species is very low.

Other

Additional studies, such as, a cultural resources evaluation, could be required as part of the future permitting process, but the actual requirements will be depend on the final project description and scope of the permits required; additional agency coordination will be necessary for a final determination.

References

County of Humboldt GIS and Assessor data, 2017

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---. (October 2007). *Recirculation Draft 3 Master Environmental Impact Report*. Eureka, CA: Humboldt County.

Humboldt Local Agency Formation Commission. (March 15, 2017). "Agenda Item 8A Staff Report, Initial Review of Proposed Reorganization of the Samoa Peninsula Fire Protection District to a Community Services District." Eureka, CA:LAFCo.

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---. (March 2017b). *Wetland Delineation, RMT II Samoa Effluent Pipeline, Samoa, California*. Eureka, CA:SHN.

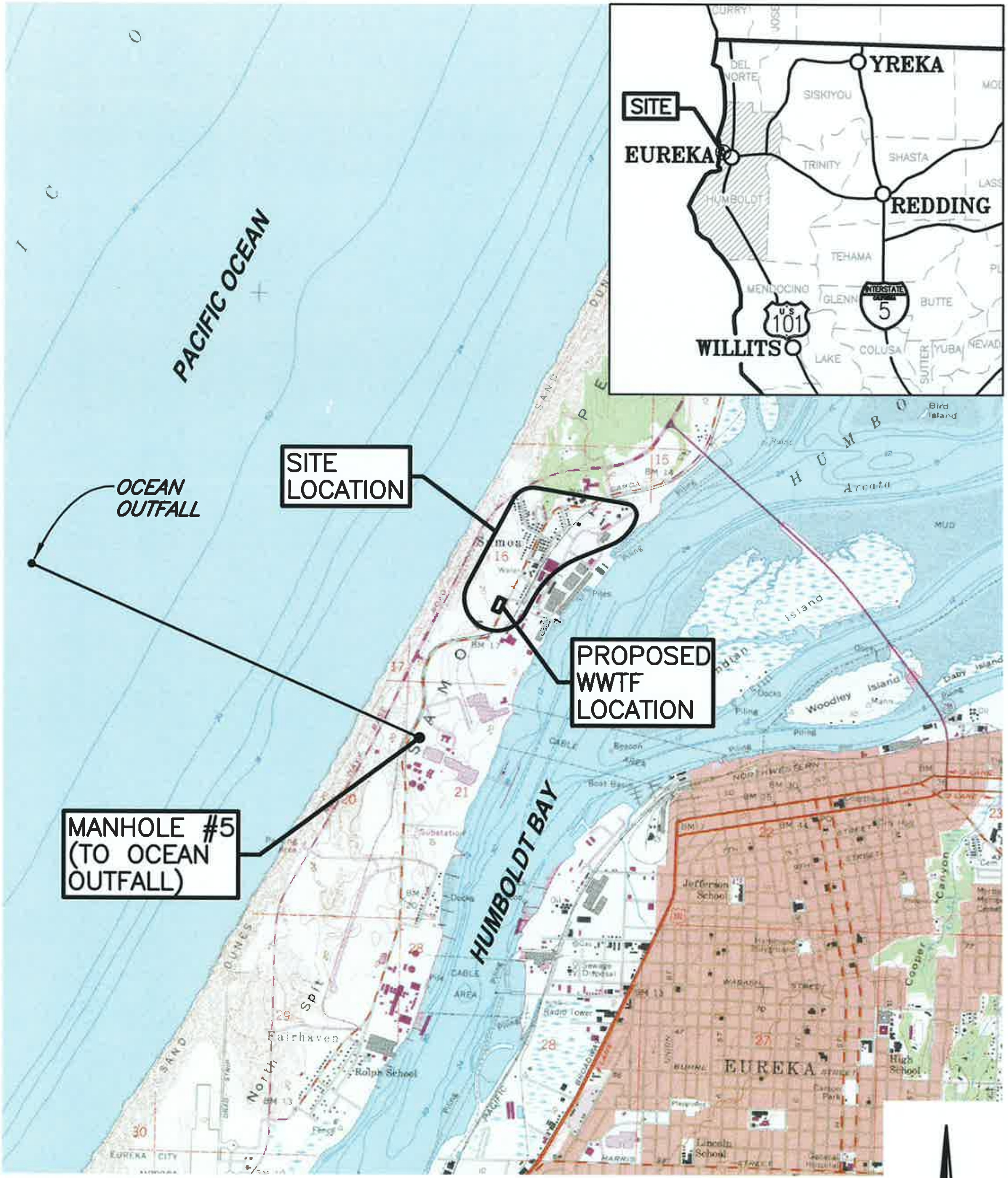
---. (March 2017c). *Draft Natural Resources Assessment, Samoa Effluent Pipeline Project, Samoa, California*

---. (February 2016). Infrastructure Needs and Reuse on the Samoa Peninsula, Redwood Marine Terminal II. Eureka, CA:SHN.

Attachments:
1. Project Site Overview
2. Proposed RMT II Effluent Pipeline Alignment and Area of Effect
3. Existing Samoa Wastewater Treatment Facilities
4. Proposed Peninsula CSD Boundaries
5. Potential Listed Plant Species & Botanical Species Observed

1

Project Site Overview



SOURCE: EUREKA USGS
7.5 MINUTE QUADRANGLE

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1"=3000'±

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SHN Consulting Engineers & Geologists, Inc.	Report of Waste Discharge Samoa, California	Site Location Map SHN 015147.100	
	March 2017	015147-100-SITE-LCTN	Figure 1

2

Proposed RMT II Effluent Pipeline Alignment and Area of Effect

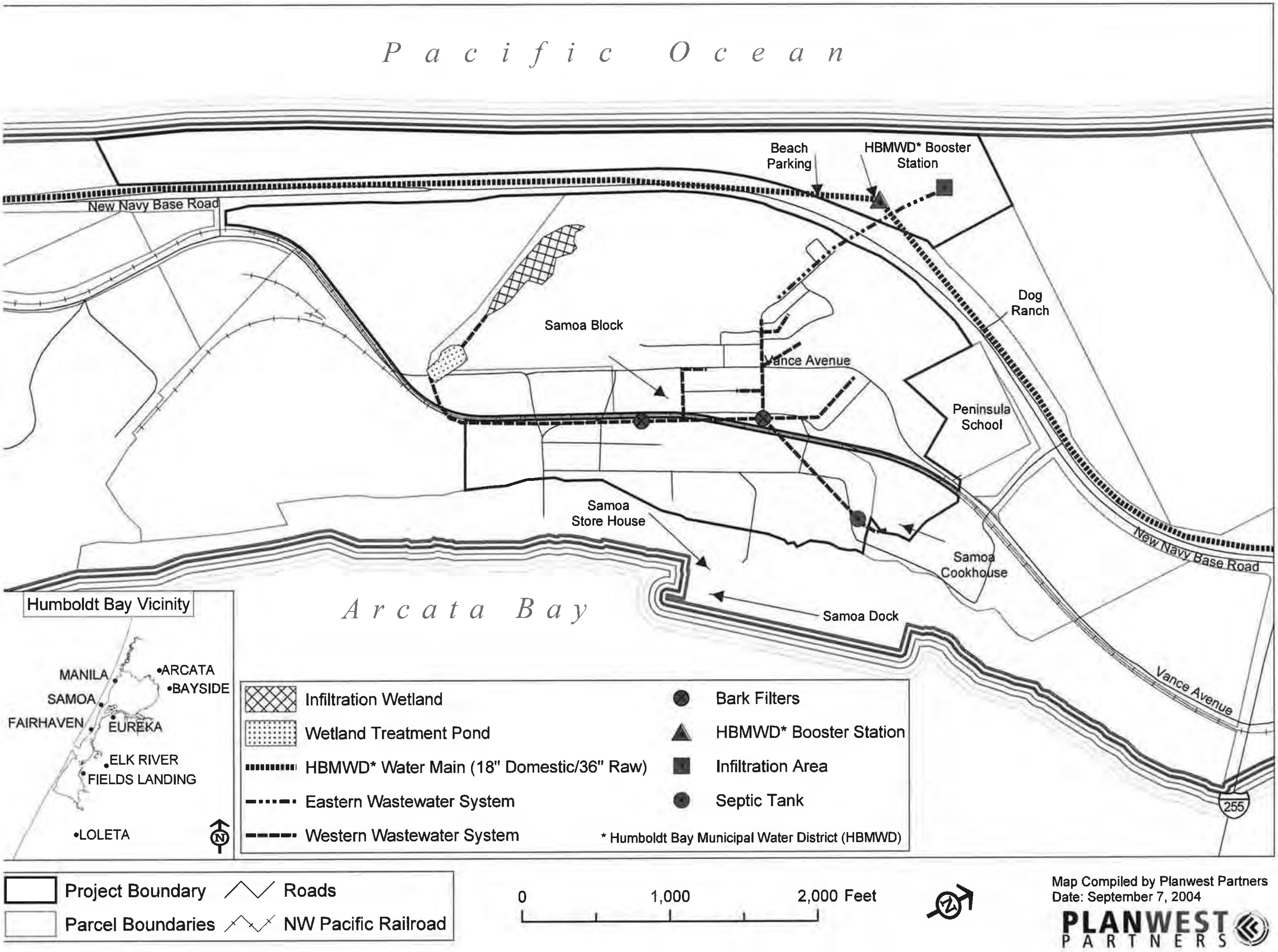
\\EurekaSVRNEW\Projects\2015\015147-redwood-marine-terminal-II\Dwgs , SAVED: 2/21/2017 4:37 PM NDOWNEY, PLOTTED: 2/24/2017 9:27 AM, CHRIS D. NEWELL

SHN Consulting Engineers & Geologists, Inc.	The County of Humboldt Redwood Marine Terminal II Samoa, California	Area of Potential Effect SHN 015147
	February 2017	015147-AREA-OF-EFFECT	Figure 14

3

Existing Samoa Wastewater Treatment Facilities

Figure 2.3-1 Existing Utilities and Public Facilities



Map Compiled by Planwest Partners
Date: September 7, 2004

PLANWEST PARTNERS

4

Proposed Peninsula CSD Boundaries

Samoa PFD Reorganization to CSD

5

Potential Listed Plant Species & Botanical Species Observed

Table A-3
Botanical Species Observed 3/23/17, 3/24/17
RMTII Samoa Effluent Pipeline

Scientific Name	Common Name	Family	Native?
Trees			
Hesperocyparis macrocarpa	Monterrey cypress	Cupressaceae	N
Morella californica	California wax-myrtle	Myricaceae	Y
Picea sitchensis	Sitka spruce	Pinaceae	Y
Pinus contorta ssp. *contorta*	beach pine	Pinaceae	Y
Pinus radiata	Monterrey pine	Pinaceae	N
Salix hookeriana	dune willow	Salicaceae	Y
Shrubs			
Baccharis pilularis	coyote brush	Asteraceae	Y
Ceanothus joyce coulter	California lilac (Cultivar)	Rhamnaceae	N
Cistus incanus	hairy rock rose (Cultivar)	Cistaceae	N
Cotoneaster lacteus	milkflower cotoneaster	Rosaceae	N
Cytisus scoparius	scotch broom	Fabaceae	N
Escallonia rubra	escallonia cultivar	Grossulariaceae	N
Garrya elliptica	coast silk tassel	Garryaceae	Y
Juniperus chinensis	landscape juniper	Cupressaceae	N
Lupinus arboreus	yellow bush lupine	Fabaceae	N
Rubus armeniacus	Himalayan blackberry	Rosaceae	N
Rubus ursinus	California blackberry	Rosaceae	Y
Ulex europaeus	gorse	Fabaceae	N
Ferns and Allies			
Polypodium scouleri	leatherleaf fern	Polypodiaceae	Y
Polystichum munitum	sword fern	Dryopteridaceae	Y
Sedges and Rushes			
Carex obnupta	slough sedge	Cyperaceae	Y
Cyperus eragrostis	tall flatsedge	Cyperaceae	Y
Juncus bufonius	toad rush	Juncaceae	Y
Juncus effuses	common rush	Juncaceae	Y
Juncus lescurii	dune rush	Juncaceae	Y
Luzula comosa	common woodrush	Juncaceae	Y
Grasses			
Agrostis stolonifera	creeping bentgrass	Poaceae	N
Ammophila arenaria	European beachgrass	Poaceae	N
Anthoxanthum odoratum	sweet vernal grass	Poaceae	N
Briza maxima	large quaking grass	Poaceae	N
Bromus catharticus	rescue grass	Poaceae	N
Cortaderia jubata	pampus grass	Poaceae	N
Cynosurus echinatus	annual dogtail grass	Poaceae	N
Dactylis glomerata	orchard grass	Poaceae	N
Festuca arundinaceae	tall fescue	Poaceae	N
Festuca microstachys	small fescue	Poaceae	Y
Festuca rubra	red fescue	Poaceae	Y
Holcus lanatus	velvet grass	Poaceae	N
Phalaris arundinacea	Canary reedgrass	Poaceae	N
Poa annua	annual grass	Poaceae	N

Table A-3
Botanical Species Observed 3/23/17, 3/24/17
RMTII Samoa Effluent Pipeline

Scientific Name	Common Name	Family	Native?
Herbs			
Abronia latifolia	coastal sand verbena	Nytaginaceae	Y
Achillea millefolium	common yarrow	Asteraceae	Y
Agapanthus africanus	lily of the Nile	Liliaceae	N
Allium triquetrum	three cornered leek	Alliaceae	N
Armeria maritima	thrift seapink	Plumbaginaceae	Y
Artemisia douglasiana	mugwort	Asteraceae	Y
Barbarea sp.	wintercress	Brassicaceae	N
Calandrinia menziesii	red maids	Montiaceae	Y
Cardamine oligosperma	bittercress	Brassecaceae	Y
Cardionema ramosissimum	sand mat	Caryophyllaceae	Y
Carpobrotus chilensis	seafig	Azioaceae	N
Carpobrotus edulis	iceplant	Azioaceae	N
Cerastium glomeratum	mouseear chickweed	Caryophyllaceae	N
Chamerion angustifolia	fireweed	Onagraceae	Y
Cirsium vulgare	bullthistle	Asteraceae	N
Claytonia perfoliata ssp. *perfoliata*	miner's lettuce	Montiaceae	Y
Daucus carota	Queen Anne's lace	Apiaceae	N
Eriogonum latifolium	coast buckwheat	Polygonaceae	Y
Erodium cicutarium	coastal heron's bill	Geraniaceae	N
Euphorbia peplus	petty spurge	Euphorbiaceae	N
Fragaria chiloensis	beach strawberry	Rosaceae	Y
Geranium dissectum	cutleaf geranium	Geraniaceae	Y
Geranium robertianum	Robert's geranium	Geraniaceae	N
Grindelia stricta	coastal gumweed	Asteraceae	Y
Hedera helix	English ivy	Araliaceae	N
Hirschfeldia incana	hoary mustard	Brassicaceae	N
Hyacinthus orientalis	Hyacinth (cultivar)	Liliaceae	N
Hypochaeris radicata	hairy cats-ear	Asteraceae	N
Lamium amplexicaule	henbit	Lamiaceae	N
Lotus corniculatus	birds foot trefoil	Fabaceae	N
Malva parviflora	cheeseweed mallow	Malvaceae	N
Medicago lupulina	black medick	Fabaceae	N
Medicago polymorpha	bur-clover	Fabaceae	N
Melilotus albus	white sweet clover	Fabaceae	N
Mentha pulegium	pennyroyal	Lamiaceae	N
Oxalis pes-caprae	Bermuda buttercup	Oxalidaceae	N
Parentucellia viscosa	yellow glandweed	Orobanchaceae	N
Plantago coronopus	cutleaf plantain	Plantaginaceae	N
Plantago lanceolata	English plantain	Plantaginaceae	N
Platystemon californicus	creamcups	Papaveraceae	Y
Polygonum paronychia	dune knotweed	Polygonaceae	Y
Pseudognaphalium luteoalbum	Jersey cudweed	Asteraceae	N
Raphanus sativus	wild radish	Brassicaceae	N
Rumex acetosella	sheep sorrel	Polygonaceae	N
Rumex crispus	curly dock	Polygonaceae	N
Senecio vulgaris	common groundsel	Asteraceae	N
Silene gallica	common catchfly	Caryophyllaceae	N
Sonchus asper	spiny sow-thistle	Asteraceae	N

Table A-3
Botanical Species Observed 3/23/17, 3/24/17
RMTII Samoa Effluent Pipeline

Scientific Name	Common Name	Family	Native?
Stachys chamissonis	coast hedgenettle	Lamiaceae	Y
Symphyotrichum chilense	pacific aster	Asteraceae	Y
Taraxicum officinale	dandelion	Asteraceae	N
Trifolium hybridum	alsike clover	Fabaceae	N
Triphysaria pusilla	dwarf owl's clover	Orobancheaceae	Y
Vicia sativa	spring vetch	Fabaceae	N
Vicia villosa	hairy vetch	Fabaceae	N
Vinca major	bigleaf periwinkle	Apocynaceae	N
Zantedeschia aethiopica	calla lily	Araceae	N
97 Species			**36% Native**

C

Natural Resources Assessment

Natural Resources Assessment

RMT II Samoa Effluent Pipeline Project
Samoa, California

Prepared for:

County of Humboldt and
Humboldt Bay Harbor, Recreation, and Conservation District

Project Funding Provided by:

U.S. Department of Commerce 07-79-07177

SHN **Engineers & Geologists**
812 W. Wabash Ave.
Eureka, CA 95501-2138
707-441-8855

September 2017
015147.100

CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash • Eureka, CA 95501-2138 • 707-441-8855 • FAX: 707-441-8877 •shninfo@shn-engr.com

Reference: 015147.100

September 20, 2017

Ms. Paula Mushrush
Redevelopment and Housing Coordinator
Humboldt County Community Development
520 E Street
Eureka, CA 95501

Subject: Natural Resources Assessment, RMT II Samoa Effluent Pipeline Project, Samoa, California

Dear Ms. Mushrush:

SHN Engineers & Geologists has prepared this Natural Resources Assessment for the Redwood Marine Terminal II (RMT II) effluent pipeline project. This report addresses potential impacts to Environmentally Sensitive Habitat Areas and special status species, evaluates project-related impacts, and recommends appropriate avoidance and minimization measures.

Field work was conducted in late March and mid July, within the bloom period for listed species potentially occurring onsite. Although a number of Environmentally Sensitive Habitat Areas that could potentially provide habitat for rare and endangered species exist in the study area, the history of disturbance within the area of potential effects makes the likelihood of sensitive species very low.

The project will not have significant effects on the natural resources within the area if the avoidance measures and recommendations contained within this Natural Resources Assessment are implemented.

Please call me at 707-822-5785 if you have any comments or concerns.

Sincerely,

SHN Engineers & Geologists

Joseph Saler
Biologist/Botanist

JLS:ceg

Enclosure: Natural Resources Assessment

Reference: 015147.100

Natural Resources Assessment

RMT II Samoa Effluent Pipeline Project
Samoa, California

Prepared for:

County of Humboldt and
Humboldt Bay Harbor, Recreation, and Conservation District

Project Funding Provided by:

U.S. Department of Commerce 07-79-07177

Prepared by:

Engineers & Geologists
812 W. Wabash Ave.
Eureka, CA 95501-2138
707-441-8855

September 2017

QA/QC: MKF___

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List of Illustrations

Abbreviations and Acronyms

°F	degrees Fahrenheit
km	kilometer
m	meter
ppt	parts per trillion

APN	Assessor's Parcel Number
BMP	best management practice
BIOS	Biogeographical Information and Observation System
C	candidate species status
CCH	Consortium of California Herbaria
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
CT	candidate threatened species status
CWA	Clean Water Act
D	delisted species status
DPS	Northern California distinct population segment/species status
E	endangered species status
EPA	U.S. Environmental Protection Agency
ESU	evolutionarily significant unit/species status
FESA	Federal Endangered Species Act
FP	fully protected species status
G	global
G1/S1	critically imperiled species heritage rank
G2/S2	imperiled species heritage rank
G3/S3	vulnerable species heritage rank
G4/S4	apparently secure species heritage rank
G5/S5	secure species heritage rank
gpd	gallons per day
IPaC	Information for Planning and Conservation
MBTA	Migratory Bird Treaty Act
NOAA	National Oceanic & Atmospheric Administration
NCDC	National Climatic Data Center
NCCP	Natural Community Conservation Planning Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPPA	Native Plant Protection Act
NRA	natural resource assessment
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory

Abbreviations and Acronyms, Continued

PT	proposed threatened species status
RMT II	Redwood Marine Terminal II
RWQCB	Regional Water Quality Control Boards
S	state
SAA	Streambed Alteration Agreement
SHN	SHN Engineers & Geologists
SSC	species of special concern
SWRCB	State Water Resources Control Board
T	threatened species status
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VegCAMP	Vegetation Classification and Mapping Program
WDR	Waste Discharge Requirement
WL	watch list species status
WWTF	wastewater treatment facility

1.0 Introduction

SHN Engineers & Geologists has conducted site investigations, literature reviews, and an assessment to determine biological resources present in relation to the proposed town of Samoa wastewater treatment facility (WWTF) effluent disposal pipeline to the Redwood Marine Terminal II (RMT II) ocean outfall pipeline. This natural resource assessment (NRA) has been prepared to evaluate the potential for special status biological resources within the project area, including natural communities.

The town of Samoa is located northeast of the RMT II on the Samoa peninsula (Figure 1). The population during the 2010 census was 258 people (U.S. Census Bureau, 2015). The town of Samoa is identified as a severely economically disadvantaged community, which is defined as having an annual median household income less than 60 percent of the statewide average (CDWR, 2016). The town of Samoa has a master plan to subdivide and redevelop the town in two phases. Phase 1 will include rehabilitation of existing homes and an 80-unit affordable housing complex. Phase 2 will include construction of additional new homes, as well as new commercial and industrial business parks. Phase 1 will require the construction of a new WWTF to provide services for the new and existing homes and businesses.

The town of Samoa is served by two disposal systems. The eastern system serves approximately 75 homes, the downtown retail area, and the Samoa Cookhouse, and has an average dry weather flow of 17,000 gallons per day (gpd), and an average wet weather flow of 32,000 gpd. The western system serves approximately 25 homes and has an average flow of 7,500 gpd (RWQCB, 2014). Following implementation of Phase 1 and Phase 2, development average influent flows are anticipated to be 61,000 gpd, with peak flows of approximately 131,000 gpd (SHN, 2015).

A WWTF is proposed to replace the eastern and western systems and treat the additional wastewater from Phase 1 and Phase 2 developments. The proposed Samoa WWTF is subject to permit requirements under Draft Waste Discharge Requirements (WDR) Order No. R1-2014-0031. Wastewater discharged through the RMT II ocean outfall would be subject to the Ocean Plan, and would be required to meet U.S. Environmental Protection Agency (EPA) secondary effluent standards.

1.1 Project Location

The project is located in Samoa, California, an unincorporated community within Humboldt County (Figure 1; United States Geological Survey [USGS] Eureka 7.5-minute Quadrangle, Township 5 North, Range 1 West, Section 16, Humboldt Meridian). The project is potentially located within portions of six separate parcels (Assessor's parcel numbers [APNs] 401-112-003, 401-031-039, 401-031-068, 401-031-065, 401-031-067, and 401-112-021). Parcels 401-112-003 and 401-031-039 are railroad right-of-way and will most likely be the location of the wastewater discharge pipeline; however, the location of the pipeline may pass through portions of the adjacent parcels. The area of potential effects for the wastewater discharge pipeline consists of approximately 23 acres with a center latitude and longitude of 40.811009° and -124.195243°, respectively. The total area of study includes an approximately 3,200-foot long, 100-foot wide proposed alignment area from the proposed WWTF to the RMT II ocean outfall access point and two different stockpile and staging areas. One stockpile and staging area is located within the area of the potential WWTF on the northern end of the discharge pipeline and includes the area surrounding the Eel River

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Samoa Effluent Pipeline, RMT II NRA
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Project Location

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NRA_Fig1_ProjectLocation

Figure 1

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Resource Recovery Samoa transfer station and recycling center. An additional stockpile and staging area is located on the southern end of the proposed discharge pipeline within the area of the connection to the ocean outfall pipeline. The proposed discharge pipeline is located approximately 250 feet east of New Navy Base Road at its nearest point, 550 feet east of the edge of sand at Samoa Beach at its nearest point, and 1,130 feet west of Humboldt Bay at its nearest point. The project is located on the Samoa peninsula, approximately 1 air-mile west of the city of Eureka, and 6.5 air-miles southwest of Arcata.

1.2 Site Description

The entire discharge pipeline project is located within former industrial land constructed on historical dune habitat. The study area is situated at an approximate 15- to 32-foot elevation above mean sea level (Figures 1 and 2). The study area has been used for industrial purposes since the 1960s. Several lumber mills operated on the northern portion of the site closing at different times within the last 20 years. These facilities have mostly been demolished, leaving vacant industrial land. The southern portion of the project area has been the location of a pulp mill from the 1960s until 2008 when it closed. The area still contains structures from the shuttered mill; however, the majority of the site is composed of broad stretches of vacant asphalt with some small scale industrial use continuing onsite. The western portion of the project area is adjacent to an industrial recycling facility that will be avoided by the proposed effluent pipeline. Currently, the majority of the project area is covered in old asphalt, broken concrete, compacted gravel on former log decks, and railroad infrastructure. Small areas of semi-natural dune habitat occur between the vacant industrial lands in areas that were used as drainages, or along property lines. The area is characterized by a mix of disturbance-adapted, primarily non-native, herbaceous species, along with shrub-dominated regions, and areas with higher native vegetation cover. The native vegetation-dominated communities usually had an over storydominated by coast willow (*Salix hookeriana*) and California wax-myrtle (*Morella californica*), indicating a longer period since it was last disturbed.

2.0 Methodology

2.1 Literature Review

This natural resources assessment includes a review of pertinent literature on habitat characteristics of the site, and a review of information related to special status species of plants and animals that could potentially use the described habitats.

The findings for this report are a result of several sources, including a review of existing literature regarding sensitive resources that have the potential to occur within the site. Resources for this determination included:

- California Natural Diversity Database (CNDDB) query for the Eureka and surrounding USGS 7.5-minute topographic quadrangles (Arcata South, Cannibal Island, McWhinney Creek, Tyee City, Arcata North, and Fields Landing) (CDFW, 2017a)
- Biogeographical Information and Observation System (BIOS; CDFW, 2017b)
- Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS, 2017c) queried for a list of all plant species reported for the Eureka and surrounding USGS 7.5-minute topographic quadrangles

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Samoa, California

Project Area

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NRA_Fig2_ProjectArea

Figure 2

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- Special Vascular Plants, Bryophytes, and Lichens of California List (CDFW, 2017c)
- Special Animals of California List (CDFW, 2017d)
- United States Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) was queried for threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of the proposed project and/or may be affected by the proposed project (USFWS, 2017a)

From the database queries, a list of potential target species for the study area was compiled. Tables A-1 and A-2 in Appendix A include species reported by the CNDDB and USFWS, and species listed in the California Native Plant Society (CNPS) inventory of rare plants.

Additionally, the USFWS Critical Habitat Portal was queried for habitat designated as critical for species listed under the Federal Endangered Species Act (FESA). No critical habitat is designated within the project area. The nearest designated critical habitat is 2.6 miles east at Ryan Slough for the threatened Chinook salmon (*Oncorhynchus tshawytscha*). Additional critical habitat is designated around Humboldt Bay for the endangered tidewater goby (*Eucyclogobius newberryi*) and the threatened Western snowy plover (*Charadrius alexandrines nivosus*). However designated critical habitat for these species is over 4 miles away.

Numerous CNDDB occurrences of special status species have been recorded from the dune habitat surrounding the project area. This includes beach layia (*Layia carnosa*), manyleaf gilia (*Gilia millefoliata*), western lily (*Lilium occidentale*), Menzies' wallflower (*Erysimum menziesii*), pink sand verbena (*Abronia umbellata* var. *breviflora*), marsh pea (*Lathyrus palustris*), coastal marsh milk-vetch (*Astragalus pycnostachyus* var. *pycnostachyus*), and western sandspurrey (*Spergularia canadensis* var. *occidentalis*) within a half-mile of the project area. The western bumblebee (Bombus occidentalis), eulachon (*Thaleichthys pacificus*), and western snowy plover (*Charadrius alexandrinus nivosus*) also have been recorded within a half-mile of the project.

2.2 Field Observations and Studies

SHN's biologist conducted site visits on March 23 and 24, and July 26, 2017, for a biological survey and habitat assessment. A wetland delineation (SHN, March 2017) was done concurrently with the survey, in order to better analyze the habitats found within the project area. Surveys were conducted with an attempt to identify all species present within the project-related area of potential effects, including possible species of special concern. In addition to surveying for target species, a list of all botanical and animal species encountered was compiled (Tables A-3 and A-4 in Appendix A). Plants were identified to the lowest taxonomic level possible to distinguish special status species from others. Nomenclature for special status animals conforms to California Department of Fish and Wildlife (CDFW) guidelines (CDFW, 2009, 2017b). Plant community names conform to *A Manual of California Vegetation, Second Edition* (Sawyer et al.; 2009) and the VegCAMP (Vegetation Classification and Mapping Program) Natural Communities List (CDFW; 2010). Botanical nomenclature of species in this assessment follows the *Jepson Manual (*Baldwin et al., 2012) and subsequent online revisions. The March and July site visits were conducted at seasonally appropriate times to best detect early and late blooming special status plant species, and a number of nesting bird species. Analysis of the habitat and vegetation communities present within the project area during the site visits indicate that the developed and former industrial lands comprising the majority of the project area do not have suitable conditions for any of the special status species reported as potentially occurring within the area. The industrial and former industrial lands are dominated with disturbance-adapted primarily non-native plants, and are not likely to support any of the special status species listed as potentially occurring within the project area. The areas most likely to support special status species, namely the willow- and California wax-myrtle (*Morella californica*)-dominated wetlands to the west of the project area, are not slated to be disturbed; an appropriate buffer will be maintained between these areas and construction activities.

Site photographs from the site visits are included in Appendix B.

3.0 Environmental Setting

The entire discharge pipeline project is located within former industrial land constructed on historical dune habitat. The study area is situated at an approximate 15- to 32-foot elevation above mean sea level (See Figures 1 and 2). The study area was used for industrial purposes since the 1960s. Several lumber mills operated on the northern portion of the site, closing at different times within the last 20 years. These facilities have mostly been demolished leaving vacant industrial land. The southern portion of the project area was the location of a pulp mill from the 1960s until 2008 when it closed. The area still contains structures from the shuttered mill; however, the majority of the site is composed of broad stretches of vacant asphalt with some small-scale industrial use continuing on site (Photo B-4 and B-5, Appendix B). The western portion of the project area passes by an industrial recycling facility that will be skirted by the proposed effluent pipeline. Currently, the majority of the project area is covered in old asphalt, broken concrete, compacted gravel within former log decks, and railroad infrastructure. Small areas of semi-natural dune habitat occur between the vacant industrial lands in areas that were used as drainages, or along property lines. The area is characterized by a mix of disturbance-adapted, primarily non-native, herbaceous species, along with shrub-dominated regions, and areas with higher native vegetation cover. The native vegetation-dominated communities primarily have an over story dominated by coast willow (*Salix hookeriana*) and California wax-myrtle, indicating a longer period since it was last disturbed. Areas that have previously been developed are flat, generally sloping to the east. Less disturbed areas are undulating, typical of coastal dune habitat. Vegetation across the site is characteristic of disturbed areas, with portions dominated by non-native grasses and herbs. Other areas are dominated by shrubby vegetation, including California blackberry (*Rubus ursinus*) and coyote brush (*Baccharis pilularis*), and represent potential habitat for bird species. (Figure 1, and Photo B-3, Appendix B). The average 30-year precipitation data for this area from October 1 through August 24 is 40.33 inches (NOAA Eureka Station, 2017), with the majority of precipitation and snowfall occurring between November and March. Temperatures in Samoa range from an average low of 46.2 degrees Fahrenheit (°F) in December to an average high of 59.6°F in September; extremes in temperatures are relatively uncommon due to the regional maritime influence.

3.1 Hydrology

The project is located within the Mad-Redwood watershed (hydrologic unit code 18010102), which includes all of Humboldt Bay. The study area is on a narrow sandy spit of land between Humboldt Bay and the Pacific Ocean. Topography across the site is naturally undulating between dunes, with stormwater draining into wetlands between dunes and other low spots. Within industrial areas, stormwater is directed into Humboldt Bay or the Pacific Ocean; at newer locations, it flows into catchment basins where it infiltrates into well-drained sandy soils. No streams originate or pass through the study area due to the well-drained nature of the soils, and relatively small catchment area. Humboldt Bay is at a minimum 1,130 feet to the east of the project area, while the Pacific Ocean is at a minimum 550 feet west of the project area.

The USFWS is the federal agency responsible for tracking wetland trends and maintaining an inventory through its National Wetland Inventory (NWI; USFWS, 2017b). The NWI can be queried for specific locations throughout the United States (U.S.) to aid federal, State, and local agencies in making informed decisions concerning wetlands. According to the NWI, freshwater emergent and excavated freshwater pond wetland types occur within the study area region (Appendix C).

NWI maps are excellent references for scoping the presence or absence of wetlands; however, the resolution of the NWI tends to be on a macro scale, often with no field verification. As recommended by NWI, a site-specific wetland delineation was conducted within the project area of potential effects detailing wetland conditions and determining an accurate distribution of wetlands within the proposed project area. Wetland distribution observed during the field visits as recorded within the wetland delineation report (SHN, March 2017) documented additional wetland areas within the northeastern portion of the project area, and noted the lack of wetland conditions in the western portion of the project area near the recycling facility (Figure 2).

3.2 Soils

Soils within the project area consist of urban industrial fill and the Samoa-Clambeach-duneland complex (151) (USDA-NRCS, 2016; McLaughlin and Harradine, 1965). Industrial fill is found across the majority of the area of potential effects; the fill consists of soils from mixed sources. Industrial fill soils were used during the construction of the various industrial facilities within and surrounding the area of potential effects, and covers the majority of the area reviewed for this assessment. Soils within the remaining area consist of the native Samoa-Clambeach-duneland complex. Soils within this complex are sandy and are found in dunes and deflation basins. They are composed of Eolian and marine sand derived from mixed sources. Soils can be somewhat excessively drained on upper dune regions, to very poorly drained in deflation basins. These soils are found within the dunes comprising the Samoa peninsula, and can support unique dune habitat and inter-dune wetlands.

3.3 Vegetation Communities

The project area is characterized by vegetation typical of disturbed sites. This included non-native grassland and forbs, shrubby areas, and more native plant communities in less disturbed areas dominated by coast willow and California wax-myrtle. The most common species within non-native grassland and forb-dominated areas included iceplant (*Carpobrotus edulis*), hairy cat's-ear (*Hypochaeris radicata*), pampas grass (*Cortaderia jubata*), bur-clover (*Medicago polymorpha*), large quaking grass (*Briza maxima*), sweet vernal grass (*Anthoxanthum odoratum*), small fescue (*Festuca microstachys*), creeping bentgrass (*Agrostis stolonifera*), and hairy vetch (*Vicia villosa*), among others. The non-native grassland forb-dominated regions represented the most disturbed areas within the project area. This included compacted gravel areas, former chip storage areas, and currently disturbed areas alongside roadways, within the vicinity of the recycling facility and the pulp mill. Vegetation within the non-native grassland and forb-dominated areas does not represent a natural vegetation community, but rather vegetation adapted to human caused disturbance.

Less continuously disturbed areas were dominated by more shrubby vegetation. This included coyote brush, California blackberry, Himalayan blackberry (*Rubus armeniacus*), yellow bush lupine (*Lupinus arboreus*), Scotch broom (*Cytisus scoparius*), and milkflower cotoneaster (*Cotoneaster lacteus*), among others. Areas dominated by shrubby vegetation included excavated depressions, concrete piles, railroad infrastructure, old industrial foundations, and the fringes of coast willow and California wax-myrtle-dominated habitat. The herbaceous stratum within the shrub-dominated portions of the project area varied depending on the density of the shrub cover; however, species composition was similar to that of the surrounding disturbed industrial lands. The majority of the shrub-dominated areas were dominated or co-dominated by non-native shrub and herbaceous species, and did not meet the criteria for a California vegetation community.

The least disturbed areas were dominated by coast willow and California wax-myrtle. Dominant species under the canopy included California blackberry, slough sedge (*Carex obnupta*), sword fern (*Polystichum munitum*), bittercress (*Cardamine oligosperma*), and the non-native English Ivy (*Hedera helix*).

Natural vegetation communities were observed within the coast willow and California wax-myrtle-dominated areas. The vegetation community most closely resembled that of the *Salix hookeriana* shrubland Alliance (Coastal dune willow thickets) (Sawyer et al., 2009), with *Salix hookeriana* constituting over 50 percent of the relative cover; with lesser amounts of cover by California wax-myrtle.

See Section 5.3.1 for more information on the natural communities observed on site.

3.4 Wildlife Habitats

Common wildlife species expected on the site are those associated with northern California coastal dunes, shrublands, and disturbed sites. This includes: willow shrub, non-native grasslands, and abandoned buildings. Wildlife species observed at the site included common raven (*Corvus corax*), song sparrow (*Melospiza melodia*), osprey (*Pandion haliaetus*), and pacific slope flycatcher (*Empidonax difficilis*), among others (see Appendix A, Table A-4). Other wildlife species are likely to inhabit the surrounding area and it is expected that there are many other bird, mammal, and amphibian species that might use the project site, if only transitionally. However, human activities within the project site may limit the abundance of a variety of birds and animals.

3.5 Wildlife Movement Corridors

Wildlife movement includes migration (that is, usually one-way per season), inter-population movement (that is, long-term genetic flow), and small travel pathways (that is, daily movement corridors within an animal's territory). Although small travel pathways usually facilitate movement for daily home range activities (such as, foraging or escape from predators), they also provide connection between outlying populations and the main corridor, permitting an increase in genetic flow among populations.

These linkages among habitat types can extend for miles from primary habitat areas and occur on a large scale throughout California. Habitat linkages facilitate movement between populations located in discrete areas and populations located within larger habitat areas. The mosaic of habitats found within a large-scale landscape results in wildlife populations that consist of discrete sub-populations constituting a large single population, which is often referred to as a meta-population. Even where patches of pristine habitat are fragmented, such as, occurs with coastal dunes and coastal scrub, the movement between wildlife populations is facilitated through habitat linkages, migration corridors, and movement corridors. Depending on the condition of the corridor, genetic flow between populations may be high in frequency, thus allowing high genetic diversity within the population, or may be low in frequency. Low-frequency genetic flow may potentially lead to complete isolation and, if pressures are strong, potential extinction (McCullough, 1996; Whittaker, 1998).

3.6 Offsite Conditions

Off-site conditions are similar to those found within the project area. The majority of the land surrounding the project area has been developed at some time in the past. Land to the north and east is relatively vacant industrial land with asphalt and gravel pavement and few remaining buildings. One large asphalt pavement area to the east of the project area is used for temporary log storage. Land to the south contains the remains of the Samoa pulp mill, with several large buildings still intact, and some ongoing small industrial use. Lands to the west of the project area are the least manipulated, however fencing and New Navy Base Road separate the project area from the less disturbed dune habitat. Two wetland areas occur to the west of the project area adjacent to New Navy Base Road; however the project is to remain outside of a 50-foot buffer from these wetland areas.

4.0 Regulatory Setting

Regulatory authority over biological resources is shared by federal, State, and local authorities under a variety of legislative acts. The following section summarizes the federal, State, and local regulations for special status species, jurisdiction Waters of the U.S. and State of California, and other sensitive biological resources. This section provides a listing and overview of these federal and State laws; only select regulations will be applicable to this project.

4.1 Federal Laws

4.1.1 Clean Water Act Sections 404 and 401

Under Section 404 (33 U.S. Code (USC) 1344) of the Clean Water Act (CWA), as amended, the U.S. Army Corps of Engineers (USACE) retains primary responsibility for permits to discharge dredged or fill material into Waters of the U.S. All discharges of dredged or fill material into jurisdictional Waters of the U.S. that result in permanent or temporary losses of Waters of the U.S. are regulated by the USACE. A permit from the USACE must be obtained before placing fill or grading in wetlands or other Waters of the U.S., unless the activity is exempt from CWA Section 404 regulation (for example, certain farming and forestry activities).

The USACE defines wetlands as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions"(USACE Environmental Laboratory, 1987). In other words, the USACE defines wetlands by the presence of all three wetland indicators: hydrophytic vegetation, hydric soils, and wetlands hydrology.

Waters of the U.S. are defined at 33 Code of Federal Regulations (CFR) Part 328. They include traditional navigable waters; relatively permanent, non-navigable tributaries of traditional navigable waters, and certain wetlands. Following recent court cases, the EPA and USACE published a memorandum entitled "Clean Water Act Jurisdiction" (USACE/EPA, 2008) to guide the determination of jurisdiction over Waters of the U.S., especially for wetlands. The applicability of Section 404 permitting over discharges to wetlands is, therefore, a two-step process: 1) determining the areas that are wetlands, and 2) where a wetland is present, assessing the wetland's connection to traditional navigable waters and non-navigable tributaries to determine whether the wetland is jurisdictional under the CWA. A wetland is considered jurisdictional if it meets certain specified criteria.

The USACE is required to consult with the USFWS and/or National Marine Fisheries Service (NMFS) under Section 7 of the FESA if the action subject to CWA permitting could result in "Take" of federally listed species or an adverse effect to designated critical habitat. The project is within the jurisdiction of the Sacramento District of the USACE.

Section 401 of the CWA (33 USC 1341) requires any applicant for a federal license or permit to conduct any activity that may result in a discharge of a pollutant into Waters of the U.S. to obtain a certification from the state in which the discharge originates or would originate, or if appropriate, from the interstate water pollution control agency having jurisdiction over the affected waters at the point where the discharge originates or would originate, that the discharge will comply with the applicable effluent limitations and water quality standards. A certification obtained for the construction of any facility must also pertain to the subsequent operation of the facility. The responsibility for the protection of water quality in California rests with the State Water Resources Control Board (SWRCB) and its nine Regional Water Quality Control Boards (RWQCB). The project is within the jurisdiction of the North Coast RWQCB.

4.1.2 Fish and Wildlife Coordination Act

The "Fish and Wildlife Coordination Act" (16 USC Sections 661-667e, March 10, 1934, as amended 1936, 1946, 1947, 1948, 1949, 1958, 1965, 1978, and 1995) requires that whenever waters or channel of a stream or other body of water are proposed or authorized to be modified by a public or private agency under a federal license or permit, the federal agency must first consult with the USFWS and/or NMFS and with the head of the agency exercising administration over the wildlife resources of the state where construction will occur (in this case the CDFW), with a view to conservation of birds, fish, mammals; all other classes of wild animals and all types of aquatic and land vegetation upon which wildlife is dependent.

If direct permanent impacts occur to Waters of the U.S. from a proposed project, then a permit from USACE under CWA Section 404 is required for the construction of the proposed project. USACE is required to consult with USFWS and/or NMFS as appropriate regarding potential impacts to federally listed species under FESA. Such action may prompt consultation with CDFW, which would review the project pursuant to California Endangered Species Act (CESA) and issue a consistency letter with USFWS and/or NMFS, if required.

4.1.3 Federal Endangered Species Act

The United States Congress passed the FESA in 1973 to protect species that are endangered or threatened with extinction. The FESA is intended to operate in conjunction with the National

Environmental Policy Act (NEPA) to help protect the ecosystems upon which endangered and threatened species depend and within which they live. The USFWS and the NMFS are the designated federal agencies responsible for administering the FESA.

The FESA prohibits the "Take" of endangered or threatened wildlife species. A "Take" is defined as harassing, harming (including significantly modifying or degrading habitat), pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting wildlife species, or any attempt to engage in such conduct (16 USC 1531, 50 CFR 17.3). An activity can be defined as a "Take" even if it is unintentional or accidental. Taking can result in civil or criminal penalties. Activities that could result in "Take" of a federally listed species require an incidental "Take" authorization resulting from FESA Section 7 consultation or FESA Section 10 consultation. Plants are legally protected under the FESA only if "Take" occurs on federal land or from federal actions, such as, issuing a wetland fill permit.

A federal endangered species is one that is considered in danger of becoming extinct throughout all, or a significant portion, of its range. A federal threatened species is one that is likely to become endangered in the foreseeable future. The USFWS also maintains a list of species proposed for listing as threatened or endangered. Proposed species are those for which a proposed rule to list as endangered or threatened has been published in the Federal Register. In addition to endangered, threatened, and proposed species, the USFWS maintains a list of candidate species. Candidate species are those for which the USFWS has on file sufficient information to support issuance of a proposed listing rule.

Pursuant to the requirements of the FESA, an agency reviewing a proposed project within its jurisdiction must determine whether any federally listed endangered or threatened species may be present in the project area and determine whether the proposed project will have a potentially significant impact on such a species. In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed to be listed under the FESA or result in the destruction or adverse modification of critical habitat designated or proposed to be designated for such species (16 USC 1536[3], [4]). Project-related impacts to species on the FESA endangered or threatened list would be considered significant and thus, would require mitigation.

4.1.4 Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA) of 1918 makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird listed in CFR Part 10, including feather or other parts, nests, eggs, or products, except as allowed by implementing regulations (50 CFR 21; USFWS, 1918). The MBTA also prohibits disturbance and harassment of nesting migratory birds at any time during their breeding season. The USFWS is responsible for enforcing the MBTA (16 USC 703). The migratory bird nesting season is generally considered to be between March 15 and August 15 within the study region.

4.2 State Laws

4.2.1 California Coastal Act

The California Coastal Act includes specific policies that address issues such as shoreline public access and recreation, lower cost visitor accommodations, terrestrial and marine habitat protection, visual resources, landform alteration, agricultural lands, commercial fisheries, industrial uses, water quality, offshore oil and gas development, transportation, development design, power plants, ports, and public works. The policies of the Coastal Act constitute the statutory standards applied to planning and regulatory decisions made by the California Coastal Commission and by local governments, pursuant to the Coastal Act.

4.2.2 Porter-Cologne Water Quality Control Act

The state and RWQCB also maintain independent regulatory authority over the placement of waste, including fill, into waters of the State under the Porter-Cologne Water Quality Control Act. Waters of the State are defined by the Act as "any surface water or groundwater, including saline waters, within the boundaries of the state." The SWRCB protects all waters in its regulatory scope, but has special responsibility for isolated wetlands and headwaters. These water bodies might not be regulated by other programs, such as Section 404 of the CWA. Waters of the State are regulated by the RWQCBs under the State Water Quality Certification Program, which regulates discharges of dredged and fill material under Section 401 of the CWA and the Porter-Cologne Water Quality Control Act. Projects that require an USACOE permit, or fall under other federal jurisdiction, and have the potential to impact waters of the State are required to comply with the terms of the Water Quality Certification Program. If a proposed project does not require a federal license or permit, but does involve activities that may result in a discharge of harmful substances to waters of the State, the RWQCBs have the option to regulate such activities under their state authority in the form of WDRs or certification of WDRs.

4.2.3 California Endangered Species Act

The State of California enacted the CESA in 1984. The CESA is similar to the FESA but pertains to state-listed endangered and threatened species. Under the CESA, the CDFW has the responsibility for maintaining a list of threatened and endangered species designated under state law (California Fish and Game Code [CFGC] 2070). Section 2080 of the CFGC prohibits "Take" of any species that the commission determines to be an endangered or threatened species. "Take" is defined in Section 86 of the CFGC as "to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."

The State and federal lists of threatened and endangered species are generally similar; however, a species present on one list may be absent from the other. CESA regulations are also somewhat different from the FESA in that the State regulations included threatened, endangered, and candidate plants on non-federal lands within the definition of "Take." CESA allows for "Take" incidental to otherwise lawful development projects.

Pursuant to the requirements of the CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any state-listed endangered or threatened species may be present in the project area and determine whether the proposed project will have a potentially significant impact on such species. Project-related impacts to species on the CESA endangered or threatened list (or, in addition, designated by the CDFW as a "Species of Special Concern," which is a level below threatened or endangered status) would be considered significant and would require mitigation.

4.2.4 California Environmental Quality Act

California Environmental Quality Act (CEQA) Guidelines Sections 15125 (c) and 15380(d) provide that a species not listed on the federal or State list of protected species may be considered rare or endangered if the species can be shown to meet certain specified criteria. Thus, CEQA provides the ability to protect a species from potential project impacts until the respective government agencies have an opportunity to designate the species as protected, if warranted.

The CNPS maintains a list of plant species native to California whose populations that are significantly reduced from historical levels, occur in limited distribution, or are otherwise rare or threatened with extinction. This information is published in the Inventory of Rare and Endangered Plants of California (CNPS, 2017). Taxa with a California Rare Plant Rank (CRPR) of 1A, 1B, 2A, 2B, and 3 in the CNPS inventory consist of plants that meet the definitions of the CESA of the CFGC, are eligible for state listing, and meet the definition of Rare or Endangered under CEQA Guidelines Sections 15125 (c) and 15380(d). Some taxa with a CRPR 4 may meet the definitions of the CESA of the CFGC. CRPR 4 populations may qualify for consideration under CEQA if they are peripheral or disjunct populations; represent the type locality of the species; or exhibit unusual morphology and/or occur on unusual substrates.

Additionally, CDFW maintains lists of special animals and plants. These lists include a species conservation ranking status from multiple sources, including FESA, CESA, and federal departments with unique jurisdictions, CNPS, and other non-governmental organizations. Based on these sources, CDFW assigns a heritage rank to each species according to their degree of imperilment (as measured by rarity, trends, and threats). These ranks follow NatureServe's Heritage Methodology, in which all species are listed with a G (global) and S (state) rank. Species with state ranks of S1-S3 are also considered highly imperiled.

CEQA checklist IV (b) calls for the consideration of riparian habitats and sensitive natural communities. Sensitive vegetation communities are natural communities and habitats that are either unique, of relatively limited distribution in the region, or of particularly high wildlife value. However, these communities may or may not necessarily contain special status species. Sensitive natural communities are usually identified in local or regional plans, policies, or regulations, or by CDFW (i.e., the CNDDB and VegCAMP programs) or the USFWS. Impacts to sensitive natural communities and habitats must be considered and evaluated under CEQA (California Code of Regulations [CCR]: Title 14, Div. 6, Chap. 3, Appendix G).

Although sensitive natural communities do not (at present) have legal protection, CEQA calls for an assessment of whether any such resources would be affected, and requires a finding of significance if there will be substantial losses. High quality occurrences of natural communities with heritage ranks of 3 or lower are considered by CDFW to be significant resources and fall under the CEQA Guidelines for addressing impacts. Local planning documents (such as general plans) often identify these resources as well. Avoidance, minimizations, or mitigation measures should be implemented if project-affected stands of rare vegetation types or natural communities are considered high-quality occurrences of the given community.

As a trustee agency under CEQA, CDFW reviews potential project impacts to biological resources, including wetlands. In accordance with the CEQA thresholds of significance for biological resources, areas that meet the state criteria of wetlands and could be impacted by a project must be analyzed. Pursuant to CFGC Section 2785, CDFW defines wet areas as "lands which may be covered periodically or permanently with shallow water and which include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, fens, and vernal pools."

4.2.5 California Fish and Game Code Section 1600

Streams, lakes, and riparian vegetation as habitat for fish and other wildlife species are subject to jurisdiction by the CDFW under Sections 1600-1616 of the CFGC. Any activity that will do one or more of the following: 1) substantially obstruct or divert the natural flow of a river, stream, or lake; 2) substantially change or use any material from the bed, channel, or bank of a river, stream, or lake; or 3) deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into a river, stream, or lake, generally requires a Streambed Alteration Agreement (SAA).

The term "stream," which includes creeks and rivers, is defined in the CCR as follows: "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life." This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation (14 CCR 1.72).

In addition, the term stream can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife. Riparian is defined as "on, or pertaining to, the banks of a stream"; therefore, riparian vegetation is defined as, "vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself" (CDFW, 1994). Removal of riparian vegetation also requires an SAA from the CDFW.

4.2.6 California Fish and Game Code Sections 3503 and 3513

According to Section 3503 of the CFGC it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird (except English sparrows [*Passer domesticus*] and European starlings [*Sturnus vulgaris*]). Section 3503.5 specifically protects birds in the orders Falconiformes and Strigiformes (birds-of-prey). Section 3513 essentially overlaps with the MBTA, prohibiting the "Take" or possession of any migratory non-game bird. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered "Take" by the CDFW.

4.2.7 Fully Protected Species and Species of Special Concern

The classification of "fully protected" was the CDFW's initial effort to identify and provide additional protection to those animals that were rare or faced with possible extinction. Lists were created for fish, amphibians and reptiles, birds, and mammals. Most of the species on these lists have subsequently been listed under CESA and/or FESA. The CFGC sections (fish at Sec. 5515, amphibian and reptiles at Sec. 5050, birds at Sec. 3511, and mammals at Sec. 4700) dealing with "fully protected" species states that these species "…may not be taken or possessed at any time and no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected species," (CDFW, 1998) although "Take" may be authorized for necessary scientific research. This language makes the "fully protected" designation the strongest and most restrictive regarding the "Take" of these species. In 2003, the code sections dealing with fully protected species were amended to allow the CDFW to authorize "Take" resulting from recovery activities for state-listed species.

Species of special concern (SSC) are broadly defined as animals not listed under the CESA, but that are nonetheless of concern to the CDFW because they are declining at a rate that could result in listing, or historically occurred in low numbers and known threats to their persistence currently exist. This designation is intended to result in special consideration for these animals by the CDFW, land managers, consulting biologists, and others, and is intended to focus attention on the species to help avert the need for costly listing under CESA and cumbersome recovery efforts that might ultimately be required. This designation is also intended to stimulate collection of additional information on the biology, distribution, and status of poorly known at-risk species, and focus research and management attention on them. Although the SSC designation provides no special legal status, they are given special consideration under CEQA during project review.

Table A-2 in Appendix A includes potentially occurring federal and state listed species and SSC animals that may occur in the project area.

4.2.8 Native Plant Protection Act of 1973

The Native Plant Protection Act (NPPA) of 1973 (Sec.1900-1913 of the CFGC) includes provisions that prohibit the taking of endangered or rare native plants from the wild and a salvage requirement for landowners. The CDFW administers the NPPA and generally regards as "rare" many plant species included on Lists 1A, 1B, 2A, 2B, 3, and 4 of the CNPS Inventory of Rare and Endangered Vascular Plants of California (CNPS, 2017).

Table A-1 in Appendix A includes potentially occurring endangered or rare native plants that may occur in the project area (including CNPS lists).

4.2.9 Natural Community Conservation Planning Act

The Natural Community Conservation Planning (NCCP) Act of 1991 is an effort by the State of California, and numerous private and public partners that is broader in its orientation and objectives than the CESA and FESA (refer to discussions above). The primary objective of the NCCP Act is to conserve natural communities at the ecosystem scale while accommodating compatible land use. The NCCP Act seeks to anticipate and prevent the controversies and gridlock caused by species listings by focusing on the long-term stability of wildlife and plant communities and including key interests in the process.

No regionally occurring natural community or associated plan is listed by the state for the project area.

5.0 Special Status Biological Resources

An evaluation was conducted for the potential presence or absence of habitat for special status plant and animal species. CNDDB RareFind (CDFW, 2017a), BIOS (CDFW, 2017b), and CNPS (CNPS, 2017) searches were completed for the 7.5-minute USGS Eureka quadrangle and all adjacent quadrangles. The aforementioned databases were queried for historical and existing occurrences of state and federally listed threatened, endangered, and candidate plant and animal species; species proposed for listing; and all plant species listed by the CNPS (Online 2017 inventory). In addition, a list of all federally listed species that are known to occur or may occur in the vicinity was obtained from the USFWS' IPaC database (USFWS, 2017a).

Table A-1 in Appendix A includes all plant species reported from the queries, their preferred habitat, and if there is suitable habitat present within the study area for the species. Table A-2 includes all animal species reported from the queries, their preferred habitat, and if there is suitable habitat present within the study area for the species. The potential for occurrence of those species included on the list were then evaluated based on the habitat requirements of each species relative to the conditions observed during the field surveys.

Each species was evaluated for its potential to occur in the study area according to the following criteria:

- **None**. Species listed as having "none" are those species for which:
  - there is no suitable habitat present in the study area (that is, habitats in the study area are unsuitable for the species requirements [for example, elevation, hydrology, plant community, disturbance regime, etc.]).
- **Low**. Species listed as having a "low" potential to occur in the study area are those species for which:
  - there is no known record of occurrence in the vicinity, and
  - there is marginal or very limited suitable habitat present within the study area.
- **Moderate**. Species listed as having a "moderate" potential to occur in the study area are those species for which:
  - there are known records of occurrence in the vicinity, and
  - there is suitable habitat present in the study area.
- **High**. Species listed as having a "high" potential to occur in the study area are those species for which:
  - there are known records of occurrence in the vicinity (there are many records and/or records in close proximity), and
  - there is highly suitable habitat present in the study area.
- **Present**. Species listed as "present" in the study area are those species for which:
  - the species was observed in the study area.

5.1 Special Status Plant Species

Based on a review for special status plant species, 53 special status plant species have been reported from the region consisting of the Eureka quadrangle and the surrounding quadrangles. Of the special status plant species reported for the region, 40 plant species are considered to have low or no potential to occur at the project site and 13 species have a moderate or high potential of occurring at the project site. Species with a moderate or high potential for occurrence within the study area are described below. The western lily is anticipated to have no occurrence of existing within the project area based on lack of appropriate habitat. However, because CNDDB includes a large polygon including a portion of the study area as potential habitat, the western lily is also described below.

Sea watch (*Angelica lucida*) is a perennial herb in the Apiaceae family. Its elevation range is reported from 0 to 150 meters above sea level. Within its range state-wide, its blooming period is reported as May through September. This species is reported from coastal bluff scrub, coastal dunes, coastal scrub, and coastal salt marshes. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

Coastal marsh milk-vetch (*Astragalus pycnostachyus* var. *pycnostachyus*) is a perennial herb in the Fabaceae family. Its elevation range is reported from 0 to 155 meters above sea level. Within its range state-wide, its blooming period is reported as April through October. This species is reported from mesic sites in coastal dunes, along streams, coastal marshes and swamps, and mesic sites in coastal scrub. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

Oregon coast paintbrush (*Castilleja litoralis*) is a perennial herb in the Orobanchaceae family. Its elevation range is reported from 5 to 255 meters above sea level. Within its range state-wide, its blooming period is reported as June. This species is reported from coastal sandy sites within coastal bluff scrub, coastal scrub, and coastal dune habitat. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

Menzies' wallflower (*Erysimum menziesii)* is a perennial herb in the Brassicaceae family. Its elevation range is reported from 0 to 35 meters above sea level. Within its range state-wide, its blooming period is reported as March through September. This species is reported from coastal dunes. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

Dark-eyed gilia (*Gilia millefoliata*) is an annual herb in the Polemoniaceae family. Its elevation range is reported from 1 to 60 meters above sea level. Within its range state-wide, its blooming period is reported as April through July. This species is reported from coastal dune habitat. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

American glehnia (*Glehnia littoralis* ssp. *leiocarpa*) is a perennial herb in the Apiaceae family. Its elevation range is reported from 0 to 20 meters above sea level. Within its range state-wide, its blooming period is reported as May through August. This species is reported from coastal dune habitat. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

Short-leaved evax (*Hesperevax sparsiflora* var. *brevifolia*) is an annual herb in the Asteraceae family. Its elevation range is reported from 0 to 215 meters above sea level. Within its range state-wide, its blooming period is reported as March through June. This species is reported from coastal bluff scrub, coastal dunes, and coastal prairie where it is found primarily on sandy bluffs and flats. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

Harlequin lotus (*Hosackia gracilis)* is a perennial herb in the Fabaceae family. Its elevation range is reported from 0 to 700 meters above sea level. Within its range state-wide, its blooming period is reported as March through July. This species is reported from broadleaf upland forests, coastal bluff scrub, coastal prairie, coastal scrub, meadows, seeps, marshes and swamps, north coast coniferous forests, and valley and foothill grassland habitats. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

Seaside pea (*Lathyrus japonicus*) is a perennial herb in the Fabaceae family. Its elevation range is reported from 3 to 65 meters above sea level. Within its range state-wide, its blooming period is reported as May through August. This species is reported from coastal dune habitat. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

Marsh pea (*Lathyrus palustris)* is a perennial herb in the Fabaceae family. Its elevation range is reported from 2 to 140 meters above sea level. Within its range state-wide, its blooming period is reported as March through August. This species is reported from bogs and fens, lower montane coniferous forests, marshes and swamps, north coast coniferous forests, coastal prairie, and coastal scrub habitats, primarily from moist coastal areas. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

Beach layia (*Layia carnosa)* is an annual herb in the Asteraceae family. Its elevation range is reported from 0 to 30 meters above sea level. Within its range state-wide, its blooming period is reported as March through July. This species is reported from coastal dunes and coastal scrub, on sparsely vegetated semi-stabilized dunes, usually behind foredunes. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance and past industrial use within the project area most likely prevents this species from occurring within the study area.

Western lily *(Lilium occidentale)* is a perennial bulbiferous herb in the Liliaceae family. Its elevation range is reported from 2 to 185 meters above sea level. Within its range state-wide, its blooming period is reported as June and July. This species is reported from bogs and fens, coastal bluff scrub, coastal prairie, coastal scrub, freshwater marshes and swamps, and from north coast coniferous forest openings. Within these habitat types, it is most common on well-drained old beach washes overlain with windblown alluvium and organic topsoil, usually near margins of Sitka spruce. This species is very susceptible to soil compaction and texture and is extremely susceptible to herbivory and encroachment by invasive species. Habitat within the study area is has been used for industry for many years and is comprised of compacted soils, paved areas, and dominance by non-native species. Poor habitat conditions within the project area prevent this species from existing within the study area.

Howell's montia *(Montia howellii)* is an annual herb in the Montiaceae family. Its elevation range is reported from 0 to 835 meters above sea level. Within its range state-wide, its blooming period is reported as March through May. This species is reported from vernally mesic meadows and seeps, north coast coniferous forests, and sometimes roadside habitats. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance, past industrial use, and non-native species cover within the project area most likely prevents this species from occurring within the study area.

Wolf's evening primrose (*Oenothera wolfii)* is a perennial herb in the Onagraceae family. Its elevation range is reported from 0 to 125 meters above sea level. Within its range state-wide, its blooming period is reported as May through October. This species is reported from coastal bluff scrub, coastal dunes, coastal prairie, and lower montane coniferous forest. Although habitat may exist locally for this species, it was not detected within the study area. Heavy disturbance, past industrial use, and non-native species cover including *Oenothera glazioviana* within the project area most likely prevents this species from occurring within the study area.

Surveys were conducted at a seasonally appropriate time for all of the plant species expected to potentially occur within the project area. Surveys of the study area failed to locate any sensitive botanical species at the project site. It is unlikely that any species were missed; however the findings in this report represent a "snapshot in time" and it is possible that false negative surveys for rare plant species could occur. This report documents the 2017 field investigations, and the findings presented here are based on best professional judgment.

5.2 Special Status Animal Species

Based on a review of special status animal species, 50 special status animal species have been reported with the potential to occur in the project region consisting of the Eureka quadrangle and the surrounding quadrangles. Of the special status animal species potentially occurring in the region, 34 animal species are considered to have a low potential to occur at the project site and 16 species have a moderate to high potential. Species with a moderate or high potential for occurrence within the study area are described below.

5.2.1 Amphibians

The northern red-legged frog (*Rana aurora*) occurs in lowlands or foothills in humid forests, woodlands, grasslands, and within and adjacent to stream sides with plant cover. Breeding occurs in permanent water sources between December and April, with metamorphosis completed by late July. Red-legged frogs are known to occur hundreds of meters from water, especially in thick vegetation. However, they are most frequently found within five meters of water in densely vegetated areas (Thomson, 2016). Habitat exists locally for this species, although they were not observed within the study area. Marginal northern red-legged frog habitat is present within the coast willow-dominated dune hollow wetland within the northeastern section of the project area. The lack of thick vegetation and expanse of compacted gravel and pavement make it unlikely that any northern red-legged frogs would occur outside of this hollow, and would be unlikely to move too far from it. A wetland area outside of the project area to the west is additional northern red-legged frog habitat; however this area is outside of the project area to the west of the railroad tracks. Wetlands within the project area have been delineated (SHN, 2017) and the project does not propose to impact wetland areas that represent moderate or high quality northern red-legged frog habitat; therefore the project is not anticipated to have a significant impact on this species or its habitat.

5.2.2 Birds

The great egret (*Ardea alba*) forages in brackish marsh, estuaries, freshwater marsh, swamps, riparian areas, and wetlands. It will sometimes forage in open fields, sometimes around cattle. It nests in trees near water and foraging areas. Rookery sites are located near foraging sites within large trees. Habitat does not exist within the project area; however habitat for this species exists surrounding the project area for this species, especially foraging habitat along Humboldt Bay. Occurrences of this species within the project area would most likely be limited to flyover from different foraging locations. Project-related activities are not anticipated to have a significant impact on this species or its habitat.

The great blue heron (*Ardea herodias*) occurs in shallow estuaries and emergent wetlands. It is less common along riverine, rocky marine shores, and pastures. The great blue heron searches for prey in shallow water and open fields. It nests in colonies in tops of secluded large snags/live trees. Habitat does not exist within the project area and this species was not detected within the study area. Habitat for this species exists surrounding the project area for this species, especially foraging habitat along Humboldt Bay. Occurrences of this species within the project area would most likely be limited to flyover from different foraging locations. Project-related activities are not anticipated to have a significant impact on this species or its habitat.

The western snowy plover (*Charadrius alexandrinus nivosus*) is known from sandy beaches, salt pond levees, and shores of large alkaline lakes. It is known to nest above the high tide line on coastal beaches, sand spits, dune-backed beaches, sparsely vegetated dunes, beaches at river mouths, and salt pans at lagoons and estuaries. Although habitat may exist to the west of the project area for this species, it was not detected within the study area. Habitat for this species was not present within the project area, due to vegetation cover, distance from the beach, compacted soils within the project area, and lack of loose sand. Project-related activities are not anticipated to have a significant impact on this species due to a lack of habitat. The closest habitat area for the western snowy plover is 500 feet to the west on the western side of New Navy Base Road, and will not be impacted by this project.

The northern harrier (*Circus cyaneus*) occurs in coastal scrub, Great Basin grassland, marshes, swamps, and riparian scrub. The northern harrier nests and forages in grasslands usually near wet areas, with nesting usually occurring at a marsh edge. This species feeds primarily on rodents and small birds, hunting over open areas. Although habitat may exist locally for this species, it was not detected within the study area. Project-related activities are not anticipated to have a significant impact on this species or its habitat, as riparian areas, marshes, wetlands, and grasslands will not be impacted by the project.

The snowy egret (*Egretta thula*) occurs in marshes, swamps, wetlands, meadows, and riparian woodlands. They are known to forage in marshes, tidal flats, streams, wet meadows, and borders of ponds and lakes with rookery sites situated nearby. This species is a colonial nester with nesting occurring in protected beds of dense tules. Habitat for this species does not exist within the project area, and this species was not observed onsite. Habitat for this species does occur along Humboldt

Bay, and it is expected that this species may flyover the project area on its way to different foraging areas. Project-related activities are not anticipated to have a significant impact on this species or its habitat. Wetlands, marshes, and tidal areas will not be impacted by the project.

The merlin (*Falco columbarius*) occurs along the coast, and tidal estuaries, savannahs, edges of grasslands and deserts, farms and ranches, and within open woodlands. Clumps of trees or windbreaks are required for roosting in open country. Nesting can occur within trees, or clefts of cliffs, or on the ground in pre-existing nests. Merlins hunt small birds, large insects, and less commonly, bats. Although habitat may exist locally for this species, it was not detected within the study area. Project-related activities are not anticipated to have a significant impact on this species or its habitat. Riparian and wooded areas will not be impacted by the project.

The American peregrine falcon (*Falco peregrinus anatum*) is found within many open habitats; however, it is more likely along coastlines, lake edges, and mountain edges. It is most common near wetlands, lakes, rivers, or other water. It often nests on cliffs, banks, dunes, and mounds; also, human-made structures, with the nest consisting of a scrape, depression, or ledge in an open area. The American peregrine falcon hunts birds which it will surprise by diving out of the sky to capture or stun. Although habitat may exist locally for this species, it was not detected within the study area. Project-related activities are not anticipated to have a significant impact on this species or its habitat. The project will occur within compacted gravel and asphalt within vacant industrial lands.

The bald eagle (*Haliaeetus leucocephalus*) is typically found along ocean shores, lake margins, and rivers for both nesting and wintering. Most nests are constructed within one mile of open water within large, old-growth, or dominant live trees with open branches, especially ponderosa pine. No appropriate nesting trees or open water exist within the project area and this species was not observed during the 2017 surveys. Habitat for this species exists surrounding the project area, especially along Humboldt Bay. Occurrences of this species within the project area would most likely be limited to flyover from different foraging locations. Project-related activities are not anticipated to have a significant impact on the bald eagle or its habitat.

The black-crowned night heron (*Nycticorax nycticorax*) occurs in marshes, swamps, wetlands, meadows, and riparian woodlands. They are known to forage in marshes, tidal flats, lake margins, and mud-bordered bays with rookery sites situated nearby. This species is a colonial nester with nesting occurring in trees and occasionally in protected beds of dense tules. Habitat for this species does not exist within the project area, and this species was not observed onsite. Habitat for this species does occur along Humboldt Bay, and it is expected that this species may flyover the project area on its way to different foraging areas. Project-related activities are not anticipated to have a significant impact on this species or its habitat. Wetlands, marshes, and tidal areas will not be impacted by the project.

The osprey (*Pandion haliaetus*) occurs near rivers, lakes, and coast where large numbers of fish are present. Ospreys are most common around major coastal estuaries and salt marshes. This species was observed within the project area, both flying over and perched nearby. Osprey nests were observed atop man-made structures approximately 1,350 feet to the east near the edge of Humboldt Bay. Project-related activities are not anticipated to have a significant impact on this species or its habitat. Ospreys hunt within open water, and do not use the project area for hunting. The lack of tall structures within the project area make it unlikely that this species will perch or nest within the project area in the future. Existing nests are 1,350 feet to the east of the project area and will not be impacted by project activities. Occurrences of Osprey within the project area will most likely be limited to flyover from perch and nesting sites to open water.

The California brown pelican (*Pelecanus occidentalis californicus*) occurs in estuaries and coastal marine habitat where it feeds on fish. This species is a colonial nester on coastal islands just outside of the surf line. Habitat for this species does not exist within the project area, and this species was not observed onsite. The California brown pelican is common in Humboldt Bay, and it is expected that this species may flyover the project area on its way to different feeding areas. Project-related activities are not anticipated to have a significant impact on this species or its habitat. Humboldt Bay wetlands, marshes, and tidal areas will not be impacted by the project.

The double-crested cormorant (*Phalacrocorax auritus*) is known to occur in riparian forests, scrub, and woodlands when feeding. This species nests colonially along the coast on islets usually on the ground, or in tall trees along lake margins. Double-crested cormorants are excellent swimmers, often chasing prey through the water. This species requires exposed perches for drying and resting following feeding. Habitat for this species does not exist within the project area, and this species was not observed onsite. The double-crested cormorant is common in Humboldt Bay, and it is expected that this species may flyover the project area on its way to different feeding areas. Project-related activities are not anticipated to have a significant impact on this species or its habitat. Humboldt Bay wetlands, marshes, and tidal areas will not be impacted by the project.

The black-capped chickadee (*Poecile atricapillus*) inhabits riparian woodlands in Del Norte and northern Humboldt counties. It is mainly found in deciduous trees, especially willows and alders, along large or small watercourses. The chickadee excavates its nest cavity in rotten wood, or nests in old woodpecker holes. Although habitat may exist locally for this species, it was not detected within the study area. Project-related activities are not anticipated to have a significant impact on this species or its habitat. All wetland areas will be avoided during the project and will not be impacted by project-related activities.

5.2.3 Fishes

Many special status fish species occur within Humboldt Bay (See Table A-2 in Appendix A). The project will not impact Humboldt Bay or any waterways or wetlands surrounding Humboldt Bay. All wetland areas will be avoided, and work will occur over 1,400 feet from Humboldt Bay marshes and tidal areas. Work is slated to occur during the dry season, with proper best management practices (BMPs) in place to prevent discharge. Project-related activities are not anticipated to have a significant impact on the special status fish species or habitat of Humboldt Bay.

5.2.4 Insects

The western bumblebee (*Bombus occidentalis*) pollinates a wide variety of flowers. It is known to gnaw through flowers to obtain nectar their tongues are too short to reach. Colonies nest in cavities or abandoned burrows. It was once common and widespread; however it has seriously declined, possibly due to disease. Although habitat may exist locally for this species, it was not detected within the study area. Project-related activities are not anticipated to have a significant impact on this species or its habitat because of the project's limited size and scope, and the lack of flowering plants suitable for pollination by the western bumblebee within the project area.

5.2.5 Mammals

The long-eared myotis (*Myotis evotis*) feeds on a variety of arthropods including moths, flies, spiders, and especially beetles. The long-eared myotis roosts singly, or in small groups in buildings, crevices, spaces under bark, and snags. Caves are used primarily as night roosts. Although habitat may exist locally for this species, it was not detected within the study area. Project-related activities are not anticipated to have a significant impact on this species or its habitat due to the project's limited size and scope and because the project will not affect roosting habitat.

5.3 Special Status Natural Communities and Habitats

Sensitive natural communities are habitats that are generally defined by vegetation type and geographical location and are increasingly restricted in abundance and distribution. Recognition of natural communities is an ecosystem-based approach to maintaining biodiversity in California. Holland-type CNDDB natural communities are habitat for numerous special status plant and animal species. CDFW no longer updates their tracking of Holland-type CNDDB natural communities and has since standardized alliance and association-level vegetation nomenclature for California to comply with the National Vegetation Classification System.

5.3.1 Natural Communities

The disturbed and developed nature of the project area precludes the occurrence of many Natural communities (defined as vegetation alliances) from occurring onsite; however island-like areas of native vegetation communities were observed within and adjacent to the project area. Vegetation alliances within and adjacent to the study area included *Baccharis pilularis* Shrubland Alliance (Coyote brush scrub), *Morella californica* Shrubland Alliance (Wax myrtle scrub), *Rubus* (*parviflorus, spectabilis, ursinus*) Shrubland Alliance (Coastal brambles), and *Salix hookeriana* Shrubland Alliance (Coastal dune willow thicket).

Coyote brush scrub is found within a wide range of conditions, and is known from stabilized dunes and disturbed sites, such as is found within the project area. This vegetation community is common within California, and is known to be increasing in many areas due to human-caused disturbance, and change in fire regimes (Sawyer, 2009). Coyote brush scrub has a rarity ranking of G5S5, meaning this vegetation community is demonstrably secure statewide and globally due to its worldwide and statewide abundance and does not qualify for consideration under CEQA. This vegetation community was found between the compacted former log deck and the dune hollow (see Figure 3 and Photo B-2, Appendix B), with many young plants in other areas, showing potential for an increase in cover by this vegetation community.

Wax myrtle scrub is known from wetland locations within coastal dunes, along coastal streams, and on coastal bluffs. This vegetation community is restricted to moist areas along the coast and consequently is not very common (Sawyer, 2009). Changes in hydrology, fire, and introduction of non-native species have further limited viable occurrences of this vegetation community. Wax myrtle scrub has a rarity ranking of G3S3, meaning this vegetation community occurs on 2,590 to 12,950 hectares and is known from 21 to 100 viable occurrences globally and statewide, and qualifies for consideration under CEQA Guidelines checklist IVb. This vegetation community was documented on the northern side of the dune hollow wetland, as well as from three isolated individuals to the west of the project area south of the recycling facility (see Figure 3 and Photo B-1, Appendix B).

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SHN
Consulting Engineers
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Humboldt Bay Harbor District
Samoa Effluent Pipeline, RMT II NRA
Samoa, California

Vegetation Communities

SHN 015147.100

September 2017

NRA_Fig3_VegCommunities

Figure 3

Coastal brambles vegetation community is known from coastal bluffs, headlands, exposed slopes, and gaps in forests. This vegetation community is restricted to coastal areas which limit the area that this vegetation community can be found (Sawyer, 2009). Consequently, coastal brambles have a rarity ranking of G4S3, meaning that there are over 100 viable occurrences globally, but less than 100 viable occurrences statewide, qualifying for consideration under CEQA Guidelines checklist IVb. Within the project area this vegetation community was dominated exclusively by the California blackberry, and was documented on the top of bank surrounding the coastal dune hollow as well as in a large thicket to the northwest of the recycling facility (see Figure 3 and Photo B-3, Appendix B).

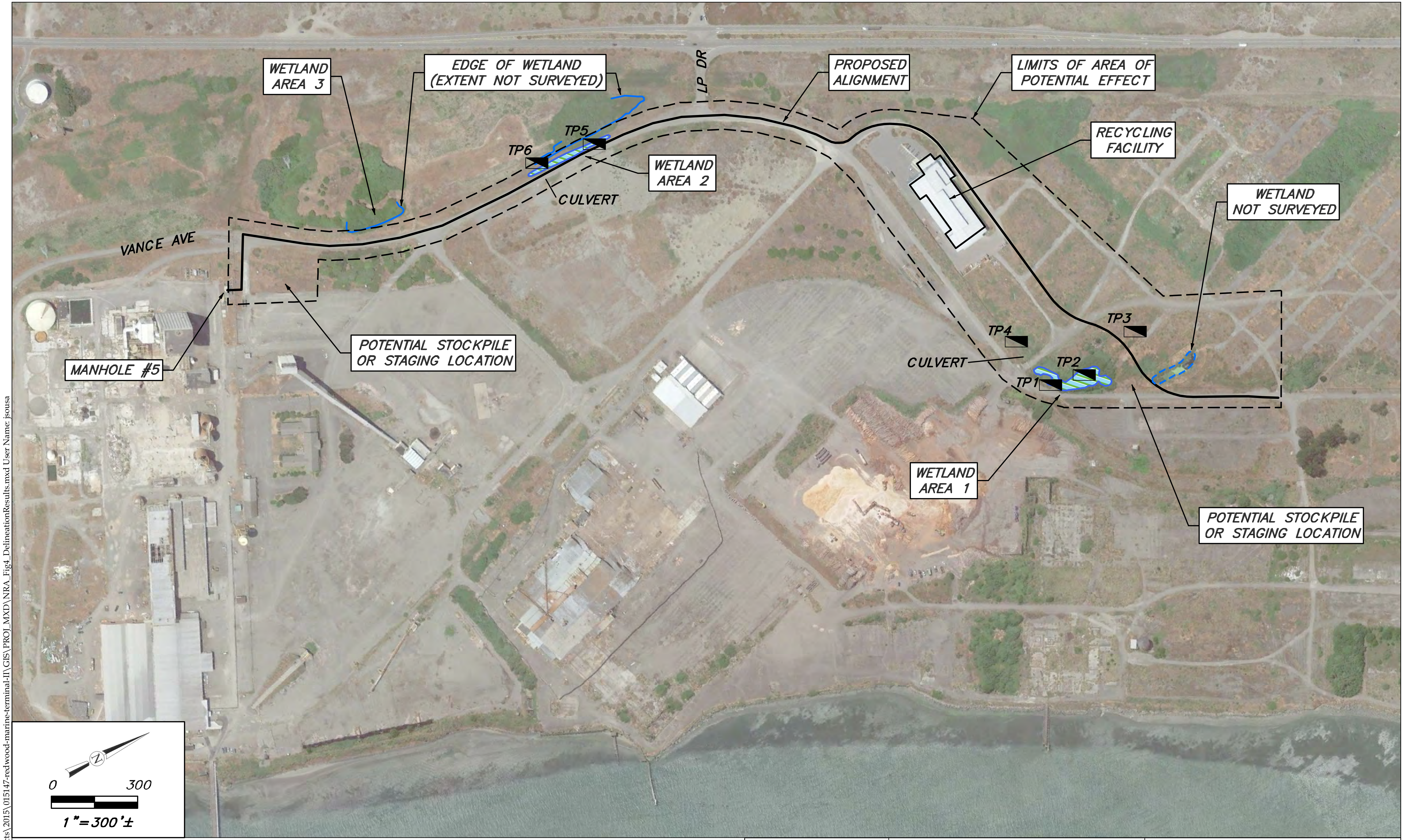
Coastal dune willow thicket is known from areas near the ocean within the summer fog belt, where water stands, and seasonally floods, such as deflation plains and swales among coastal dunes, lagoon margins, and floodplains. This vegetation community is restricted to moist areas along the coast and consequently is not very common (Sawyer, 2009). The coastal dune willow thicket has a rarity ranking of G4S3 meaning that there are over 100 viable occurrences globally, but less than 100 viable occurrences statewide, and qualifies for consideration under CEQA Guidelines checklist IVb. Within the project area, this vegetation community occurs within the coastal dune hollow in the northern portion of the project area, as well as to the west of the project area between the railroad and New Navy Base Road (see Figure 3 and Photo B-1, Appendix B).

Appropriate buffers should be established and maintained for the duration of the project to minimize impacts to the S3 vegetation communities. The dune hollow (containing two of the S3 vegetation communities) was also mapped as wetland within the Samoa effluent pipeline wetland delineation (SHN, 2017) and will be protected by buffers required around wetlands. See Section 7.0 for recommended buffers and setbacks from S3 vegetation communities.

5.3.2 Wetlands and Riparian Habitats

A site-specific wetland delineation was conducted within the proposed project area (SHN, 2017). Wetlands were documented within the northeastern portion of the project area, associated with the existing wastewater treatment pond, and within the dune hollow (see Figure 4). Additional wetlands were observed and documented within and adjacent to the southwestern portion of the project (see Figure 4). This included a drainage ditch between Vance Avenue and the railroad bed as well as wetlands to the west of the project area, on the western side of the railroad fill prism. Wetlands to the west of the railroad are outside of the project area; however wetland setbacks apply to these wetlands that will determine where the pipeline is placed. The wetland delineation (SHN, 2017) also documented and mapped Coastal Act wetlands (one or more wetland parameters present) within the project area. The project is not scheduled to occur on any coastal wetlands. Project-related activities will be designed to avoid wetlands as much as is feasibly possible, however, there are areas where the project will occur within the 100-foot wetland buffer. See Section 7.0 for measures to minimize impacts to the wetlands on site.

There are no riparian areas within the proposed project area.



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Humboldt Bay Harbor District
Samoa Effluent Pipeline, RMT II NRA
Samoa, California

Wetland Delineation Results

SHN 015147.100

September 2017

NRA_Fig4_DelineationResults

Figure 4

6.0 Conclusions

The purpose of this report was to assess the biological resources and habitat available within the study area, and to evaluate project-related impacts. The habitat value and availability was assessed for special status species that could occur within the study area. Recommendations for avoiding and mitigating impacts are addressed in Section 7.0.

6.1 Special Plant Status Species

Of the 53 special status plant species potentially occurring in the area, 40 are considered to have a low potential to occur within the project site, and 13 are considered to have a moderate or higher potential; however, site investigations failed to locate any rare plants within the study area. Surveys were conducted at a seasonally appropriate time for all of the plant species expected to potentially occur within the project area. Surveys of the study area failed to locate any sensitive botanical species at the project site. The project is not likely to affect rare plant species or their habitats, due to the lack of habitat within the project area. The industrial conditions surrounding the project area, and disturbed nature of the project area, are unlikely to support the special status species most likely to occur in the area.

6.2 Special Wildlife Status Species

Of the 50 special status animal species potentially occurring in the Eureka and surrounding quadrangles, 34 animal species are considered to have a low or no potential to occur at the project site, and 16 species have a moderate to high potential.

Special status birds are not likely to be affected by the proposed project. Riparian and wooded areas will not be impacted by the project. No trees will be removed, and no significant vegetation clearing is slated to occur. Construction is proposed to occur within previously developed areas, including a former log deck, the railroad right of way, and alongside Vance Avenue. There may be some noise-related disturbance associated with the construction of the project; however, a minimum 50-foot buffer will be maintained between construction, wetlands, and ESHA (the only areas that contain significant vegetation cover). Construction activities are comparable to existing ongoing industrial operations at the site (including recycling processing, log deck storage and chipping, and small scale industrial operations within the pulp mill buildings) and it is not anticipated that the project will have a significant impact on special status birds. Osprey nests were observed approximately 1,350 feet to the east of the project area along Humboldt Bay. Construction will maintain a 300-foot buffer between construction and nesting osprey.

Special status mammals are not likely to be affected by the proposed project. Wetland habitat will be avoided during construction of the project, and no significant vegetation clearing is slated to occur. Habitats that may be used by bats will not be impacted by the project.

Special status amphibians are not likely to be affected by the proposed project. Wetland habitat and areas suitable for the northern red-legged frog or other special status amphibians will be avoided during construction of the project, and no significant vegetation clearing is slated to occur. Therefore the project is not anticipated to have a significant impact on special status amphibians or their habitats.

Special status fishes are not likely to be affected by the proposed project. All wetland areas will be avoided, and work will occur over 1,400 feet from Humboldt Bay marshes and tidal areas. Work is slated to occur during the dry season, with proper BMPs in place to prevent discharge. Project-related activities are not anticipated to have a significant impact on the special status fish species or habitat of Humboldt Bay.

Special status insects (western bumble bee) are not likely to be affected by the proposed project. Wetland habitat will not be impacted by the project, and no significant vegetation clearing is slated to occur. Project-related activities are not anticipated to have a significant impact on the special status insect species or habitat.

6.3 Sensitive Natural Communities

Three sensitive natural communities (defined as vegetation alliances) were identified within the study area (see Figure 3). Sensitive vegetation communities are not anticipated to be impacted during the project. Vegetation communities will be protected by a 100-foot buffer or a 50-foot buffer where a 100-foot buffer is determined to be infeasible (see Section 7.0 for buffer recommendations). No vegetation clearing is anticipated with this project, and the majority of vegetation communities will have a 100-foot buffer between them and construction. Therefore no impact to a sensitive natural community is anticipated from this project.

6.4 Nesting Birds

Nesting birds protected by the MBTA are not likely to be affected by this project. Only limited vegetation removal is proposed and above-ground disturbance will be limited to construction at previously developed industrial lands. While construction activities associated with the project will temporarily elevate noise levels, birds nesting within and immediately adjacent to the project area are subject to constant disturbance from existing industrial use and traffic on New Navy Base Road; therefore, it is unlikely that birds nesting within such a setting would be persuaded to leave the nest due to construction noise disturbance. Equipment noise within the project area is not likely to exceed that which regularly occurs onsite with ongoing industrial operations, including log deck storage and chipping, recycling processing, and small scale industry within the pulp mill buildings.

6.5 Impacts on Wildlife Movement

Wildlife corridors are not anticipated to be impacted by the proposed effluent pipeline project. The project area is located on the isolated north spit, with little vegetation cover. While this area is used as a flyover path for migratory birds, the lack of vegetation on site make it unlikely that the project area is used for resting, and is most likely bypassed during migrations. The industrial and isolated nature of the site makes it unlikely that the project area is used as a wildlife movement corridor. Wildlife movement corridors are expected to be concentrated along Humboldt Bay and its associated marshes, wetlands, and connectivity to other riparian habitat. The project will not impact a wildlife movement corridor.

6.6 Wetlands and Riparian Habitats

Wetlands within and adjacent to the project area will not be directly impacted by the project. The Samoa effluent pipeline will be located 100 feet from wetlands; however there are several areas were the setback may need to be reduced to 50 feet from the edge of wetlands. If a reduced setback is determined to be the least environmentally damaging feasible alternative, then a reduced wetland setback justification will be written, with information stating why a reduced buffer is justified (see Section 7.0 for recommendations regarding wetland setbacks).

With the incorporation of Recommendations within Section 7.0, the project will not result in a significant impact to wetlands, including indirect impacts.

7.0 Recommendations

The Humboldt Bay Local Coastal Program (LCP) states: "All wetlands and non-wetland ESHAs (within the Samoa Town Master Plan) identified outside of the areas designated Natural Resources shall require a 100-foot setback/buffer, unless it can be demonstrated that a reduced buffer is sufficient to prevent disruption of the habitat. Wetland and non-wetland ESHA buffers shall not be reduced to less than 50 feet." (County of Humboldt, 2007)

Should it be found to be infeasible to locate the pipeline 100 feet from the edge of wetland or ESHA areas, then a minimum 50-foot setback will be created to minimize impacts to wetlands during temporary encroachment into the 100-foot wetland buffer during construction. Should a buffer reduction be required for this project, then a wetland and ESHA buffer reduction assessment shall be submitted that addresses the following:

1. Biological significance of adjacent lands and the functional relationships among nearby habitat types and areas;
2. Sensitivity of species to disturbance;
3. Nesting bird habitat nearby;
4. An assessment of the short-term and long-term adaptability of various species to human disturbance;
5. An assessment of the impact and activity levels of the proposed development on the resource;
6. Erosion susceptibility; and
7. Use of natural topography for situating development. Where feasible, use hills and bluffs adjacent to ESHAs to buffer habitat areas.

Required buffer areas shall be measured from the following points:

- The perimeter of the sand dune/permanently established terrestrial vegetation interface for dune-related ESHA.
- The upland of a wetland.
- The outer edge of the canopy of coastal sage scrub or forests including areas for underground root zones.
- The outer edge of the plants that comprise the rare plant community for rare plant community ESHA.

All BMPs detailed within the project description shall be adhered to in order to reduce impacts during construction.

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Species Lists

Table A-1
Regionally Occurring Special Status Plant Species Scoping List CNDDB[1], CNPS[2], IPaC[3]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	Family	FedList[4]	CalList[4]	GRank[5]	SRank[5]	RPlant Rank	Bloom Period	General Habitat	Micro-Habitat	Potential of Occurrence
Abronia umbellata var. *breviflora*	pink sand-verbena	Nyctaginaceae	None	None	G4G5-T2	S1	1B.1	June-Oct.	Coastal dunes and coastal strand.	Foredunes and interdunes with sparse cover. Usually the plant closest to the ocean. 0-10 m(6).	Low
Angelica lucida	sea-watch	Apiaceae	None	None	G5	S3	4.2	May-Sept.	Coastal strand	Coastal bluff scrub, coastal dunes, coastal scrub, coastal salt marshes. 0-150 m	Moderate
Astragalus pycnostachyus var. *pycnostachyus*	coastal marsh milk-vetch	Fabaceae	None	None	G2T2	S2	1B.2	April-Oct.	Coastal dunes, marshes & swamps, coastal scrub.	Mesic sites in dunes or along streams or coastal salt marshes. 0-155 m.	Moderate
Astragalus rattanii var. *rattanii*	Rattan's milk-vetch	Fabaceae	None	None	G4T4	S4	4.3	April-July	Chaparral, cismontane woodland, lower montane conifer forest.	Open grassy hillsides, gravelly flats in valleys, and gravel bars of stream beds. 30-825 m.	None
Bryoria pseudocapillaris	false gray horsehair lichen	Parmeliaceae	None	None	G3	S2	3.2	Lichen	Coastal dunes, N. Coast conifer forest (immediate coast).	Usually on conifers. 0-90 m.	None
Bryoria spiralifera	twisted horsehair lichen	Parmeliaceae	None	None	G3	S1S2	1B.1	Lichen	North coast conifer forest.	Usually on conifers. 0-30 m.	None
Cardamine angulata	seaside bittercress	Brassicaceae	None	None	G5	S1	2B.1	Jan.-July	Lower montane, conifer forest, N. coast conifer forest, wetland	Wet areas, streambanks. 90-155 m.	Low
Carex arcta	northern clustered sedge	Cyperaceae	None	None	G5	S1	2B.2	June-Sept.	Bogs and fens, north coast conifer forest.	Mesic sites. 60-1,405 m.	Low
Carex leptalea	bristle-stalked sedge	Cyperaceae	None	None	G5	S1	2B.2	March-July	Bogs and fens, meadows and seeps, marshes and swamps.	Mostly known from bogs and wet meadows. 3-1,395 m.	Low

Table A-1
Regionally Occurring Special Status Plant Species Scoping List CNDDB[1], CNPS[2], IPaC[3]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	Family	FedList[4]	CalList[4]	GRank[5]	SRank[5]	RPlant Rank	Bloom Period	General Habitat	Micro-Habitat	Potential of Occurrence
Carex lyngbyei	Lyngbye's sedge	Cyperaceae	None	None	G5	S3	2B.2	April-August	Marsh & swamp (brackish or freshwater).	0-200 m.	None
Carex praticola	northern meadow sedge	Cyperaceae	None	None	G5	S2	2B.2	May-July	Meadows and seeps.	Moist to wet meadows. 15-3200 m.	None
Castilleja ambigua var. *humboldtiensis*	Humboldt Bay owl's-clover	Orobanchaceae	None	None	G4T2	S2	1B.2	April-August	Marshes and swamps.	Coastal saltmarsh with Spartina, Distichlis, Salicornia, Jaumea. 0-20 m.	None
Castilleja litoralis	Oregon coast paintbrush	Orobanchaceae	None	None	G3	S3	2B.2	June	Coastal bluff scrub, coastal dunes, coastal scrub.	Sandy sites. 5-255 m.	Moderate
Chloropyron maritimum ssp. *palustre*	Point Reyes salty bird's-beak	Orobanchaceae	None	None	G4?T2	S2	1B.2	June-Oct.	Coastal salt marsh.	Usually in coastal salt marsh with Salicornia, Distichlis, Jaumea, Spartina, etc. 0-10 m.	None
Chrysosplenium glechomifolium	Pacific golden saxifrage	Saxifragaceae	None	None	G5	S3	4.3	Feb.-June	North Coast coniferous forest, riparian forest	Streambanks, sometimes seeps, sometimes roadsides. 10-220 m.	None
Clarkia amoena ssp. *whitneyi*	Whitney's farewell-to-spring	Onagraceae	None	None	G5T1	S1	1B.1	June-August	Coastal bluff scrub, coastal scrub.	10-100 m.	Low
Collinsia corymbosa	round-headed Chinese-houses	Plantaginaceae	None	None	G1	S1	1B.2	April-June	Coastal Dunes	Coastal dunes from 10-30 m	Low
Collomia tracyi	Tracy's collomia	Polemoniaceae	None	None	G4	S4	4.3	June-July	Lower montane coniferous forest, ultramafic.	On rock outcrops. On serpentine at least sometimes. 300-2,100 m.	None
Eleocharis parvula	small spikerush	Cyperaceae	None	None	G5	S4	4.3	July-August	Marsh & swamp, salt marsh, wetland	In coastal salt marshes. 1-3,020 m.	Low
Erysimum menziesii	Menzies' wallflower	Brassicaceae	E	E	G1	S1	1B.1	March-Sept.	Coastal dunes.	Localized on dunes and coastal strand. 0-35 m.	High

Table A-1
Regionally Occurring Special Status Plant Species Scoping List CNDDB[1], CNPS[2], IPaC[3]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	Family	FedList[4]	CalList[4]	GRank[5]	SRank[5]	RPlant Rank	Bloom Period	General Habitat	Micro-Habitat	Potential of Occurrence
Erythronium revolutum	coast fawn lily	Liliaceae	None	None	G4G5	S3	2B.2	March-August	Bogs & fens, broadleaf upland forest, north coast conifer forest.	Mesic sites; streambanks. 60-1,405 m.	None
Fissidens pauperculus	minute pocket moss	Fissidentaceae	None	None	G3?	S2	1B.2	Lichen	North coast coniferous forest, Redwood.	Moss growing on damp soil along the coast. In dry streambeds& stream banks. 10-1,024 m.	None
Gilia capitata ssp. *pacifica*	Pacific gilia	Polemoniaceae	None	None	G5T3	S2	1B.2	April-August	Coastal bluff scrub, chaparral, coastal prairie, valley & foothill grassland.	5-1,345 m.	Low
Gilia millefoliata	dark-eyed gilia	Polemoniaceae	None	None	G2	S2	1B.2	April-July	Coastal dunes.	1-60 m.	High
Glehnia littoralis ssp. *leiocarpa*	American glehnia	Apiaceae	None	None	G5T5	S3	4.2	May-August	Coastal Dunes	0-20 m.	High
Hesperevax sparsiflora var. *brevifolia*	short-leaved evax	Asteraceae	None	None	G4T3	S2	1B.2	March-June	Coastal bluff scrub, coastal dunes, coastal prairie.	Sandy bluffs and flats. 0-215 m.	Moderate
Hosackia gracilis	harlequin lotus	Fabaceae	None	None	G4	S3	4.2	March-July	Broadleaf upland forest, coast bluff scrub, coast prairie, coast scrub, closed-cone conifer forest, meadow, seep, marsh & swamp, N. coast conifer forest, valley & foothill grassland.	Wetlands and roadsides. 0-700 m.	Moderate
Lasthenia californica ssp. *macrantha*	perennial goldfields	Asteraceae	None	None	G3T2	S2	1B.2	Jan.-Nov.	Coastal bluff scrub, coastal dunes, coastal scrub.	5-185 m.	Low

Table A-1
Regionally Occurring Special Status Plant Species Scoping List CNDDB[1], CNPS[2], IPaC[3]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	Family	FedList[4]	CalList[4]	GRank[5]	SRank[5]	RPlant Rank	Bloom Period	General Habitat	Micro-Habitat	Potential of Occurrence
Lathyrus glandulosus	sticky pea	Fabaceae	None	None	G3	S3	4.3	April-June	Cismontane woodland.	In oak woodlands upland from the coast redwood forests & along roadsides. 300-800 m.	None
Lathyrus japonicus	seaside pea	Fabaceae	None	None	G5	S2	2B.1	May-August	Coastal dunes.	3-65 m.	Moderate
Lathyrus palustris	marsh pea	Fabaceae	None	None	G5	S2	2B.2	March-August	Bogs & fens, lower montane conifer forest, marsh & swamp, north coast conifer forest, coastal prairie, coastal scrub.	Moist coastal areas. 2-140 m.	Moderate
Layia carnosa	beach layia	Asteraceae	E	E	G2	S2	1B.1	March-July	Coastal dunes, coastal scrub.	On sparsely vegetated, semi-stabilized dunes, usually behind foredunes. 0-30 m.	High
Lilium kelloggii	Kellogg's lily	Liliaceae	None	None	G3	S3	4.3	May-August	Lower montane conifer forest, N. coast conifer forest.	Gaps and roadsides in conifer forest. 3-1,300 m.	None
Lilium occidentale	western lily	Liliaceae	E	E	G1	S1	1B.1	June-July	Coastal scrub, freshwater marsh, bogs & fens, coastal bluff scrub, coast prairie, N. coast conifer forest, marshes and swamps.	Well-drained, old beach washes overlain with wind-blown alluvium and organic topsoil; usually near margins of Sitka spruce. 3-110 m.	None
Listera cordata	heart-leaved twayblade	Orchidaceae	None	None	G5	S4	4.2	Feb.-July	Lower montane conifer forest, north coast conifer forest.	Bogs and fens, 5-1,370 m.	None

Table A-1
Regionally Occurring Special Status Plant Species Scoping List CNDDB[1], CNPS[2], IPaC[3]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	Family	FedList[4]	CalList[4]	GRank[5]	SRank[5]	RPlant Rank	Bloom Period	General Habitat	Micro-Habitat	Potential of Occurrence
Lycopodium clavatum	running-pine	Lycopodiaceae	None	None	G5	S3	4.1	June-Sept.	Lower montane conifer forest, north coast conifer forest, marsh &swamp.	Forest understory, edges, openings, roadsides; mesic sites with partial shade and light. 45-1,225 m.	None
Mitellastra caulescens	leafy-stemmed mitrewort	Saxifragaceae	None	None	G5	S4	4.2	March-Oct.	Broadleaf upland forest, lower montane conifer forest, meadow & seep, N. coast conifer forest.	Mesic sites. 5-1,700 m.	None
Monotropa uniflora	ghost-pipe	Ericaceae	None	None	G5	S2	2B.2	June-Sept.	Broadleaved upland forest, north coast conifer forest.	Often under redwoods or west hemlock. 15-855 m.	None
Montia howellii	Howell's montia	Montiaceae	None	None	G3G4	S2	2B.2	Feb.-May	Meadows and seeps, north coast coniferous forest, vernal pools.	Vernally wet sites; often on compacted soil. 10-1,005 m.	Moderate
Oenothera wolfii	Wolf's evening-primrose	Onagraceae	None	None	G2	S1	1B.1	May-Oct.	Coastal bluff scrub, coastal dunes, coastal prairie, low montane conifer forest.	Sandy substrates; usually mesic sites. 0-125 m.	Moderate
Packera bolanderi var. *bolanderi*	seacoast ragwort	Asteraceae	None	None	G4T4	S2S3	2B.2	Jan.-August	Coastal scrub, north coast conifer forest.	Often along roadsides. 30-915 m.	Low
Pityopus californicus	California pinefoot	Ericaceae	None	None	G4G5	S4	4.2	March-August	Broadleaf upland forest, upper montane and, N. coast conifer forest, low montane conifer forest.	Deep shade with few understory species, often under layer of duff, in rocky to clay loam soil. 15-2,225 m.	None
Pleuropogon refractus	nodding semaphore grass	Poaceae	None	None	G4	S4	4.2	March-August	Meadow & seep, low montane conifer forest, N. coast conifer forest, riparian forest.	Mesic sites along streams, grassy flats in shaded redwood groves. 0-1,600 m.	None

Table A-1
Regionally Occurring Special Status Plant Species Scoping List CNDDB[1], CNPS[2], IPaC[3]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	Family	FedList[4]	CalList[4]	GRank[5]	SRank[5]	RPlant Rank	Bloom Period	General Habitat	Micro-Habitat	Potential of Occurrence
Polemonium carneum	Oregon polemonium	Polemoniaceae	None	None	G3G4	S2	2B.2	April-Sept.	Coast scrub & prairie, low montane conifer forest.	0-1,830 m.	None
Puccinellia pumila	dwarf alkali grass	Poaceae	None	None	G4?	SH	2B.2	July	Marshes and swamps.	Mineral spring meadows and coastal salt marshes. 1-10 m.	None
Ribes laxiflorum	trailing black currant	Grossulariaceae	None	None	G5	S4	4.3	March-August	N. coast conifer forest, Redwood forests.	Grows over logs and stumps in moist, wet places. 5-1,395 m.	None
Sidalcea malachroides	maple-leaved checkerbloom	Malvaceae	None	None	G3	S3	4.2	March-August	Broadleaf upland forest, coast prairie, coast scrub, N. coast conifer forest, riparian.	Woodlands and clearings near coast; often in disturbed areas. 0-730 m.	None
Sidalcea malviflora ssp. *patula*	Siskiyou checkerbloom	Malvaceae	None	None	G5T2	S2	1B.2	May-August	Coastal bluff scrub, coastal prairie, north coast conifer forest.	Open coastal forest; road cuts. 5-1,255 m.	Low
Sidalcea oregana ssp. *eximia*	coast checkerbloom	Malvaceae	None	None	G5T1	S1	1B.2	June-August	Meadow & seep, N. coast & low montane conifer forest.	Near meadows, in gravelly soil. 5-1,805 m.	None
Spergularia canadensis var. *occidentalis*	western sand-spurrey	Caryophyllaceae	None	None	G5T4	S1	2B.1	June-August	Marshes and swamps (coastal salt marshes).	0-3 m.	None
Trichodon cylindricus	cylindrical trichodon	Ditrichaceae	None	None	G4	S2	2B.2	Moss	Broadleafed upland forest, upper montane coniferous forest.	Moss growing in openings on sandy or clay soils on roadsides, stream banks, trails or in fields. 50-1,500 m.	None
Usnea longissima	Methuselah's beard lichen	Parmeliaceae	None	None	G4	S4	4.2	Lichen	North coast coniferous forest, broadleaf upland forest.	In the "redwood zone" on tree branches of a variety of trees, incl. big leaf maple, oaks, ash, Douglas-fir, and bay. 45-1,465 m in California.	None

Table A-1
Regionally Occurring Special Status Plant Species Scoping List CNDDB[1], CNPS[2], IPaC[3]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	Family	FedList[4]	CalList[4]	GRank[5]	SRank[5]	RPlant Rank	Bloom Period	General Habitat	Micro-Habitat	Potential of Occurrence
Viola palustris	alpine marsh violet	Violaceae	None	None	G5	S1S2	2B.2	March-August	Coastal scrub, bogs and fens.	Swampy, shrubby places in coastal scrub or coastal bogs. 0-150 m.	Low

1. CNDDB: California Natural Diversity Database
2. CNPS: California Native Plant Society
3. IPaC: Information, Planning, and Conservation System
4. Species indicator status as assigned by Federal Endangered Species Act (FESA), California Endangered Species Act (CESA), and California Department of Fish and Wildlife (CDFW). Note: Occurrence rankings need evaluation in report. 3/31/2017
   - C: candidate
   - CT: candidate threatened
   - D: delisted
   - DPS: distinct population segment
   - E: endangered
   - ESU: evolutionarily significant unit
   - FP: fully protected
   - PT: proposed threatened
   - SSC: species of special concern
   - T: threatened
   - WL: watch list
5. Species Heritage rank as assigned by California Department of Fish and Wildlife (CDFW)
   - G1/S1: critically imperiled
   - G2/S2: imperiled
   - G3/S3: vulnerable
   - G4/S4: apparently secure
   - G5/S5: secure
6. m: meters

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Amphibians									
Ascaphus truei	Pacific tailed frog	None	None, SSC	G4	S3S4	Aquatic, Klamath/ N. coast flowing waters, Lower montane conifer, N. coast conifer, Redwood, and Riparian forests	Occurs in montane hardwood-conifer, redwood, Douglas-fir & ponderosa pine habitats.	Restricted to perennial montane streams. Tadpoles require water below 15 degrees C.	None
Rana aurora	northern red-legged frog	None	None, SSC	G4	S3	Klamath/N. coast flowing waters, riparian forest, riparian woodland	Humid forests, woodlands, grasslands, & streamsides in NW California, usually near dense riparian cover.	Generally near permanent water, but can be found far from water, in damp woods and meadows, during non-breeding season.	High
Rana boylii	foothill yellow-legged frog	None	None, SSC	G3	S3	Aquatic, Chaparral, Cismontane woodland, coast scrub, Klamath/N. coast flowing waters, lower montane conifer forest, meadow & seep, riparian forest and woodland	Partly-shaded, shallow streams & riffles with a rocky substrate in a variety of habitats.	Need at least some cobble-sized substrate for egg-laying. Need at least 15 weeks to attain metamorphosis.	None
Rhyacotriton variegatus	southern torrent salamander	None	None, SSC	G3G4	S2S3	Lower montane conifer forest, old growth, redwood forest, riparian forest.	Coastal redwood, Douglas-fir, mixed conifer, montane riparian, and montane hardwood-conifer habitats. Old growth forest.	Cold, well-shaded, permanent streams and seepages, or within splash zone or on moss-covered rock within trickling water.	None

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Birds									
Accipiter cooperii	Cooper's hawk	None	None, WL	G5	S4	Cismontane woodland Riparian forest Riparian woodland Upper montane conifer forest	Woodland, chiefly of open, interrupted or marginal type.	Nest sites mainly in riparian growths of deciduous trees, as in canyon bottoms on river flood-plains; also, live oaks.	Low
Accipiter striatus	sharp-shinned hawk	None	None, WL	G5	S4	Cismontane woodland, lower montane conifer forest, riparian forest, riparian woodland	Ponderosa pine, black oak, riparian deciduous, mixed conifer & Jeffrey pine habitats. Prefers riparian areas.	North-facing slopes, with plucking perches are critical requirements. Nests usually within 275 ft of water.	None
Ardea alba	great egret	None	None	G5	S4	Brackish marsh, estuary, freshwater marsh, marsh & swamp, riparian forest, wetland	Colonial nester in large trees.	Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.	High
Ardea herodias	great blue heron	None	None	G5	S4	Brackish marsh, estuary, freshwater marsh, marsh & swamp, riparian forest, wetland	Colonial nester in tall trees, cliff sides, and sequestered spots on marshes.	Rookery sites in close proximity to foraging areas: marshes, lake margins, tide-flats, rivers and streams, wet meadows.	High
Brachyramphus marmoratus	marbled murrelet	Threatened	Endangered	G3G4	S1	Lower montane conifer forest, Oldgrowth Redwood	Feeds near-shore; nests inland along coast from Eureka to Oregon border.	Nests in old-growth redwood-dominated forests, up to 6 mi. inland, often in Douglas-fir.	None
Charadrius alexandrinus nivosus	western snowy plover	T	None, SSC	G3T3	S2S3	Great Basin standing waters, Sand shore, Wetland	Sandy beaches, salt pond levees & shores of large alkali lakes.	Needs sandy, gravelly or friable soils for nesting.	High

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Charadrius montanus	mountain plover	None	None, SSC	G3	S2S3	Chenopod scrub Valley & foothill grassland	Short grasslands, freshly plowed fields, newly sprouting grain fields, & sometimes sod farms.	Short vegetation, bare ground & flat topography. Prefers grazed areas & areas with burrowing rodents.	None
Circus cyaneus	northern harrier	None	None, SSC	G5	S3	Coastal scrub, Great Basin grassland, Marsh & swamp, Riparian scrub	Coastal salt & fresh-water marsh. Nest & forage in grasslands, from salt grass in desert sink to mountain cienagas.	Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	High
Coccyzus americanus occidentalis	western yellow-billed cuckoo	T	E	G5T2T3	S1	Riparian forest	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems.	Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.	None
Egretta thula	snowy egret	None	None	G5	S4	Marsh & swamp, meadow & seep, riparian forest, riparian woodland, wetland	Colonial nester, with nest sites situated in protected beds of dense tules.	Rookery sites situated close to foraging areas: marshes, tidal-flats, streams, wet meadows, and borders of lakes.	Moderate
Elanus leucurus	white-tailed kite	None	None, FP	G5	S3S4	Cismontane woodland, marsh & swamp, riparian woodland, valley & foothill grassland, wetland	Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland.	Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	Low

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Falco columbarius	merlin	None	None, WL	G5	S3S4	Estuary, Great Basin grassland, Valley & foothill grassland	Seacoast, tidal estuaries, open woodlands, savannahs, edges of grasslands & deserts, farms & ranches.	Clumps of trees or windbreaks are required for roosting in open country.	Moderate
Falco peregrinus anatum	American peregrine falcon	Delisted	Delisted, FP	G4T4	S3S4	Many open habitats, however, more likely along coastlines, lake edges, mountain edges.	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures.	Nest consists of a scrape or a depression or ledge in an open site.	Moderate
Haliaeetus leucocephalus	bald eagle	Delisted	Endangered, FP	G5	S3	Lower montane conifer forest, Oldgrowth	Ocean shore, lake margins, & rivers for both nesting & wintering. Most nests within 1 mile of water.	Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	Moderate
Icteria virens	yellow-breasted chat	None	None, SSC	G5	S3	Riparian forest, Riparian scrub, Riparian woodland	Summer resident; inhabits riparian thickets of willow & other brushy tangles near watercourses.	Nests in low, dense riparian, consisting of willow, blackberry, wild grape; forages and nests within 10 feet of ground.	Low
Numenius americanus	long-billed curlew	None	None, WL	G5	S2	Great Basin grassland Meadow & seep	Breeds in upland shortgrass prairies & wet meadows in northeastern California.	Habitats on gravelly soils and gently rolling terrain are favored over others.	None

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Nycticorax nycticorax	black-crowned night heron	None	None	G5	S4	Marsh & swamp, riparian forest, riparian woodland, wetland	Colonial nester, usually in trees, occasionally in tule patches.	Rookery sites located adjacent to foraging areas: lake margins, mud-bordered bays, marshy spots.	Moderate
Pandion haliaetus	osprey	None	None, WL	G5	S4	Riparian forest	Ocean shore, bays, fresh-water lakes, and larger streams.	Large nests built in tree-tops within 15 miles of a good fish-producing body of water.	**Present**
Pelecanus occidentalis californicus	California brown pelican	Delisted	Delisted, FP	G4T3	S3	Estuaries and coastal marine habitat.	Colonial nester on coastal islands just outside the surf line.	Nests on coastal islands of small to moderate size which afford immunity from attack by ground-dwelling predators. Roosts communally.	High
Phalacrocorax auritus	double-crested cormorant	None	None	G5	S4	Riparian forest, Riparian scrub, Riparian woodland	Colonial nester on coastal cliffs, offshore islands, & along lake margins in the interior of the state.	Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.	High
Poecile atricapillus	black-capped chickadee	None	None, WL	G5	S3	Riparian woodland	Inhabits riparian woodlands in Del Norte and northern Humboldt counties.	Mainly found in deciduous tree-types, especially willows and alders, along large or small watercourses.	Moderate

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Rallus longirostris obsoletus	California clapper rail	Endangered	Endangered, FP	G5T1	S1	Brackish marsh Marsh & swamp Salt marsh Wetland	Salt-water & brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay.	Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	None
Riparia riparia	bank swallow	None	T	G5	S2	Riparian scrub, Riparian woodland	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert.	Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	None
Setophaga petechia	yellow warbler	None	None, SSC	G5	S3S4	Riparian forest, Riparian scrub, Riparian woodland Also nests in montane shrubbery in open conifer forests in Cascades and Sierra Nevada.	Riparian plant associations in close proximity to water.	Frequently found nesting and foraging in willow shrubs and thickets, and in other riparian plants including cottonwoods, sycamores, ash, and alders.	Low
Strix nebulosa	great gray owl	None	Endangered	G5	S1	Lower montane conifer forest, old growth, subalpine conifer forest, upper montane conifer forest.	Resident of mixed conifer or red fir forest habitat, in or on edge of meadows.	Requires large diameter snags in a forest with high canopy closure, which provide a cool sub-canopy microclimate.	None

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Strix occidentalis caurina	northern spotted owl	Threatened	SSC	G3T3	S2S3	North coast conifer forest, Oldgrowth Redwood	Old-growth forests or mixed stands of old-growth & mature trees. Occasional in younger forests with patches of big trees.	High, multistory canopy dominated by big trees, many trees with cavities or broken tops, woody debris & space under canopy.	None
Fish									
Acipenser medirostris	green sturgeon	T	None, SSC	G3	S1S2	Aquatic, Klamath/N. coast flowing waters, Sacramento/ San Joaquin flowing waters	The most marine species of sturgeon. Abundance increases northward of Point Conception. Spawns in the Sacramento, Klamath, & Trinity Rivers.	Spawns at temps between 8-14 °C (degrees Celsius). Preferred spawning substrate is large cobble, but can range from clean sand to bedrock.	None
Entosphenus tridentatus	Pacific lamprey	None	None, SSC	G4	S4	Aquatic, Klamath/N. coast flowing waters, Sacramento/ San Joaquin flowing waters, South coast flowing waters	Found in Pacific Coast streams north of San Luis Obispo Co.; however, regular runs in Santa Clara River. Size of runs is declining.	Swift-current gravel-bottomed areas for spawning with water temps between 12-18 °C. Ammocoetes need soft sand or mud.	None
Eucyclogobius newberryi	tidewater goby	E	None, SSC	G3	S3	Aquatic, Klamath/North coast flowing waters, Sacramento/ San Joaquin flowing waters, South coast flowing waters	Brackish water habitats along the Calif coast from Agua Hedionda Lagoon, San Diego Co. to the mouth of the Smith River.	Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water & high oxygen levels.	None

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Oncorhynchus clarkii clarkii	coast cutthroat trout	None	None, SSC	G4T4	S3	Aquatic | Klamath/North coast flowing waters	Small coastal streams from the Eel River to the Oregon border.	Small, low-gradient coastal streams & estuaries. Need shaded streams with water temps <18°C, & small gravel for spawning	None
Oncorhynchus kisutch	Coho salmon (S. Oregon/N. California ESU)	Threat-ened	Threat-ened	G4T2Q	S2?	Aquatic, Klamath/North coast flowing waters, Sacramento/ San Joaquin flowing waters	Fed listing refers to populations between Cape Blanco, Oregon & Punta Gorda, Humboldt County, California.	State listing refers to populations between the Oregon border & Punta Gorda, California.	None
Oncorhynchus mykiss irideus	summer run steelhead trout	None	None, SSC	G5T4Q	S2	Aquatic Klamath/North coast flowing waters Sacramento/San Joaquin flowing waters	No. Calif coastal streams south to Middle Fork Eel River. Within range of Klamath Mtns province DPS & No. Calif DPS.	Cool, swift, shallow water & clean loose gravel for spawning, & suitably large pools in which to spend the summer.	None
Oncorhynchus tshawytscha	Chinook salmon (California coast ESU)	Threat-ened	None	G5	S1	Aquatic Sacramento/San Joaquin flowing waters	Federal listing refers to wild spawned, coastal, spring & fall runs between Redwood Cr, Humboldt Co & Russian R., Sonoma Co	Major limiting factor for juvenile chinook salmon is temperature, which strongly effects growth & survival.	None
Spirinchus thaleichthys	longfin smelt	C	T, SSC	G5	S1	Aquatic | Estuary	Euryhaline, nektonic & anadromous. Open waters of estuaries, mostly mid to bottom of water column.	Prefer salinities of 15-30 ppt[5], but can be found in completely freshwater to almost pure seawater.	None

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Thaleichthys pacificus	Eulachon	Threatened	None	G5	S3	Aquatic Klamath/North coast flowing waters	Found in Klamath River, Mad River, Redwood Creek & in small numbers in Smith River & Humboldt Bay tributaries.	Spawn in lower reaches of coastal rivers with moderate water velocities & bottom of pea-sized gravel, sand & woody debris	None
Insects									
Bombus caliginosus	obscure bumble bee	None	None	G4?	S1S2	Nests underground or above ground in abandoned bird nests.	Coastal areas from Santa Barbara county to north to Washington state.	Food plant genera include Baccharis, Cirsium, Lupinus, Lotus, Grindelia, and Phacelia.	Low
Bombus occidentalis	western bumble bee	None	None	G2G3	S1	Pollinates a wide variety of flowers. Will gnaw through flowers to obtain nectar their tongues are too short to reach.	Once common & widespread; species has declined precipitously from central CA to southern B.C., perhaps from disease.	Nest in cavities or abandoned burrows.	Moderate
Cicindela hirticollis gravida	sandy beach tiger beetle	None	None	G5T2	S2	Coastal dunes	Inhabits areas adjacent to non-brackish water along the coast of California from San Francisco Bay to northern Mexico.	Clean, dry, light-colored sand in the upper zone. Subterranean larvae prefer moist sand not affected by wave action.	None

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Mammals									
Arborimus albipes	white footed vole	None	None, SSC	G3G4	S2	North coast coniferous forest, Redwood, Riparian forest	Mature coastal forests in Humboldt & Del Norte Cos. Prefers areas near small, clear streams with dense alder & shrubs.	Occupies the habitat from the ground surface to the canopy. Feeds in all layers & nests on the ground under logs or rock	None
Arborimus pomo	Sonoma tree vole	None	None, SSC	G3	S3	North coast conifer forest, old growth, redwood forest	N. coast fog belt from Oregon border to Sonoma Co. In Douglas-fir, redwood & montane hardwood-conifer forests.	Feeds almost exclusively on Douglas-fir needles. Will occasionally take needles of grand fir, hemlock or spruce.	None
Corynorhinus townsendii	Townsend's big-eared bat	None	None, SSC	G3G4	S2	Broadleaf upland forest, chaparral, lower montane conifer forest, meadow & seep, riparian forest, riparian wood-land, montane conifer forest, valley & foothill grassland	Throughout California in a wide variety of habitats. Most common in mesic sites.	Roosts in the open, hanging from walls & ceilings. Roosting sites limiting. Extremely sensitive to human disturbance.	Low
Martes caurina humboldtensis	Humboldt marten	None	CE, SSC	G5T1	S1	North coast conifer forest, old growth, Redwood forest	Occurs only in the coastal redwood zone from the Oregon border south to Sonoma County.	Associated with late-successional coniferous forests, prefer forests with low, overhead cover.	None

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence
Myotis evotis	long-eared myotis	None	None	G5	S3	Roosts in a wide range of substrate.	Found in all brush, woodland & forest habitats from sea level to about 9,000 feet; prefers coniferous woodlands & forests.	Nursery colonies in buildings, crevices, spaces under bark, & snags. Caves used primarily as night roosts.	Moderate
Pekania pennanti	fisher (west coast DPS)	Prop. Threat-ened	Cand. Threat-ened, SSC	G5T2-T3Q	S2S3	North coast conifer forest, old growth, riparian forest	Intermediate to large-tree stages of conifer forests & deciduous-riparian areas with high percent canopy closure.	Uses cavities, snags, logs & rocky areas for cover & denning. Needs large areas of mature, dense forest.,	None
Reptiles									
Emys marmorata	western pond turtle	None	None, SSC	G3G4	S3	Aquatic, Artificial flowing waters, Klamath/North coast flowing waters, Klamath/North coast standing waters, Marsh & swamp, Wetland	A thoroughly aquatic turtle of ponds, marshes, rivers, streams & irrigation ditches, usually with aquatic vegetation, below 6.000 feet elevation.	Need basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km(6) from water for egg-laying.	None
Mollusks									
Anodonta californiensis	California floater	None	None	G3Q	S2?	Freshwater lakes and slow-moving streams and rivers. Taxonomy under review by specialists.	Aquatic	Generally in shallow water.	None

Table A-2
Regionally Occurring Special Status Animal Species Scoping List CNDDB[1], IPaC[2]
RMT II Samoa Effluent Pipeline Project

Scientific Name	Common Name	FedList[3]	CalList[3]	GRank[4]	SRank[4]	Habitats	GenHab	MicroHab	Potential of Occurrence

1. CNDDB: California Natural Diversity Database
2. IPaC: Information, Planning, and Conservation System
3. Species indicator status as assigned by Federal Endangered Species Act (FESA), California Endangered Species Act (CESA), and California Department of Fish and Wildlife (CDFW)

C: candidate
CT: candidate threatened
D: delisted
DPS: distinct population segment
E: endangered
ESU: evolutionarily significant unit
FP: fully protected
PT: proposed threatened
SSC: species of special concern
T: threatened
WL: watch list

4. Species Heritage rank as assigned by California Department of Fish and Wildlife (CDFW)

G1/S1: critically imperiled
G2/S2: imperiled
G3/S3: vulnerable
G4/S4: apparently secure
G5/S5: secure

5. ppt: parts per trillion
6. km: kilometer

Table A-3
Botanical Species Observed 3/23/17, 3/24/17,7/26/2017
RMTII Samoa Effluent Pipeline

Scientific Name	Common Name	Family	Native?
Trees			
Hesperocyparis macrocarpa	Monterrey cypress	Cupressaceae	N
Morella californica	California wax-myrtle	Myricaceae	Y
Picea sitchensis	Sitka spruce	Pinaceae	Y
Pinus contorta ssp. *contorta*	beach pine	Pinaceae	Y
Pinus radiata	Monterrey pine	Pinaceae	N
Salix hookeriana	dune willow	Salicaceae	Y
Shrubs			
Baccharis pilularis	coyote brush	Asteraceae	Y
Ceanothus joyce coulter	California lilac (Cultivar)	Rhamnaceae	N
Cistus incanus	hairy rock rose (Cultivar)	Cistaceae	N
Cotoneaster lacteus	milkflower cotoneaster	Rosaceae	N
Cytisus scoparius	scotch broom	Fabaceae	N
Escallonia rubra	escallonia cultivar	Grossulariaceae	N
Garrya elliptica	coast silk tassel	Garryaceae	Y
Juniperus chinensis	landscape juniper	Cupressaceae	N
Lonicera involucrata	twinberry	Caprifoliaceae	Y
Lupinus arboreus	yellow bush lupine	Fabaceae	N
Rubus armeniacus	Himalayan blackberry	Rosaceae	N
Rubus ursinus	California blackberry	Rosaceae	Y
Ulex europaeus	gorse	Fabaceae	N
Ferns and Allies			
Polypodium scouleri	leatherleaf fern	Polypodiaceae	Y
Polystichum munitum	sword fern	Dryopteridaceae	Y
Sedges and Rushes			
Carex obnupta	slough sedge	Cyperaceae	Y
Carex subbracteata	small bract sedge	Cyperaceae	Y
Cyperus eragrostis	tall flatsedge	Cyperaceae	Y
Juncus bufonius	toad rush	Juncaceae	Y
Juncus effuses	common rush	Juncaceae	Y
Juncus breweri	brewer's rush	Juncaceae	Y
Luzula comosa	common woodrush	Juncaceae	Y
Grasses			
Agrostis exarata	spike bentgrass	Poaceae	Y
Agrostis stolonifera	creeping bentgrass	Poaceae	N
Ammophila arenaria	European beachgrass	Poaceae	N
Anthoxanthum odoratum	sweet vernal grass	Poaceae	N
Briza maxima	large quaking grass	Poaceae	N
Bromus catharticus	rescue grass	Poaceae	N
Cortaderia jubata	pampus grass	Poaceae	N
Cynosurus echinatus	annual dogtail grass	Poaceae	N
Dactylis glomerata	orchard grass	Poaceae	N

Table A-3
Botanical Species Observed 3/23/17, 3/24/17, 7/26/2017
RMTII Samoa Effluent Pipeline

Scientific Name	Common Name	Family	Native?
Festuca arundinacea	tall fescue	Poaceae	N
Festuca bromoides	brome fescue	Poaceae	N
Festuca microstachys	small fescue	Poaceae	Y
Festuca rubra	red fescue	Poaceae	Y
Holcus lanatus	velvet grass	Poaceae	N
Phalaris arundinacea	Canary reedgrass	Poaceae	N
Poa annua	annual grass	Poaceae	N
Herbs			
Abronia latifolia	coastal sand verbena	Nyctaginaceae	Y
Achillea millefolium	common yarrow	Asteraceae	Y
Acmispon americanus	American bird-foot trefoil	Fabaceae	Y
Agapanthus africanus	lily of the Nile	Liliaceae	N
Allium triquetrum	three cornered leek	Alliaceae	N
Ambrosia chamissonis	beach bur	Asteraceae	Y
Armeria maritima	thrift seapink	Plumbaginaceae	Y
Artemisia douglasiana	mugwort	Asteraceae	Y
Barbarea sp.	wintercress	Brassicaceae	N
Calandrinia menziesii	red maids	Montiaceae	Y
Camissoniopsis cheiranthifolia	beach evening primrose	Onagraceae	Y
Cardamine oligosperma	bittercress	Brassicaceae	Y
Cardionema ramosissimum	sand mat	Caryophyllaceae	Y
Carpobrotus chilensis	seafig	Aizoaceae	N
Carpobrotus edulis	iceplant	Aizoaceae	N
Cerastium glomeratum	mouseear chickweed	Caryophyllaceae	N
Chamerion angustifolia	fireweed	Onagraceae	Y
Cirsium vulgare	bullthistle	Asteraceae	N
Claytonia perfoliata ssp. *perfoliata*	miner’s lettuce	Montiaceae	Y
Daucus carota	Queen Anne’s lace	Apiaceae	N
Epilobium ciliatum	fringed willowherb	Onagraceae	Y
Eriogonum latifolium	coast buckwheat	Polygonaceae	Y
Erodium cicutarium	coastal heron’s bill	Geraniaceae	N
Euphorbia peplus	petty spurge	Euphorbiaceae	N
Fragaria chiloensis	beach strawberry	Rosaceae	Y
Geranium dissectum	cutleaf geranium	Geraniaceae	Y
Geranium robertianum	Robert’s geranium	Geraniaceae	N
Grindelia stricta	coastal gumweed	Asteraceae	Y
Hedera helix	English ivy	Araliaceae	N
Hirschfeldia incana	hoary mustard	Brassicaceae	N
Hyacinthus orientalis	Hyacinth (cultivar)	Liliaceae	N
Hypericum perforatum	Klamath weed	Hypericaceae	N
Hypochaeris radicata	hairy cats-ear	Asteraceae	N
Lamium amplexicaule	henbit	Lamiaceae	N
Linum bienne	flax	Linaceae	N
Lotus corniculatus	birds foot trefoil	Fabaceae	N
Madia sativa	coast tarweed	Asteraceae	Y

Table A-3
Botanical Species Observed 3/23/17, 3/24/17, 7/26/2017
RMTII Samoa Effluent Pipeline

Scientific Name	**Common Name**	**Family**	**Native?**
Malva parviflora	cheeseweed mallow	Malvaceae	N
Medicago lupulina	black medick	Fabaceae	N
Medicago polymorpha	bur-clover	Fabaceae	N
Melilotus albus	white sweet clover	Fabaceae	N
Mentha pulegium	pennyroyal	Lamiaceae	N
Oxalis pes-caprae	Bermuda buttercup	Oxalidaceae	N
Parentucellia viscosa	yellow glandweed	Orobanchaceae	N
Piperia transversa	royal rein orchid	Orchidaceae	Y
Plantago coronopus	cutleaf plantain	Plantaginaceae	N
Plantago lanceolata	English plantain	Plantaginaceae	N
Platystemon californicus	creamcups	Papaveraceae	Y
Polygonum paronychia	dune knotweed	Polygonaceae	Y
Pseudognaphalium beneolens	cudweed	Asteraceae	Y
Pseudognaphalium luteoalbum	Jersey cudweed	Asteraceae	N
Raphanus sativus	wild radish	Brassicaceae	N
Rumex acetosella	sheep sorrel	Polygonaceae	N
Rumex crassus	willow-leaved dock	Polygonaceae	Y
Rumex crispus	curly dock	Polygonaceae	N
Senecio vulgaris	common groundsel	Asteraceae	N
Silene gallica	common catchfly	Caryophyllaceae	N
Solidago spathulata	dune goldenrod	Asteraceae	Y
Sonchus asper	spiny sow-thistle	Asteraceae	N
Stachys chamissonis	coast hedge nettle	Lamiaceae	Y
Symphyotrichum chilense	pacific aster	Asteraceae	Y
Taraxacum officinale	dandelion	Asteraceae	N
Trifolium hybridum	alsike clover	Fabaceae	N
Triphysaria pusilla	dwarf owl’s clover	Orobanchaceae	Y
Vicia sativa	spring vetch	Fabaceae	N
Vicia villosa ssp. *villosa*	hairy vetch	Fabaceae	N
Vinca major	bigleaf periwinkle	Apocynaceae	N
Zantedeschia aethiopica	calla lily	Araceae	N
Zeltnera muehlenbergii	Muehlenberg’s centaury	Gentiaceae	Y
113 Species			**42% Native**

Table A-4
Animal Species Observed 3/23/17, 3/24/17,7/26/2017
RMTII Samoa Effluent Pipeline

Scientific Name	**Common Name**	**Family**	**Nesting Habit**	**Listed?**
Birds				
Callipepla californica	California quail	Odontophoridae	Hides nest on the ground amid grasses, shrubs.	NL
Calypte anna	Anna’s hummingbird	Trochilidae	Horizontal branches, open woodlands	NL
Chamaea fasciata	wrentit	Paradoxornithidae	In dense vegetation, 1-9 feet high.	NL
Corvus corax	raven	Corvidae	Cliffs, trees, and structures	NL
Empidonax difficilis	pacific slope flycatcher	Tyrannidae	Cavity nester in densely vegetated woodlands	NL
Melospiza melodia	song sparrow	Emberizidae	In grasses/weeds usually on the ground.	NL
Pandion haliaetus	osprey	Pandionidae	In open areas on a wide sturdy support.	WL
Petrocheliodon pyrrhonota	cliff swallow	Hirundinidae	mud nests on structures near water.	NL
Poecile rufescens	chestnut backed chickadee	Paridae	Cavity nester, variety of woodland sites	NL
Sturnella neglecta	western meadowlark		On the ground shielded by dense vegetation	NL
Mammals				
Felis catus	house cat	Felidae	N/A	NL

B

Site Photographs

Photo B-1: Coastal dune hollow, with two S3 vegetation communities present. Note Wax Myrtle Shrubland Alliance on the Left and Coastal dune willow thicket on the right. Photo taken 3/23/2017.

Photo B-2: Coastal dune willow thicket transition to upland Coyote brush shrubland alliance. Note adjacent non-native grassland and former industrial area to the right.

Photo taken 3/23/2017.

Photo B-3: Site conditions looking north. (Photo taken to the west of the recycling facility). Note former industrial lands to the right and California blackberry thicket at a distance in the left hand side of the photo.

Photo taken 3/24/2017.

Photo B-4: Typical conditions within the project area. Samoa effluent pipeline proposed to be placed between Vance Avenue (left) and the railroad.

Photo taken 3/23/2017.

Photo B-5: Typical conditions within the south end of the project area. Note developed area and non-native dominated grassland (Photo looking east).

Photo taken 3/23/2017.

Photo B-6: Typical vegetation within the project area. Note low growing non-native grasses over compacted gravel. *Oenothera glazioviana* stalk is in foreground.

Photo taken 3/23/2017.

C

National Wetlands Inventory

U.S. Fish and Wildlife Service

National Wetlands Inventory

RMT II Samoa Effluent Pipeline Project
NWI Map

Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

March 2, 2017

- 🟦 Estuarine and Marine Deepwater
- 🟩 Estuarine and Marine Wetland
- 🟩 Freshwater Emergent Wetland
- 🟩 Freshwater Forested/Shrub Wetland
- 🟦 Freshwater Pond
- 🟪 Lake
- 🟫 Other
- 🟦 Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

D

Draft ROWD Samoa WWTF Project

Report of Waste Discharge

Town of Samoa Wastewater Treatment Facility
Samoa, California

Prepared for:

County of Humboldt and
Humboldt Bay Harbor, Recreation, and Conservation District

Project Funding Provided by:

U.S. Department of Commerce 07-79-07177

DRAFT

Engineers & Geologists
812 W. Wabash Ave.
Eureka, CA 95501-2138
707-441-8855

March 2017
015147.100

CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash • Eureka, CA 95501-2138 • 707-441-8855 • FAX: 707-441-8877 •shninfo@shn-engr.com

Reference: 015147.100

March 31, 2017

Ms. Mona Dougherty
North Coast Regional Water Quality Control Board
5550 Skylane Boulevard, Suite A
Santa Rosa, CA 95403-1072

Subject: **Preliminary Draft Report of Waste Discharge, Samoa Wastewater Treatment Facility, Samoa, California**

DRAFT

Dear Ms. Dougherty:

SHN Engineers & Geologists, on behalf of the County of Humboldt and Humboldt Bay Harbor, Recreation, and Conservation District, is submitting the following Report of Waste Discharge (ROWD) and National Pollutant Discharge Elimination System (NPDES) permit application for the Town of Samoa Wastewater Treatment Facility (WWTF) for preliminary review by the North Coast Regional Water Quality Control Board (RWQCB) prior to final submittal. In accordance with the facility's current Waste Discharge Requirements, Order R1-2001-62, this application is being submitted prior to 120 days before any proposed change in the character, location, or volume of the discharge.

The following forms are included herein as a part of the ROWD/NPDES permit application:

- RWQCB Form 200: Application/ROWD General Information
- EPA Form 1: General Information
- EPA Form 2A: Basic Application Information
- EPA Form 2S: Sewage Sludge Production and Disposal Information

Please call me at 707-441-8855 if you have any comments or concerns.

Sincerely,

SHN Engineers & Geologists

Mike Foget, PE
Project Engineer

MKF/CRS:dla

Enclosure: Report
c. w/Encl.: Jack Crider, Humboldt Bay Harbor, Recreation, and Conservation District

Reference: 015147.100

Report of Waste Discharge

Samoa Wastewater Treatment Facility
Samoa, California

Prepared for:

County of Humboldt and
Humboldt Bay Harbor, Recreation, and Conservation District

Project Funding Provided by:

U.S. Department of Commerce 07-79-07177

DRAFT

Prepared by:

Engineers & Geologists
812 W. Wabash Ave.
Eureka, CA 95501-2138
707-441-8855

March 2017

QA/QC: MKF ____

Table of Contents

Appendices

DRAFT

List of Illustrations

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Abbreviations and Acronyms

gpd	gallons per day
lb/d	pounds per day
mgd	million gallons per day
mg/L	milligrams per liter
APN	Assessor's parcel number
BOD	biochemical oxygen demand
CEC	California Engineering Company
CEQA	California Environmental Quality Act
CSD	community services district
EPA	Environmental Protection Agency
Harbor District	Humboldt Bay Harbor, Recreation and Conservation District
LAFCo	Local Agency Formation Commission
MRP	monitoring and reporting program
NPDES	National Pollutant Discharge Elimination System
Orenco	Orenco Systems, Inc.
RMT II	Redwood Marine Terminal II
ROWD	report of waste discharge
RWQCB	North Coast Regional Water Quality Control Board
SHN	SHN Engineers & Geologists
SPG	Samoa Pacific Group, LLC
TCLP	toxicity characteristic leaching procedure
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TSS	total suspended solids
WDRs	waste discharge requirements
WWTF	wastewater treatment facility

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1.0 Introduction

SHN Engineers & Geologists (SHN), on behalf of the County of Humboldt and Humboldt Bay Harbor, Recreation, and Conservation District has prepared this report of waste discharge (ROWD) for the Town of Samoa Wastewater Treatment Facility (WWTF). The purpose of this document is to provide current information to the North Coast Regional Water Quality Control Board (RWQCB) to replace Waste Discharge Requirements (WDRs) Order R1-2001-62 (Appendix A), and Monitoring and Reporting Program (MRP) Order R1-2007-0026 (Appendix B) with a National Pollutant Discharge Elimination System (NPDES) permit to discharge to the Pacific Ocean. In accordance with Order R1-2001-62, this ROWD is being submitted more than 120 days before making any material change or proposed change in the character, location, or volume of the discharge.

As a part of this NPDES permit application, the following forms are being submitted:

1. RWQCB Form 200: Report of Waste Discharge (Appendix C)
2. EPA Form 1: General Information (Appendix D)
3. EPA Form 2A: Supplemental Information (Appendix E)
4. EPA Form 2S: Sewage Sludge Production and Disposal Information (Appendix F)

The proposed ocean discharge location is through the ocean outfall located at Redwood Marine Terminal II (RMT II), also known as the former Samoa Pulp Mill. The RMT II ocean outfall is owned and operated by the Humboldt Bay Harbor, Recreation, and Conservation District (Harbor District). The Harbor District has agreed to lease access to the ocean outfall to the town of Samoa for the discharge of treated municipal wastewater; however, there is no written lease agreement at this time.

The Samoa wastewater collection and treatment systems are currently owned and operated by the Samoa Pacific Group, LLC (SPG); however, SPG intends to transfer control and ownership of the systems to a publicly-responsible party as soon as one can be formed. The Samoa Peninsula Fire Protection District submitted an application to the Local Agency Formation Commission (LAFCo) in April 2016 to form a community services district (CSD) that would include the Samoa wastewater collection and treatment systems, among other services. Once the Peninsula CSD is formed, the RWQCB will be notified of any transfer of ownership, operation, or control of the Samoa wastewater systems. The Harbor District is aware of the CSD formation plans and intends to transfer the lease for access to the ocean outfall to the Peninsula CSD once it is formed.

The Harbor District is currently pursuing a plan that would combine three separately-permitted NPDES waste streams through the ocean outfall at the Samoa Pulp Mill. The three proposed dischargers would include the Samoa WWTF (WDID 1B85017RHUM), DG Fairhaven Power Facility (WDID 1B85026RHUM), and industrial users at RMT II (WDID 1B77005OHUM). The ocean outfall is currently only being used by DG Fairhaven; although, a February 2016 feasibility study conducted by SHN indicates that the ocean outfall at RMT II has the capacity for all three discharges (Appendix G).

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2.0 Site Location and Description

The Town of Samoa WWTF is located in Humboldt County, approximately 1.5 miles northwest of the City of Eureka, on New Navy Base Road in Section 20, Township 5 North, Range 1 West, Humboldt Base and Meridian (Figure 1). The site is approximately at latitude 40.814012°, longitude 124.189882°, and occupies portions of Humboldt County Assessor's parcel numbers (APNs) 401-031-038, 401-031-039, 401-031-046, 401-031-059, and 401-031-065.

The Town of Samoa WWTF currently consists of two separate collection systems: the eastern and western systems (Figure 2). The western system serves approximately 25 residences and discharges through a 15,000 gallon septic tank to a leach-trench system in the Pacific Ocean watershed on the northwest side of New Navy Base Road. The eastern system serves the Samoa Cookhouse restaurant, a hostelry, and approximately 68 residences. The eastern system contains three septic tanks and two bark filters (the bark filters are no longer operational) distributed in the collection system that discharge into an equalization and treatment pond followed by a percolation basin located within the Humboldt Bay watershed. The proposed re-development project will replace both eastern and western collection systems and will route all wastewater to a single treatment system located near the existing treatment and percolation ponds (Figure 3; California Engineering Company [CEC], 2015).

A detailed description of the proposed wastewater collection and treatment system improvements project is included in the project description and design calculations from the September 2015 ROWD submittal (fourth submittal) by CEC, included in Appendices H and I, respectively. Design calculations from the May 2015 ROWD submittal (second submittal) are included as Appendix J because they include design parameters from the proposed WWTF manufacturer, Orenco Systems, Inc.

Please note that the September 2015 CEC ROWD was written for the original proposal to discharge to land through a leachfield and has not been updated to include changes to the currently proposed discharge to the ocean outfall described herein. The proposal to discharge to land through a new leachfield is still actively being sought by SPG in case the option for disposal through the ocean outfall is not approved. For the ocean outfall disposal option, effluent from the proposed collection and treatment system will be discharged to Manhole #5 at RMT II following the force main alignment indicated in Figure 3 along Vance Avenue; a distance of approximately 0.75 miles. Manhole #5 is located at the effluent discharge control structure and pump station that discharges to the ocean outfall at RMT II.

Also note that the Samoa Town Master Plan consists of three phases of development, with the first phase including upgrade and replacement of the wastewater collection and treatment systems. Design of the WWTF currently includes advanced tertiary treatment to reduce impacts to groundwater for the land disposal option. If the ocean discharge option is approved, full tertiary treatment may not be necessary, and the WWTF design may be modified to include secondary treatment and disinfection to meet ocean discharge standards.

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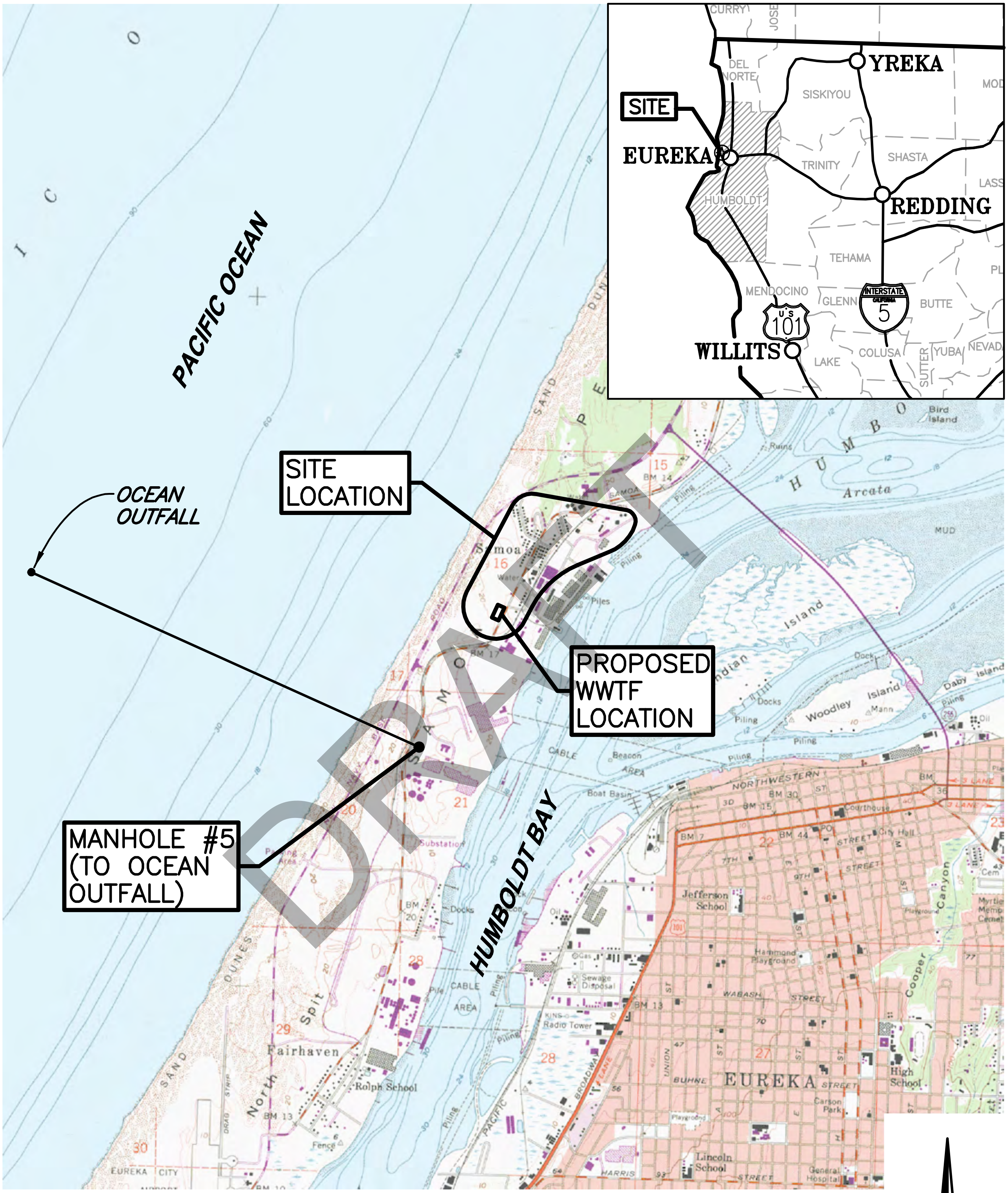


SOURCE: EUREKA USGS
7.5 MINUTE QUADRANGLE

1"=3000'±

Consulting Engineers
& Geologists, Inc.

Report of Waste Discharge
Samoa, California

Site Location Map

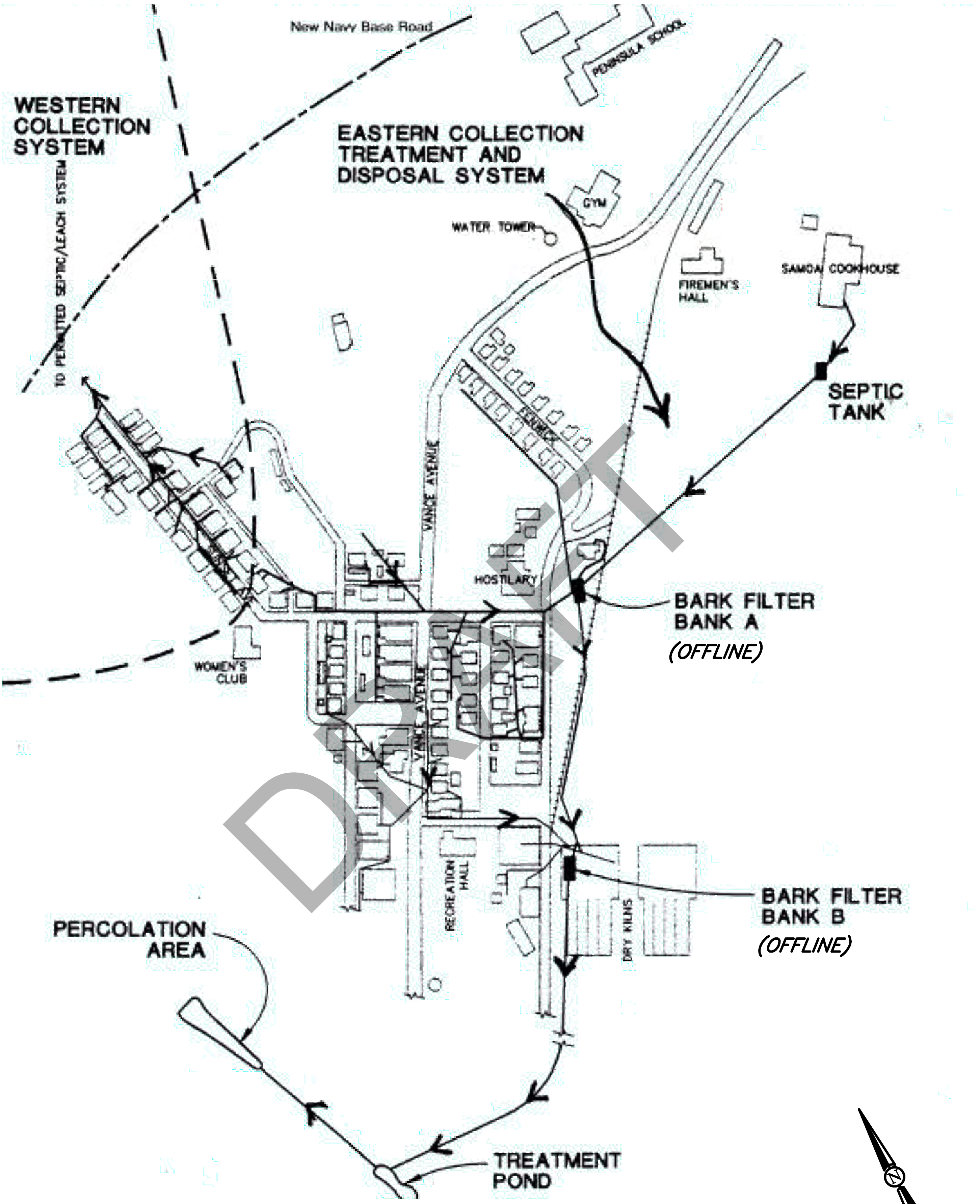
SHN 015147.100

March 2017

015147-100-SITE-LCTN

Figure 1

\\EurekaSVRNEW\Projects\2015\015147-redwood-marine-terminal-II\100-NPDES-permit\Dwgs , SAVED: 3/9/2017 1:28 PM CNEWELL, PLOTTED: 3/9/2017 1:28 PM, CHRIS D. NEWELL



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SOURCE: BASE MAP FROM WINZLER & KELLY
"EXISTING WASTEWATER SYSTEM"

NOT TO SCALE

SHN
Consulting Engineers
& Geologists, Inc.

Report of Waste Discharge
Samoa, California

Existing Sewer Collection
and Treatment Systems Map
SHN 015147.100

March 2017

015147-100-SEWR-CLCT-TRET-SYST

Figure 2

\\EurekaSVRNEW\Projects\2015\015147-redwood-marine-terminal-II\100-NPDES-permit\Dwgs , SAVED: 3/10/2017 9:49 AM CNEWELL, PLOTTED: 3/10/2017 9:53 AM, CHRIS D. NEWELL

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SHN
Consulting Engineers
& Geologists, Inc.

Report of Waste Discharge
Samoa, California

Samoa Alignment

SHN 015147.100

March 2017

015147-100-ALIGN-SAMOA

Figure 3

\\EurekaSVRNEW\Projects\2015\015147-redwood-marine-terminal-II\100-NPDES-permit\Dwgs , SAVED: 3/9/2017 1:33 PM CNEWELL, PLOTTED: 3/9/2017 1:33 PM, CHRIS D. NEWELL

3.0 Report of Waste Discharge: RWQCB Form 200

An RWQCB Form 200 is included in Appendix C and contains general information about the applicant and the facility. A process diagram of the proposed WWTF is included as Figure 4, and a map of the proposed sewer collection system is included as Figure 5.

Item V includes information about California Environmental Quality Act (CEQA) compliance. A final master environmental impact report for construction of the WWTF and collection system in the Town of Samoa, has been created by the Humboldt County Community Development Services Department and was approved by the Humboldt County Board of Supervisors on February 26, 2008 (State Clearinghouse Number 2003052054). A copy of the notice of determination for the final master environmental impact report is included in Appendix K. Additional environmental compliance work on the proposed pipeline alignment from the new WWTF to Manhole 5 at RMT II is underway. The proposed alignment falls completely within previously developed industrial property, and is expected to receive either a negative declaration or mitigated negative declaration of significant impacts.

4.0 General Information: EPA Form 1

An EPA Form 1 is included in Appendix D and contains general information about the facility, owner, and operator.

5.0 Supplemental Information: EPA Form 2A

An EPA Form 2A is included in Appendix E and is a modular permit application consisting of Parts A through G. The "Basic Application Information" is addressed in Parts A and C, and the "Supplemental Application Information" is addressed in Part B, and Parts D through G. SHN has completed Parts A through C of the application; all other parts refer to systems with design flows greater than 0.1 million gallons per day (mgd), whereas the design flow for the proposed WWTF is 0.045 mgd. The following sections provide an explanation of data used for various parts of the permit application.

Part A–Part A is the basic application information required for all applicants.

Item A.4 summarizes collection system information including population served. In 2015, there were approximately 268 people in the town of Samoa (US Census Bureau, 2017) living in 100 residences (CEC, 2015), indicating that there were approximately 2.68 people per residence in Samoa. At full build-out, there will be 184 residences for a total residential population of approximately 493 people.

Item A.6a identifies the design flow rate for the treatment system. The design flow rate for the proposed Phase I treatment system is 44,650 gallons per day (gpd). Phase II and Phase III will not likely occur until this permit period expires in four or five years, and will be included in the design flow for the next permitting period. Phase I is in the process of acquiring the appropriate permits and will take multiple years to complete. The proposed treatment system is a modular design that will allow construction of additional capacity during subsequent development phases as defined in the September 2015 project description (CEC, 2015; Appendix H).

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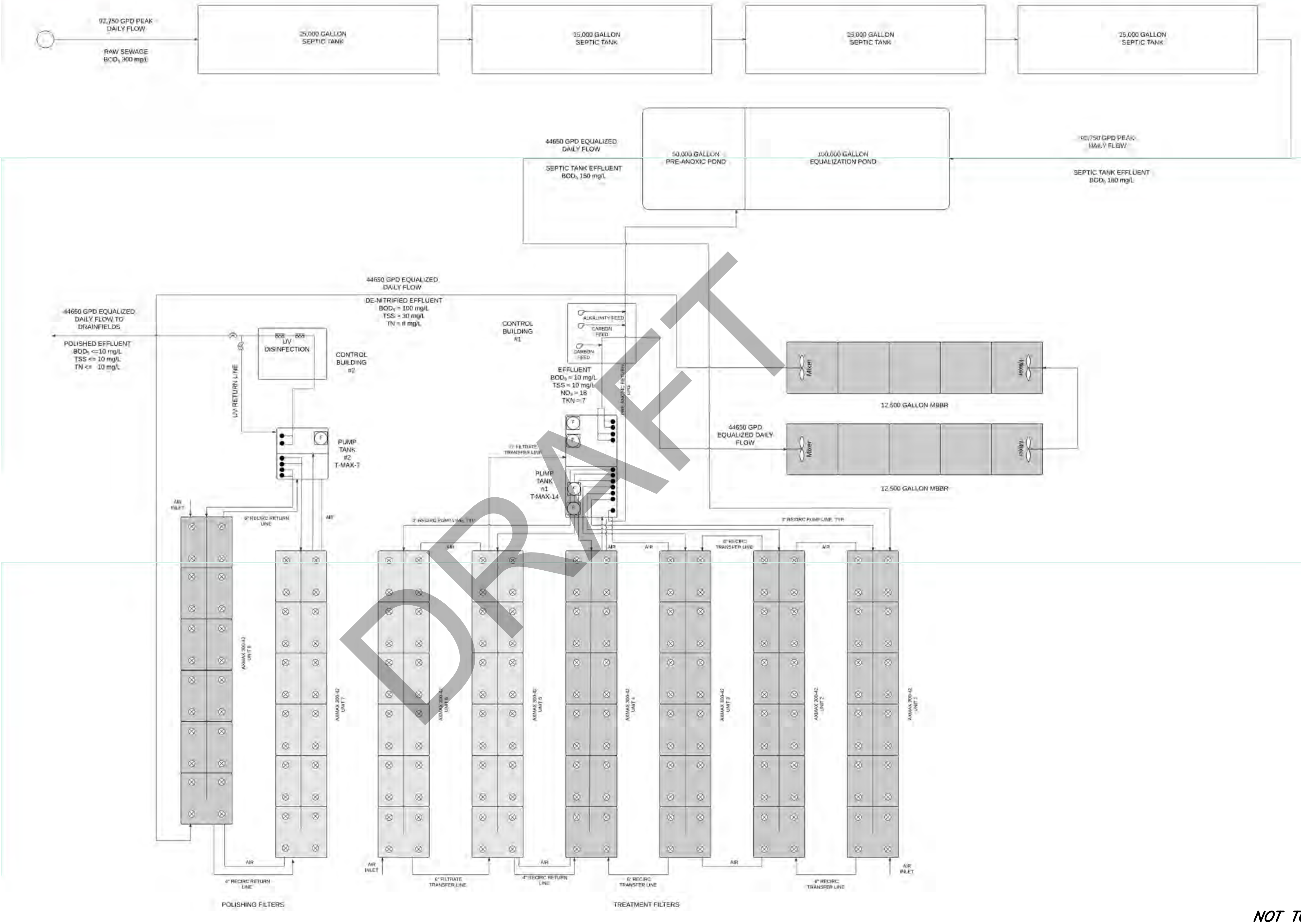
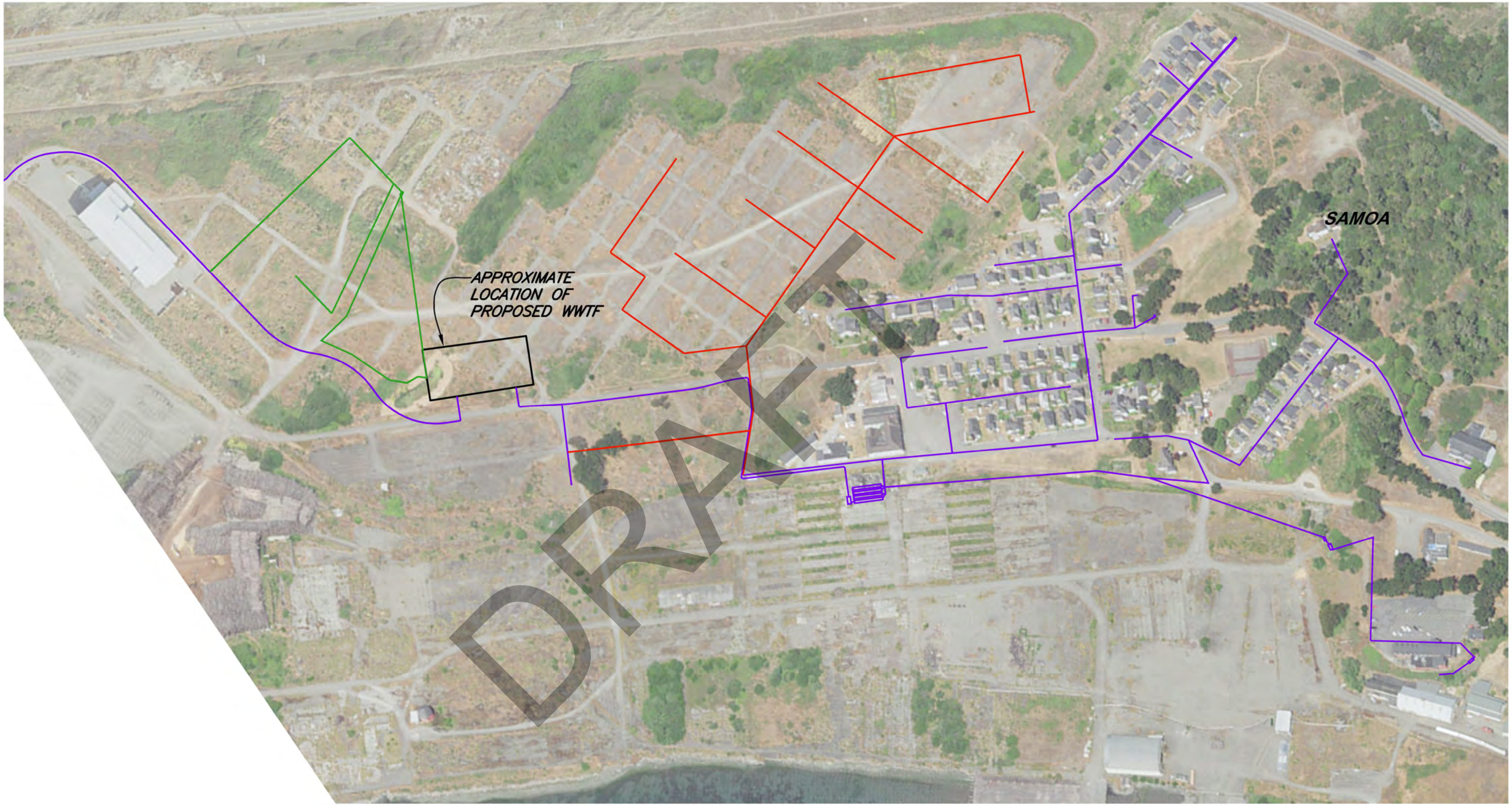


NOT TO SCALE

SOURCE: *BASE MAP FROM CALIFORNIA ENGINEERING COMPANY, INC "Samoa WWTP_Line Diagram–Proposed–2.pdf"*

SHN Consulting Engineers & Geologists, Inc.	Report of Waste Discharge Samoa, California	Proposed Wastewater Treatment System Diagram SHN 015147.100
March 2017	015147-100-PROP-WW-TRET-SYST	Figure 4

\\EurekaSVRNEW\Projects\2015\015147-redwood-marine-terminal-II\100-NPDES-permit\Dwgs , SAVED: 3/9/2017 1:34 PM CNEWELL, PLOTTED: 3/9/2017 1:34 PM, CHRIS D. NEWELL



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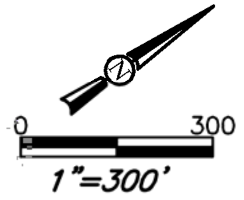
EXPLANATION

🟪	PROPOSED SEWER (PHASE 1)
🟥	PROPOSED SEWER (PHASE 2)
🟩	PROPOSED SEWER (PHASE 3)



NOTE: ALL LOCATIONS APPROXIMATE

SHN
Consulting Engineers
& Geologists, Inc.

Report of Waste Discharge
Samoa, California

Proposed Sewer Collection System

SHN 015147

March 2017

015147-100-PROP-SEWER

Figure 5

\\Eureka\Projects\2015\015147-redwood-marine-terminal-II\100-NPDES-permit\Dwgs, SAVED: 3/23/2017 11:08 AM NDOWNEY, PLOTTED: 3/23/2017 11:23 AM, NATHAN DOWNEY

Items A.6b and A.6c summarize average and maximum daily flow rates for the last three years. Flow rates were calculated using data collected daily between October 2013 and September 2016 for the eastern system only; data is unavailable for the western system. As mentioned previously, the eastern system has approximately 68 residences, and the western system has approximately 25 residences; thus, approximately 37% of residential wastewater flow may be unaccounted for in these data. As a part of the September 2015 ROWD submittal, CEC conducted a flow study using 2014 daily flow data and calculated the average daily flow rate of the eastern system to be approximately 16,282 gpd. From this data and using assumptions about non-residential uses, CEC estimated the average daily flow rate of the western system to be approximately 5,100 gpd (CEC 2015b; Appendix L). Note that the average daily flow rate for the eastern system increased from approximately 14,000 gpd to 20,000 gpd over the last three years, possibly due to increased rainfall during this period. Because the population of Samoa has not increased significantly during this time, wastewater flows from the western system should remain similar to the 2014 estimate, resulting in the total average daily flow rate for the eastern and western systems combined of approximately 25,100 gpd.

Item A.8a includes information about discharges occurring to waters of the US. This item was selected to indicate that the system will eventually discharge to waters of the US through the ocean outfall at RMT II.

Item A.8b indicates whether the facility discharges to basins, ponds, or surface impoundments. The facility currently discharges to groundwater at two locations: the western system discharges to a leachfield located northwest of Old Navy Base Road, and the eastern system discharges to a percolation basin located east of Old Navy Base Road (Figure 2). SPG intends to construct a new leachfield near the existing treatment pond and percolation basin that may be used during the interim period until the system can be connected to the ocean outfall (Figure 5).

Item A.9 includes information about the discharge to waters of the US identified above in Item A.8a, which includes the future discharge to the ocean outfall. The average daily flow rate reported in Item A.9e indicates the calculated average daily flow rate for the eastern and western systems described above of 25,100 gpd. Item A.9g indicates that the ocean outfall has a diffuser; the diffuser is approximately 0.25 miles long and provides a minimum probably initial dilution factor of 115:1 according to the previous RWQCB order governing its discharge (Order R1-2010-0033).

Item A.11 includes a description of the type of treatment provided by the facility. The existing system provides primary treatment through the three septic tanks in the collection system and secondary treatment through the treatment pond. The system originally included two bark filters; however, these filters are no longer operational and serve only as settling tanks (Humboldt County, 2006). The proposed treatment system will provide advanced tertiary treatment with nitrogen removal and polishing packed bed media filtration. A description of the proposed treatment system including design calculations and criteria are included in Appendix I.

Item A.11.b includes a summary of removal rates expected from the proposed treatment system. According to the design calculations included in the most recent CEC ROWD submittal dated September 2015 (fourth submittal: Appendix I), design influent biochemical oxygen demand (BOD) concentrations are 150 milligrams per liter (mg/L) and effluent concentrations are expected to be less than 10 mg/L indicating a 93% removal rate with respect to concentration (note that percent mass removal would remain the same assuming a single design flow rate were applied to influent and effluent concentrations to calculate mass removal). According to the design calculations

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included in the May 2015 ROWD submittal (second submittal: Appendix J), influent total nitrogen (TN) concentrations are 67 mg/L as N and effluent TN concentrations are expected to be less than 10 mg/L as N indicating an 85% removal rate. Note that the second ROWD submittal included design parameters by Orenco, the proposed WWTF designer. The design parameters listed by Orenco include a design influent total Kjeldahl nitrogen (TKN) concentration of 67 mg/L as N; raw wastewater typically contains very little nitrate- or nitrite-nitrogen. Therefore, TKN should approximately equal TN. Design influent total suspended solid (TSS) concentrations are 100 mg/L and effluent TSS concentrations are expected to be less than 10 mg/L, indicating a 90% removal rate.

Item A.12 summarizes effluent testing data for the eastern system (data is unavailable for the western system). This data was collected between April 2013 and November 2016 in accordance with Waste Discharge Requirements Order R1-2001-62 Monitoring and Reporting Program R1-2007-0026; all samples were handled in accordance with standard methods and tested according to accepted laboratory procedures described in 40 CFR Part 136 at North Coast Laboratories in Arcata, California.

6.0 Sewage Sludge Production and Disposal Information: EPA Form 2S

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An EPA Form 2S containing information about biosolids treatment and disposal is included in Appendix F. Form 2S includes Sections A through E; Sections A and B are included as a part of this application, and include general facility information, and biosolids production, treatment, and disposal information, respectively. Sewage sludge is currently removed from the in-line settling/septic tanks by Steve's Septic Service of McKinleyville, California. A pumper truck removes sludge and hauls it to a dewatering facility in McKinleyville where the sludge is mixed with sludge from other municipal facilities in the area and dewatered before hauling the Class B biosolids to a landfill in Anderson, California. Biosolids will continue to be handled by Steve's Septic Service and hauled to the landfill in Anderson.

Item A.8 includes pollutant concentrations in sewage sludge including selected metals. Sludge samples have not been tested at the Samoa WWTF at this time.

Item B.1 indicates how much biosolids are generated at the treatment facility. Approximately 1.70 dry tons per year of biosolids are projected to be produced by the proposed treatment system (CEC, 2015a). Bulk sludge production is projected to be approximately 46.5 pounds per day (lb/d) with a solids content of approximately 20% indicating approximately 9.3 lb/d of dry solids will be produced by the system, or 1.70 tons per year (CEC, 2015a; Appendix I). Since 2010, approximately 136,900 gallons of sludge has been removed from the Samoa sewer system. At an estimated 20% solids content, this would result in an annual dry solids production rate of approximately 2.0 tons per year, approximately 18% greater than the projected production rate for the new system. This is because the new system will provide additional solids digestion, and because the last 7 years of removal partially included historically accumulated sludge. It should also be noted that the Samoa Cookhouse accounts for approximately 22% of the sludge removed from the system since 2010.

Item B.6h includes any notice and necessary information supplied to Steve's Septic Service in accordance with 40 CFR 503.12(g), which refers to information provided for land application of biosolids. Steve's Septic Service does not land-apply biosolids.

Item B.10 includes information regarding disposal in a solid waste landfill. Steve's Septic Service ultimately hauls dewatered biosolids to a solid waste landfill in Anderson. The Anderson landfill requires Steve's Septic Service to renew their certification to haul to the landfill annually which does not include testing of biosolids using the toxicity characteristic leaching procedure (TCLP) or the paint filter liquids test.

7.0 References Cited

California Engineering Company. (2015). *Application/Report of Waste Discharge- Town of Samoa: Project Description–4th Submittal.* Yuba City, CA:CEC.

---. (2015a). *Report of Waste Discharge- Town of Samoa: Design Documents and Calculations–4th Submittal.* Yuba City, CA:CEC.

---. (2015b). *Town of Samoa Wastewater Flow and Dispersal Area Study.* Yuba City, CA:CEC.

Humboldt County. (January 2006). *Samoa Town Master Plan: Draft Master Environmental Impact Report.* Humboldt County Community Development Services Department. Eureka, CA:County of Humboldt.

U.S. Census Bureau. (2017). *United States Census Bureau; American Fact Finder; Community Facts; Samoa CDP, California; Population; 2011-2015 American Community Survey 5-Year Estimates.* Accessed January 20, 2017, from: <https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml>.

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A

RWQCB WDR Order No. R1-2001-62

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Incorporated by Reference Only:

http://www.swrcb.ca.gov/northcoast/board_decisions/adopted_orders/pdf/071001SamoaWDR.pdf

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RWQCB MRP Order No. R1-2007-0026

B

DRAFT

Incorporated by Reference Only:

http://www.swrcb.ca.gov/northcoast/board_decisions/adopted_orders/pdf/2007/070717_0026_Samoa_M_R.pdf

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C

RWQCB Form 200: Report of Waste Discharge

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CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

I. FACILITY INFORMATION

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A. Facility:

Name: Town of Samoa Wastewater Treatment Facility
Address: 3 North Bay View Rd
City: Samoa **County:** Humboldt **State:** California **Zip Code:** 95564
Contact Person: David Swartz **Telephone Number:** 530-751-0952

B. Facility Owner:

Name: Samoa Pacific Group, LLC
Address: 5251 Ericson Way
City: Arcata **State:** California **Zip Code:** 95521
Contact Person: Dan Johnson **Telephone Number:** 707-822-9000
Federal Tax ID:

Owner Type (Check One)
1. ☐ Individual 2. ☑ Corporation
3. ☐ Governmental Agency 4. ☐ Partnership
5. ☐ Other: ____

C. Facility Operator (The agency or business, not the person):

Name: Samoa Pacific Group, LLC
Address: 5251 Ericson Way
City: Arcata **State:** California **Zip Code:** 95521
Contact Person: Chuck Barnhart **Telephone Number:** 707-822-9000

Operator Type (Check One)
1. ☐ Individual 2. ☑ Corporation
3. ☐ Governmental Agency 4. ☐ Partnership
5. ☐ Other: ____

D. Owner of the Land:

Name: same as owner
Address:
City: **State:** **Zip Code:**
Contact Person: **Telephone Number:**

Owner Type (Check One)
1. ☐ Individual 2. ☑ Corporation
3. ☐ Governmental Agency 4. ☐ Partnership
5. ☐ Other: ____

E. Address Where Legal Notice May Be Served:

Address: same as owner
City: **State:** **Zip Code:**
Contact Person: **Telephone Number:**

F. Billing Address:

Address: same as owner
City: **State:** **Zip Code:**
Contact Person: **Telephone Number:**

CALIFORNIA ENVIRONMENTAL
PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

II. TYPE OF DISCHARGE

Check Type of Discharge(s) Described in this Application (A or B):

☐ **A. WASTE DISCHARGE TO LAND** ☑ **B. WASTE DISCHARGE TO SURFACE WATER**

Check all that apply:

☑ Domestic/Municipal Wastewater Treatment and Disposal
☐ Cooling Water
☐ Mining
☐ Waste Pile
☐ Wastewater Reclamation
☐ Other, please describe: ______

☐ Animal Waste Solids
☐ Land Treatment Unit
☐ Dredge Material Disposal
☐ Surface Impoundment
☐ Industrial Process Wastewater

☐ Animal or Aquacultural Wastewater
☐ Biosolids/Residual
☐ Hazardous Waste (see instructions)
☐ Landfill (see instructions)
☐ Storm Water

III. LOCATION OF THE FACILITY

Describe the physical location of the facility.

1. Assessor's Parcel Number(s)
Facility: 401-031-059
Discharge Point: Pacific Ocean

2. Latitude
Facility: 40.814012 N
Discharge Point: 40.819 N

3. Longitude
Facility: -124.189882 W
Discharge Point: -124.226 W

IV. REASON FOR FILING

☐ New Discharge or Facility
☑ Change in Design or Operation
☐ Change in Quantity/Type of Discharge
☐ Changes in Ownership/Operator (see instructions)
☐ Waste Discharge Requirements Update or NPDES Permit Reissuance
☐ Other: ______

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Name of Lead Agency: Humboldt County Community Development Services Department

Has a public agency determined that the proposed project is exempt from CEQA? ☐ **Yes** ☑ **No**

If Yes, state the basis for the exemption and the name of the agency supplying the exemption on the line below.

Basis for Exemption/Agency: ______

Has a "Notice of Determination" been filed under CEQA? ☑ **Yes** ☐ **No**

If Yes, enclose a copy of the CEQA document, Environmental Impact Report, or Negative Declaration. If no, identify the expected type of CEQA document and expected date of completion.

Expected CEQA Documents:

☐ **EIR** ☐ **Negative Declaration**

Expected CEQA Completion Date: ______

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APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

VI. OTHER REQUIRED INFORMATION

Please provide a COMPLETE characterization of your discharge. A complete characterization includes, but is not limited to, design and actual flows, a list of constituents and the discharge concentration of each constituent, a list of other appropriate waste discharge characteristics, a description and schematic drawing of all treatment processes, a description of any Best Management Practices (BMPs) used, and a description of disposal methods.

Also include a site map showing the location of the facility and, if you are submitting this application for an NPDES permit, identify the surface water to which you propose to discharge. Please try to limit your maps to a scale of 1:24,000 (7.5' USGS Quadrangle) or a street map, if more appropriate.

VII. OTHER

Attach additional sheets to explain any responses which need clarification. List attachments with titles and dates below:

Please refer to attached report for additional information relating to this application.

You will be notified by a representative of the RWQCB within 30 days of receipt of your application. The notice will state if your application is complete or if there is additional information you must submit to complete your Application/Report of Waste Discharge, pursuant to Division 7, Section 13260 of the California Water Code.

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VIII. CERTIFICATION

"I certify under penalty of law that this document, including all attachments and supplemental information, were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Print Name: ______________________ **Title:** ______________________

Signature: ______________________ **Date:** ______________________

FOR OFFICE USE ONLY

Date Form 200 Received:	Letter to Discharger:	Fee Amount Received:	Check #:

D

EPA Form 1: General Information

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Please print or type in the unshaded areas only.

Form Approved. OMB No. 2040-0086.

FORM
1
GENERAL

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

S		T/A	C
F	1B85017RHUM		D
1	2 13	14	15

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill-in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of **bold-faced terms**.

SPECIFIC QUESTIONS	Mark "X"			SPECIFIC QUESTIONS	Mark "X"		
	YES	NO	FORM ATTACHED		YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.**? (FORM 2A)	16	X 17	X 18	B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge** to **waters of the U.S.**? (FORM 2B)	19	X 20	21
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C)	22	X 23	24	D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.**? (FORM 2D)	25	X 26	27
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)	28	X 29	30	F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)	31	X 32	33
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)	34	X 35	36	H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)	37	X 38	39
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)	40	X 41	42	J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)	43	X 44	45

III. NAME OF FACILITY

C 1 SKIP (16 – 29) Town of Samoa Wastewater Treatment Facility (15, 30, 69)

IV. FACILITY CONTACT

A. NAME & TITLE *(last, first, & title)*	B. PHONE *(area code & no.)*
C 2 David Swartz	(530) 751-0952
15 16 45	46 48 49 51 52- 55

V. FACILTY MAILING ADDRESS

A. STREET OR P.O. BOX

C 3 5251 Ericson Way (15 16 45)

B. CITY OR TOWN	C. STATE	D. ZIP CODE
C 4 Arcata	CA	95521
15 16 40	41 42	47 51

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

C 5 3 North Bay View Rd (15 16 45)

B. COUNTY NAME

Humboldt (46 70)

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE *(if known)*
C 6 Samoa	CA	95564	023
15 16 40	41 42	47 51	52 -54

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CONTINUED FROM THE FRONT

VII. SIC CODES *(4-digit, in order of priority)*

A. FIRST		B. SECOND	
C 7 4952 (15 16 - 19)	*(specify)* Sewer Systems	C 7 (15 16 - 19)	*(specify)*
C. THIRD		D. FOURTH	
C 7 (15 16 - 19)	*(specify)*	C 7 (15 16 - 19)	*(specify)*

VIII. OPERATOR INFORMATION

A. NAME

C 8 Chuck Barnhart (15 16 55)

B. Is the name listed in Item VIII-A also the owner?
☐ YES ☑ NO
66

C. STATUS OF OPERATOR *(Enter the appropriate letter into the answer box: if "Other," specify.)*

F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC *(other than federal or state)*
O = OTHER *(specify)*

P (56) *(specify)*

D. PHONE *(area code & no.)*
c A (707) 822-9000
15 6 - 18 19 - 21 22 - 26

E. STREET OR P.O. BOX

5251 Ericson Way (26 55)

F. CITY OR TOWN	G. STATE	H. ZIP CODE
C B Arcata (15 16 40)	CA (41 42)	95521 (47 - 51)

IX. INDIAN LAND
Is the facility located on Indian lands?
☐ YES ☑ NO
52

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES *(Discharges to Surface Water)*	C 9 T N (15 16 17 18 30)	D. PSD *(Air Emissions from Proposed Sources)*	C 9 T P (15 16 17 18 30)
B. UIC *(Underground Injection of Fluids)*	C 9 T U (15 16 17 18 30)	E. OTHER *(specify)*	C 9 R1-2001-62 (15 16 17 18 30) *(specify)* WDR
C. RCRA *(Hazardous Wastes)*	C 9 T R (15 16 17 18 30)	E. OTHER *(specify)*	C 9 R1-2007-0026 (15 16 17 18 30) *(specify)* MRP

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers, and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS *(provide a brief description)*

The Samoa Pacific Group, LLC. owns and operates the community of Samoa as well as its sewer collection, treatment, and disposal systems.

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XIII. CERTIFICATION *(see instructions)*

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE *(type or print)*	B. SIGNATURE	C. DATE SIGNED

COMMENTS FOR OFFICIAL USE ONLY

C C (15 16 55)

E

EPA Form 2A: Supplemental Information

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FACILITY NAME AND PERMIT NUMBER:
Town of Samoa WWTF, #CA0005894

Form Approved 1/14/99
OMB Number 2040-0086

FORM
2A
NPDES

NPDES FORM 2A APPLICATION OVERVIEW

APPLICATION OVERVIEW

Form 2A has been developed in a modular format and consists of a "Basic Application Information" packet and a "Supplemental Application Information" packet. The Basic Application Information packet is divided into two parts. All applicants must complete Parts A and C. Applicants with a design flow greater than or equal to 0.1 mgd must also complete Part B. Some applicants must also complete the Supplemental Application Information packet. The following items explain which parts of Form 2A you must complete.

BASIC APPLICATION INFORMATION:

A. **Basic Application Information for all Applicants.** All applicants must complete questions A.1 through A.8. A treatment works that discharges effluent to surface waters of the United States must also answer questions A.9 through A.12.

B. **Additional Application Information for Applicants with a Design Flow ≥ 0.1 mgd.** All treatment works that have design flows greater than or equal to 0.1 million gallons per day must complete questions B.1 through B.6.

C. **Certification.** All applicants must complete Part C (Certification).

SUPPLEMENTAL APPLICATION INFORMATION:

D. **Expanded Effluent Testing Data.** A treatment works that discharges effluent to surface waters of the United States and meets one or more of the following criteria must complete Part D (Expanded Effluent Testing Data):

1. Has a design flow rate greater than or equal to 1 mgd,
2. Is required to have a pretreatment program (or has one in place), or
3. Is otherwise required by the permitting authority to provide the information.

E. **Toxicity Testing Data.** A treatment works that meets one or more of the following criteria must complete Part E (Toxicity Testing Data):

1. Has a design flow rate greater than or equal to 1 mgd,
2. Is required to have a pretreatment program (or has one in place), or
3. Is otherwise required by the permitting authority to submit results of toxicity testing.

F. **Industrial User Discharges and RCRA/CERCLA Wastes.** A treatment works that accepts process wastewater from any significant industrial users (SIUs) or receives RCRA or CERCLA wastes must complete Part F (Industrial User Discharges and RCRA/CERCLA Wastes). SIUs are defined as:

1. All industrial users subject to Categorical Pretreatment Standards under 40 Code of Federal Regulations (CFR) 403.6 and 40 CFR Chapter I, Subchapter N (see instructions); and
2. Any other industrial user that:
   a. Discharges an average of 25,000 gallons per day or more of process wastewater to the treatment works (with certain exclusions); or
   b. Contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the treatment plant; or
   c. Is designated as an SIU by the control authority.

G. **Combined Sewer Systems.** A treatment works that has a combined sewer system must complete Part G (Combined Sewer Systems).

ALL APPLICANTS MUST COMPLETE PART C (CERTIFICATION)

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BASIC APPLICATION INFORMATION

PART A. BASIC APPLICATION INFORMATION FOR ALL APPLICANTS:

All treatment works must complete questions A.1 through A.8 of this Basic Application Information packet.

A.1. Facility Information.

Facility name: Town of Samoa Wastewater Treatment Facility

Mailing Address:
5251 Ericson Way
Arcata, CA 95521

Contact person: David Swartz

Title: Engineer

Telephone number: (530) 751-0952

Facility Address (not P.O. Box):
3 North Bay View Rd
Samoa, CA 95564

A.2. Applicant Information. If the applicant is different from the above, provide the following:

Applicant name: ______

Mailing Address: ______

Contact person: ______

Title: ______

Telephone number: ______

Is the applicant the owner or operator (or both) of the treatment works?

✓ owner ✓ operator

Indicate whether correspondence regarding this permit should be directed to the facility or the applicant.

______ facility ✓ applicant

A.3. Existing Environmental Permits. Provide the permit number of any existing environmental permits that have been issued to the treatment works (include state-issued permits).

NPDES ______

UIC ______

RCRA ______

PSD ______

Other WDR R1-2001-62

Other MRP R1-2007-0026

A.4. Collection System Information. Provide information on municipalities and areas served by the facility. Provide the name and population of each entity and, if known, provide information on the type of collection system (combined vs. separate) and its ownership (municipal, private, etc.).

Name	Population Served	Type of Collection System	Ownership
Samoa	493	Separate	Private

Total population served 493

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A.5. Indian Country.

a. Is the treatment works located in Indian Country?

Yes [✓ No]

b. Does the treatment works discharge to a receiving water that is either in Indian Country or that is upstream from (and eventually flows through) Indian Country?

Yes [✓ No]

A.6. Flow. Indicate the design flow rate of the treatment plant (i.e., the wastewater flow rate that the plant was built to handle). Also provide the average daily flow rate and maximum daily flow rate for each of the last three years. Each year's data must be based on a 12-month time period with the 12th month of "this year" occurring no more than three months prior to this application submittal.

a. Design flow rate 0.045 mgd

	Two Years Ago	Last Year	This Year	
b. Annual average daily flow rate	0.014	0.017	0.020	mgd
c. Maximum daily flow rate	0.057	0.068	0.049	mgd

A.7. Collection System. Indicate the type(s) of collection system(s) used by the treatment plant. Check all that apply. Also estimate the percent contribution (by miles) of each.

✓ Separate sanitary sewer	100.00	%
Combined storm and sanitary sewer		%

A.8. Discharges and Other Disposal Methods.

a. Does the treatment works discharge effluent to waters of the U.S.? [✓ Yes] No

If yes, list how many of each of the following types of discharge points the treatment works uses:

i. Discharges of treated effluent 1

ii. Discharges of untreated or partially treated effluent

iii. Combined sewer overflow points

iv. Constructed emergency overflows (prior to the headworks)

v. Other

b. Does the treatment works discharge effluent to basins, ponds, or other surface impoundments that do not have outlets for discharge to waters of the U.S.? [✓ Yes] No

If yes, provide the following for each surface impoundment:

Location: 40.815833 N, 124.191171 W

Annual average daily volume discharged to surface impoundment(s) 0.02 mgd

Is discharge [✓ continuous] or intermittent?

c. Does the treatment works land-apply treated wastewater? Yes [✓ No]

If yes, provide the following for each land application site:

Location:

Number of acres:

Annual average daily volume applied to site: Mgd

Is land application continuous or intermittent?

d. Does the treatment works discharge or transport treated or untreated wastewater to another treatment works? Yes [✓ No]

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If yes, describe the mean(s) by which the wastewater from the treatment works is discharged or transported to the other treatment works (e.g., tank truck, pipe).

____

If transport is by a party other than the applicant, provide:

Transporter name: ____________________

Mailing Address: ____________________

Contact person: ____________________

Title: ____________________

Telephone number: ____________________

For each treatment works that receives this discharge, provide the following:

Name: ____________________

Mailing Address: ____________________

Contact person: ____________________

Title: ____________________

Telephone number: ____________________

If known, provide the NPDES permit number of the treatment works that receives this discharge. __________

Provide the average daily flow rate from the treatment works into the receiving facility. __________ mgd

e. Does the treatment works discharge or dispose of its wastewater in a manner not included in A.8.a through A.8.d above (e.g., underground percolation, well injection)? ____ Yes ✓ No

If yes, provide the following for each disposal method:

Description of method (including location and size of site(s) if applicable):

____

Annual daily volume disposed of by this method: ________________

Is disposal through this method ______ continuous or ______ intermittent?

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FACILITY NAME AND PERMIT NUMBER:
Town of Samoa WWTF, #CA0005894

Form Approved 1/14/99
OMB Number 2040-0086

WASTEWATER DISCHARGES:

If you answered "yes" to question A.8.a, complete questions A.9 through A.12 **once for each outfall** (including bypass points) through which effluent is discharged. Do not include information on combined sewer overflows in this section. **If you answered "no" to question A.8.a**, go to Part B, "Additional Application Information for Applicants with a Design Flow Greater than or Equal to 0.1 mgd."

A.9. Description of Outfall.

a. Outfall number 001 (proposed)

b. Location Ocean Outfall

(City or town, if applicable)	(Zip Code)
(County)	(State)
40º, 49', 10" N	124º, 13', 32" W
(Latitude)	(Longitude)

c. Distance from shore (if applicable) 8,200.00 ft.

d. Depth below surface (if applicable) 82.00 ft.

e. Average daily flow rate 0.025 mgd

f. Does this outfall have either an intermittent or a periodic discharge? ___ Yes ✓ No (go to A.9.g.)

If yes, provide the following information:

Number of times per year discharge occurs: ___

Average duration of each discharge: ___

Average flow per discharge: ___ mgd

Months in which discharge occurs: ___

g. Is outfall equipped with a diffuser? ✓ Yes ___ No

A.10. Description of Receiving Waters.

a. Name of receiving water Pacific Ocean

b. Name of watershed (if known) NA

United States Soil Conservation Service 14-digit watershed code (if known): NA

c. Name of State Management/River Basin (if known): NA

United States Geological Survey 8-digit hydrologic cataloging unit code (if known): NA

d. Critical low flow of receiving stream (if applicable):
acute ___ cfs chronic ___ cfs

e. Total hardness of receiving stream at critical low flow (if applicable): ___ mg/l of $CaCO_3$

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FACILITY NAME AND PERMIT NUMBER:
Town of Samoa WWTF, #CA0005894

Form Approved 1/14/99
OMB Number 2040-0086

A.11. Description of Treatment.

a. What levels of treatment are provided? Check all that apply.

✓ Primary ✓ Secondary
✓ Advanced ✓ Other. Describe: denitrification, polishing filtration, and UV disinfection

b. Indicate the following removal rates (as applicable):

Design BOD_5 removal or Design $CBOD_5$ removal 93.00 %
Design SS removal ______ %
Design P removal ______ %
Design N removal 85.00 %
Other TSS 90.00 %

c. What type of disinfection is used for the effluent from this outfall? If disinfection varies by season, please describe.

Ultraviolet (UV)

If disinfection is by chlorination, is dechlorination used for this outfall? ______ Yes ______ No

d. Does the treatment plant have post aeration? ______ Yes ✓ No

A.12. Effluent Testing Information. All Applicants that discharge to waters of the US must provide effluent testing data for the following parameters. Provide the indicated effluent testing required by the permitting authority for each outfall through which effluent is discharged. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. At a minimum, effluent testing data must be based on at least three samples and must be no more than four and one-half years apart.

Outfall number: Eastern System

PARAMETER	MAXIMUM DAILY VALUE		AVERAGE DAILY VALUE		
	Value	Units	Value	Units	Number of Samples
pH (Minimum)	6.40	s.u.	▨	▨	▨
pH (Maximum)	7.60	s.u.	▨	▨	▨
Flow Rate	68,186.41	gal/day	15,541.00	gal/day	1,172.00
Temperature (Winter)					
Temperature (Summer)					

* For pH please report a minimum and a maximum daily value

POLLUTANT		**MAXIMUM DAILY DISCHARGE**		**AVERAGE DAILY DISCHARGE**			**ANALYTICAL METHOD**	**ML / MDL**
		Conc.	**Units**	**Conc.**	**Units**	**Number of Samples**		
CONVENTIONAL AND NONCONVENTIONAL COMPOUNDS.								
BIOCHEMICAL OXYGEN DEMAND (Report one)	BOD-5	120.00	mg/L	43.00	mg/L	37.00	SM 5210 B	2.0
	CBOD-5							
FECAL COLIFORM								
TOTAL SUSPENDED SOLIDS (TSS)		20.00	mg/L	11.00	mg/L	37.00	SM 2540 D	1.0

END OF PART A.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

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FACILITY NAME AND PERMIT NUMBER:
Town of Samoa WWTF, #CA0005894

Form Approved 1/14/99
OMB Number 2040-0086

BASIC APPLICATION INFORMATION

PART C. CERTIFICATION

All applicants must complete the Certification Section. Refer to instructions to determine who is an officer for the purposes of this certification. All applicants must complete all applicable sections of Form 2A, as explained in the Application Overview. Indicate below which parts of Form 2A you have completed and are submitting. By signing this certification statement, applicants confirm that they have reviewed Form 2A and have completed all sections that apply to the facility for which this application is submitted.

Indicate which parts of Form 2A you have completed and are submitting:

__✓__ Basic Application Information packet

Supplemental Application Information packet:

______ Part D (Expanded Effluent Testing Data)
______ Part E (Toxicity Testing: Biomonitoring Data)
______ Part F (Industrial User Discharges and RCRA/CERCLA Wastes)
______ Part G (Combined Sewer Systems)

ALL APPLICANTS MUST COMPLETE THE FOLLOWING CERTIFICATION.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name and official title ____________________

Signature ____________________

Telephone number ____________________

Date signed ____________________

Upon request of the permitting authority, you must submit any other information necessary to assess wastewater treatment practices at the treatment works or identify appropriate permitting requirements.

SEND COMPLETED FORMS TO:

DRAFT

DRAFT

F

EPA Form 2S: Sewage Sludge Production & Disposal Information

FACILITY NAME AND PERMIT NUMBER:
Samoa WWTF, WDR R1-2001-62

Form Approved 1/14/99
OMB Number 2040-0086

PART 2: PERMIT APPLICATION INFORMATION

Complete this part if you have an effective NPDES permit or have been directed by the permitting authority to submit a full permit application at this time. In other words, complete this part if your facility has, or is applying for, an NPDES permit.

For purposes of this form, the term "you" refers to the applicant. "This facility" and "your facility" refer to the facility for which application information is submitted.

APPLICATION OVERVIEW — SEWAGE SLUDGE USE OR DISPOSAL INFORMATION

Part 2 is divided into five sections (A-E). Section A pertains to all applicants. The applicability of Sections B, C, D, and E depends on your facility's sewage sludge use or disposal practices. The information provided on this page indicates which sections of Part 2 to fill out.

1. SECTION A: GENERAL INFORMATION.

Section A must be completed by all applicants

2. SECTION B: GENERATION OF SEWAGE SLUDGE OR PREPARATION OF A MATERIAL DERIVED FROM SEWAGE SLUDGE.

Section B must be completed by applicants who either:

1) Generate sewage sludge, or

2) Derive a material from sewage sludge.

3. SECTION C: LAND APPLICATION OF BULK SEWAGE SLUDGE.

Section C must be completed by applicants who either:

1) Apply sewage to the land, or

2) Generate sewage sludge which is applied to the land by others.

NOTE: Applicants who meet either or both of the two above criteria are exempted from this requirement if <u>all</u> sewage sludge from their facility falls into one of the following three categories:

1) The sewage sludge from this facility meets the ceiling and pollutant concentrations, Class A pathogen reduction requirements, and one of vector attraction reduction options 1-8, as identified in the instructions, or
2) The sewage sludge from this facility is placed in a bag or other container for sale or give-away for application to the land, or
3) The sewage sludge from this facility is sent to another facility for treatment or blending.

4. SECTION D: SURFACE DISPOSAL

Section D must be completed by applicants who own or operate a surface disposal site.

5. SECTION E: INCINERATION

Section E must be completed by applicants who own or operate a sewage sludge incinerator.

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FACILITY NAME AND PERMIT NUMBER:
Samoa WWTF, WDR R1-2001-62

Form Approved 1/14/99
OMB Number 2040-0086

A. GENERAL INFORMATION

All applicants must complete this section.

A.1. Facility Information.

a. Facility name: Town of Samoa Wastewater Treatment Facility

b. Mailing Address:
5251 Ericson Way
Arcata, CA 95521

c. Contact person: David Swartz

Title: Engineer

Telephone number: (530) 751-0952

d. Facility Address (not P.O. Box):
3 North Bay View Rd
Samoa, CA 95564

e. Is this facility a Class I sludge management facility? ______ Yes __✓__ No

f. Facility design flow rate: 0.045 mgd

g. Total population served: 493.00

h. Indicate the type of facility:

______ Publicly owned treatment works (POTW)
______ Federally owned treatment works
______ Surface disposal site
______ Other (describe) ______

__✓__ Privately owned treatment works
______ Blending or treatment operation
______ Sewage sludge incinerator

A.2. Applicant Information. If the applicant is different from the above, provide the following:

a. Applicant name ______

b. Mailing Address ______

c. Contact person ______

Title ______

Telephone number ______

d. Is the applicant the owner or operator (or both) of this facility?

______ owner ______ operator

e. Should correspondence regarding this permit should be directed to the facility or the applicant.

______ facility ______ applicant

DRAFT

FACILITY NAME AND PERMIT NUMBER:
Samoa WWTF, WDR R1-2001-62

A.3. Permit Information.

a. Facility's NPDES permit number (if applicable): NA

b. List, on this form or an attachment, all other Federal, State, and local permits or construction approvals received or applied for that regulate this facility's sewage sludge management practices:

Permit Number	Type of Permit
R1-2001-62	WDR
R1-2007-0026	MRP

A.4. Indian Country. Does any generation, treatment, storage, application to land, or disposal of sewage sludge from this facility occur in Indian Country?

______Yes ✓ No If yes, describe: ______________________________

A.5. Topographic Map. Provide a topographic map or maps (or other appropriate map(s) if a topographic map is unavailable) that show the following information. Map(s) should include the area one mile beyond all property boundaries of the facility:

a. Location of all sewage sludge management facilities, including locations where sewage sludge is stored, treated, or disposed.

b. Location of all wells, springs, and other surface water bodies, listed in public records or otherwise known to the applicant within 1/4 mile of the facility property boundaries.

A.6. Line Drawing. Provide a line drawing and/or a narrative description that identifies all sewage sludge processes that will be employed during the term of the permit, including all processes used for collecting, dewatering, storing, or treating sewage sludge, the destination(s) of all liquids and solids leaving each unit, and all methods used for pathogen reduction and vector attraction reduction.

A.7. Contractor Information.

Are any operational or maintenance aspects of this facility related to sewage sludge generation, treatment, use or disposal the responsibility of a contractor? ______Yes ✓ No

If yes, provide the following for each contractor (attach additional pages if necessary):

a. Name ______________________________

b. Mailing Address ______________________________

c. Telephone Number ______________________________

d. Responsibilities of contractor ______________________________

DRAFT

FACILITY NAME AND PERMIT NUMBER:
Samoa WWTF, WDR R1-2001-62

Form Approved 1/14/99
OMB Number 2040-0086

A.8. Pollution Concentrations: Using the table below or a separate attachment, provide sewage sludge monitoring data for the pollutants for which limits in sewage sludge have been established in 40 CFR Part 503 for this facility's expected use or disposal practices. All data must be based on three or more samples taken at least one month apart and must be no more than four and one-half years old.

POLLUTANT	CONCENTRATION (mg/kg dry weight)	ANALYTICAL METHOD	DETECTION LEVEL FOR ANALYSIS
ARSENIC	Not Available		
CADMIUM	Not Available		
CHROMIUM	Not Available		
COPPER	Not Available		
LEAD	Not Available		
MERCURY	Not Available		
MOLYBDENUM	Not Available		
NICKEL	Not Available		
SELENIUM	Not Available		
ZINC	Not Available		

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A.9. Certification. Read and submit the following certification statement with this application. Refer to the instructions to determine who is an officer for purposes of this certification. Indicate which parts of Form 2S you have completed and are submitting:

______ Part 1 Limited Background Information packet

Part 2 Permit Application Information packet:

✓ Section A (General Information)
______ Section B (Generation of Sewage Sludge or Preparation of a Material Derived from Sewage Sludge)
______ Section C (Land Application of Bulk Sewage Sludge)
______ Section D (Surface Disposal)
______ Section E (Incineration)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with the system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name and official title ______________________________

Signature ______________________________ Date signed ______________

Telephone number ______________________________

Upon request of the permitting authority, you must submit any other information necessary to assess sewage sludge use or disposal practices at your facility or identify appropriate permitting requirements.

SEND COMPLETED FORMS TO:

FACILITY NAME AND PERMIT NUMBER:
Samoa WWTF, WDR R1-2001-62

B. GENERATION OF SEWAGE SLUDGE OR PREPARATION OF A MATERIAL DERIVED FROM SEWAGE SLUDGE

Complete this section if your facility generates sewage sludge or derives a material from sewage sludge.

B.1. Amount Generated On Site.

Total dry metric tons per 365-day period generated at your facility: 1.70 dry metric tons

B.2. Amount Received from Off Site. If your facility receives sewage sludge from another facility for treatment, use, or disposal, provide the following information for each facility from which sewage sludge is received. If you receive sewage sludge from more than one facility, attach additional pages as necessary.

a. Facility name _______________

b. Mailing Address _______________

c. Contact person _______________

Title _______________

Telephone number _______________

d. Facility Address (not P.O. Box) _______________

e. Total dry metric tons per 365-day period received from this facility: _______________ dry metric tons

f. Describe, on this form or on another sheet of paper, any treatment processes known to occur at the off-site facility, including blending activities and treatment to reduce pathogens or vector attraction characteristics.

____

B.3. Treatment Provided At Your Facility.

a. Which class of pathogen reduction is achieved for the sewage sludge at your facility?

_______ Class A   _______ Class B   ___✓___ Neither or unknown

b. Describe, on this form or another sheet of paper, any treatment processes used at your facility to reduce pathogens in sewage sludge:

____

c. Which vector attraction reduction option is met for the sewage sludge at your facility?

_______ Option 1 (Minimum 38 percent reduction in volatile solids)
_______ Option 2 (Anaerobic process, with bench-scale demonstration)
_______ Option 3 (Aerobic process, with bench-scale demonstration)
_______ Option 4 (Specific oxygen uptake rate for aerobically digested sludge)
_______ Option 5 (Aerobic processes plus raised temperature)
_______ Option 6 (Raise pH to 12 and retain at 11.5)
_______ Option 7 (75 percent solids with no unstabilized solids)
_______ Option 8 (90 percent solids with unstabilized solids)
___✓___ None or unknown

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B.3. Treatment Provided At Your Facility. (con't)

d. Describe, on this form or another sheet of paper, any treatment processes used at your facility to reduce vector attraction properties of sewage sludge:

____

____

e. Describe, on this form or another sheet of paper, any other sewage sludge treatment or blending activities not identified in (a) - (d) above:

____

____

Complete Section B.4 if sewage sludge from your facility meets the ceiling concentrations in Table 1 of 40 CFR 503.13, the pollutant concentrations in Table 3 of §503.13, the Class A pathogen reduction requirements in §503.32(a), and one of the vector attraction reduction requirements in § 503.33(b)(1)-(8) and is land applied. Skip this section if sewage sludge from your facility does not meet all of these criteria.

B.4. Preparation of Sewage Sludge Meeting Ceiling and Pollutant Concentrations, Class A Pathogen Requirements, and One of Vector Attraction Reduction Options 1-8.

a. Total dry metric tons per 365-day period of sewage sludge subject to this section that is applied to the land: ____________ dry metric tons

b. Is sewage sludge subject to this section placed in bags or other containers for sale or give-away for application to the land?

_______Yes _______No

Complete Section B.5. if you place sewage sludge in a bag or other container for sale or give-away for land application. Skip this section if the sewage sludge is covered in Section B.4.

B.5. Sale or Give-Away in a Bag or Other Container for Application to the Land.

a. Total dry metric tons per 365-day period of sewage sludge placed in a bag or other container at your facility for sale or give-away for application to the land: ________________________ dry metric tons

b. Attach, with this application, a copy of all labels or notices that accompany the sewage sludge being sold or given away in a bag or other container for application to the land.

Complete Section B.6 if sewage sludge from your facility is provided to another facility that provides treatment or blending. This section does not apply to sewage sludge sent directly to a land application or surface disposal site. Skip this section if the sewage sludge is covered in Sections B.4 or B.5. If you provide sewage sludge to more than one facility, attach additional pages as necessary.

B.6. Shipment Off Site for Treatment or Blending.

a. Receiving facility name: Steve's Septic Service

b. Mailing address:
1810 Murray Road
McKinleyville, CA 95519

c. Contact person: Lyndsey Brunner

Title: Office Manager

Telephone number: (707) 839-2270

d. Total dry metric tons per 365-day period of sewage sludge provided to receiving facility: 1.70

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FACILITY NAME AND PERMIT NUMBER:
Samoa WWTF, WDR R1-2001-62

B.6. Shipment Off Site for Treatment or Blending. (con't)

e. Does the receiving facility provide additional treatment to reduce pathogens in sewage sludge from your facility? __✓__ Yes ____ No

Which class of pathogen reduction is achieved for the sewage sludge at the receiving facility?

______ Class A __✓___ Class B ______ Neither or unknown

Describe, on this form or another sheet of paper, any treatment processes used at the receiving facility to reduce pathogens in sewage sludge:

Dewatering with polymer addition.

f. Does the receiving facility provide additional treatment to reduce vector attraction characteristics of the sewage sludge?
______Yes __✓___No

Which vector attraction reduction option is met for the sewage sludge at the receiving facility?

______ Option 1 (Minimum 38 percent reduction in volatile solids)
______ Option 2 (Anaerobic process, with bench-scale demonstration)
______ Option 3 (Aerobic process, with bench-scale demonstration)
______ Option 4 (Specific oxygen uptake rate for aerobically digested sludge)
______ Option 5 (Aerobic processes plus raised temperature)
______ Option 6 (Raise pH to 12 and retain at 11.5)
______ Option 7 (75 percent solids with no unstabilized solids)
______ Option 8 (90 percent solids with unstabilized solids)
__✓___ None

Describe, on this form or another sheet of paper, any treatment processes used at the receiving facility to reduce vector attraction properties of sewage sludge.

g. Does the receiving facility provide any additional treatment or blending activities not identified in (c) or (d) above? __✓__ Yes ____ No

If yes, describe, on this form or another sheet of paper, the treatment or blending activities not identified in (c) or (d) above:

Biosolids are mixed with other sources, polymer is added, the mixture is put into dewater bins, the leachate is discharged to a municpal sewer system, and the polymer sludge is transported to a landfill.

h. If you answered yes to (e), (f), or (g), attach a copy of any information you provide the receiving facility to comply with the "notice and necessary information" requirement of 40 CFR 503.12(g).

i. Does the receiving facility place sewage sludge from your facility in a bag or other container for sale or give-away for application to the land? ______ Yes __✓___ No

If yes, provide a copy of all labels or notices that accompany the product being sold or given away.

Complete Section B.7 if sewage sludge from your facility is applied to the land, <u>unless</u> the sewage sludge is covered in:

- **Section B.4 (it meets Table 1 ceiling concentrations, Table 3 pollutant concentrations, Class A pathogen requirements, and one of vector attraction reduction options 1-8); <u>or</u>**
- **Section B.5 (you place it in a bag or other container for sale or give-away for application to the land); <u>or</u>**
- **Section B.6 (you send it to another facility for treatment or blending).**

B.7. Land Application of Bulk Sewage Sludge.

a. Total dry metric tons per 365-day period of sewage sludge applied to all land application sites: _______________ dry metric tons

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FACILITY NAME AND PERMIT NUMBER:
Samoa WWTF, WDR R1-2001-62

Form Approved 1/14/99
OMB Number 2040-0086

B.7. Land Application of Bulk Sewage Sludge. (con't)

b. Do you identify all land application sites in Section C of this application? ______ Yes ______ No

If no, submit a copy of the land application plan with application (see instructions).

c. Are any land application sites located in States other than the State where you generate sewage sludge or derive a material from sewage sludge? _______ Yes _______ No

If yes, describe, on this form or another sheet of paper, how you notify the permitting authority for the States where the land application sites are located. Provide a copy of the notification.

____

____

Complete Section B.8 if sewage sludge from your facility is placed on a surface disposal site.

B.8. Surface Disposal.

a. Total dry metric tons of sewage sludge from your facility placed on all surface disposal sites per 365-day period: ________ dry metric tons

b. Do you own or operate all surface disposal sites to which you send sewage sludge for disposal?

_______ Yes _______ No

If no, answer B.8.c through B.8.f for each surface disposal site that you do not own or operate. If you send sewage sludge to more than one such surface disposal site, attach additional pages as necessary.

c. Site name or number ____

d. Contact person ____

Title ____

Telephone number ____

Contact is _________Site owner _________Site operator

e. Mailing address ____

____

f. Total dry metric tons of sewage sludge from your facility placed on this surface disposal site per 365-day period: ________ dry metric tons

Complete Section B.9 if sewage sludge from your facility is fired in a sewage sludge Incinerator.

B.9. Incineration.

a. Total dry metric tons of sewage sludge from your facility fired in all sewage sludge incinerators per 365-day period: ______ dry metric tons

b. Do you own or operate all sewage sludge incinerators in which sewage sludge from your facility is fired? ______ Yes ______ No

If no, complete B.9.c through B.9.f for each sewage sludge incinerator that you do not own or operate. If you send sewage sludge to more than one such sewage sludge incinerator, attach additional pages as necessary.

c. Incinerator name or number: ____

d. Contact person: ____

Title: ____

Telephone number: ____

Contact is: _________ Incinerator owner _________ Incinerator operator

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FACILITY NAME AND PERMIT NUMBER:
Samoa WWTF, WDR R1-2001-62

Form Approved 1/14/99
OMB Number 2040-0086

B.9. Incineration. (con't)

e. Mailing address: ____________________
____

f. Total dry metric tons of sewage sludge from your facility fired in this sewage sludge incinerator per 365-day period: ______ dry metric tons

Complete Section B.10 if sewage sludge from this facility is placed on a municipal solid waste landfill.

B.10. Disposal in a Municipal Solid Waste Landfill. Provide the following information for each municipal solid waste landfill on which sewage sludge from your facility is placed. If sewage sludge is placed on more than one municipal solid waste landfill, attach additional pages as necessary.

a. Name of landfill: Anderson Landfill

b. Contact person: David Bayley

Title: District Manager

Telephone number: (530) 227-8730

Contact is ______ Landfill owner ✓ Landfill operator

c. Mailing address:
18703 Cambridge Road
Anderson, CA 96007

d. Location of municipal solid waste landfill:

Street or Route #: 18703 Cambridge Road

County: Shasta

City or Town: Anderson State: CA Zip: 96007

e. Total dry metric tons of sewage sludge from your facility placed in this municipal solid waste landfill per 365-day period:

1.70 dry metric tons

f. List, on this form or an attachment, the numbers of all other Federal, State, and local permits that regulate the operation of this municipal solid waste landfill.

Permit Number	Type of Permit
45-AA-0020	Solid Waste Permit

g. Submit, with this application, information to determine whether the sewage sludge meets applicable requirements for disposal of sewage sludge in a municipal solid waste landfill (e.g., results of paint filter liquids test and TCLP test)

h. Does the municipal solid waste landfill comply with applicable criteria set forth in 40 CFR Part 258?

✓ Yes ______ No

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RMT II Infrastructure Re-use Evaluation

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Infrastructure Needs and Reuse on the Samoa Peninsula

Redwood Marine Terminal II

DRAFT

Prepared for:

County of Humboldt and
Humboldt Bay Harbor, Recreation and Conservation District

Project Funding Provided by:

The HUD Community Development Block Grant No. 14-CDBG-9890

Prepared by:

SHN
Engineers & Geologists

ch2m

HEMPHILL
water
engineering

February 2016 015147

SHN CONSULTING ENGINEERS & GEOLOGISTS, INC.
812 W. Wabash • Eureka, CA 95501-2138 • 707-441-8855 • FAX: 707-441-8877 •shninfo@shn-engr.com

Reference: 015147

February 25, 2016

Ms. Paula Mushrush
Humboldt County Community Development
520 E St.
Eureka, CA 95501

Subject: **Infrastructure Needs and Reuse on the Samoa Peninsula, Redwood Marine Terminal II**

Dear Ms. Mushrush:

Attached is the reuse evaluation of water and wastewater infrastructure at the Redwood Marine Terminal II, in Samoa, California. Water and wastewater infrastructure on the peninsula is a vital part of future improvements that will provide housing and economic growth to the nearby communities. This evaluation considered several onsite and offsite alternatives that could potentially be used with the existing infrastructure at RMT II. In addition, we evaluated improvements that may be required for the potential alternatives examined and associated planning-level costs associated with those improvements.

This document is intended to be used a guide for Humboldt County and the Humboldt Bay Harbor, Recreation and Conservation District on the potential future uses identified in this report.

Sincerely,

SHN Engineers & Geologists

Mike Foget, PE
Principal Engineer
707-441-8855

MKF/BGH:lms

Enclosures: Report

DRAFT

Reference: 015147

Infrastructure Needs and Reuse on the Samoa Peninsula

Redwood Marine Terminal II

Prepared for:

County of Humboldt and Humboldt Bay Harbor, Recreation and Conservation District
Eureka, California

Project Funding Provided by:

The HUD Community Development Block Grant No. 14-CDBG-9890

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Exp. 12/31/17

Prepared by:
SHN
Engineers & Geologists
812 W. Wabash Ave.
Eureka, CA 95501-2138
707-441-8855

February 2016

QA/QC:MKF___

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Table of Contents, Continued

Appendices

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List of Illustrations

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Abbreviations and Acronyms

CY	cubic yards
ft	foot
gpd	gallons per day
gpm	gallons per minute
hp	horsepower
kg	kilogram
kva	kilovolt ampere
lbs/day	pounds per day
LF	linear feet
MG	million gallon
mg/L	milligrams per liter
MGD	million gallons per day
ml/L	milliliter per liter
NTU	nephelometric turbidity units
psu	practical salinity units
SF	square foot
SY	square yard
ug/L	microgram per liter

AAF	average annual flow
ACOE	U.S. Army Corps of Engineers
BMPs	best management practices
BOD	biochemical oxygen demand
BOD$_5$	five-day biochemical oxygen demand
CCC	California Coastal Commission
CDFW	California Department of Fish & Wildlife
CDP	coastal development permit
CDWR	California Department of Water Resources
CEQA	California Environmental Quality Act
City	City of Eureka
County	County of Humboldt
CSLC	California State Lands Commission
DW	dissolved waste
EA	each
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
GHG	greenhouse gas
HBHRCD	Humboldt Bay Harbor, Recreation and Conservation District
HDD	horizontal directional drilling
HDPE	high density polyethylene
HWE	Hemphill Water Engineering
LS	lump sum
LSA	lake and streambed alteration
MH-#	manhole-number
MMWWF$_5$	maximum monthly average wet weather flow (with a 5-year recurrence level)
N	nitrogen
NA	not available
NAVD88	North American Vertical Datum, 1988
NH$_4$	ammonia
NMFS	National Marine Fisheries Service
NOAA	National Oceanic & Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NR	no reference
P	phosphorus
PDAF$_5$	peak daily average flow (for a 5-year, 24-hour storm)
PIF$_5$	peak instantaneous flow (attained during 5-year 24-hour storm)
RMT II	Redwood Marine Terminal II
RWQCB	North Coast Regional Water Quality Control Board
SHN	SHN Engineers & Geologists
SLR	sea level rise
SW	solid waste
SWRCB	State Water Resources Control Board
TSS	total suspended solids
TW	total waste
USFWS	United States Fish and Wildlife Service
WDR	Waste Discharge Requirement
WQS	water quality standard
WWTF	wastewater treatment facility

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1.0 Introduction

This planning- and feasibility-level report analyzes potential reuse of existing water and wastewater infrastructure located at the Redwood Marine Terminal II (RMT II) site (Figure 1). Reuse of the existing infrastructure at RMT II can benefit communities on the Samoa Peninsula and Humboldt Bay through economic development (aquaculture and a cost-effective method for processing dredge spoils), and environmental health (disposal of treated effluent through the ocean outfall limits impacts to groundwater from existing on site disposal activities).

RMT II is the site of the Former Louisiana Pacific Pulp Mill located at 1 TCF Drive, Samoa, California. The site is a 72-acre parcel (Assessor's parcel number 401-112-021) acquired by the Humboldt Bay Harbor, Recreation and Conservation District (HBHRCD) in 2013. This report was prepared by SHN Engineers & Geologists for the HBHRCD and the County of Humboldt (County). Additional support was provided by CH2M and Hemphill Water Engineering (HWE) to conduct engineering analyses for proposed upgrades. Individual engineering reports are included as appendices.

This report evaluates several key assets at the RMT II site for reuse or repurposing:

- An industrial water filtration system with a 30-million gallon per day (MGD) capacity, including two 1.5-million gallon (MG) clarifier ponds, fourteen 17,000-gallon water filters, four 150-horsepower (hp) pumps, a MicroFloc water filter system, and a 1,000-kilovolt amperes (kva) electrical substation
- An ocean outfall that is 1.5 miles in length, with a 48-inch diameter steel pipe and anchoring system with a 32-inch diameter high density polyethylene (HDPE) sleeve with an 800-foot long diffuser system at the ocean floor
- A large domestic wastewater treatment system that includes a collection system, septic tank, and leachfield

This study also evaluates several possible future uses and presents planning-level cost estimates for these reuse options:

- Use of the existing water treatment facility and ocean outfall pipe for treatment and discharge of water used for aquaculture operations
- Use of the existing ocean outfall pipe for discharge of wastewater collected from nearby areas, including the Samoa Peninsula and possibly the City of Eureka
- Use of the existing MicroFloc industrial water treatment facility for the dewatering and discharge of dredge slurry from a projected 30,000 to 50,000 cubic yards of dredge materials generated annually from HBHRCD dredging operations and piped to the site from the bay channel.

Challenges for reuse of the existing infrastructure include potential impacts from sea level rise.

Based on available models for the rate and magnitude of projected global sea level rise (SLR), and inundation models for the Samoa Peninsula, it appears that the former pulp mill site is not subject to impacts related to potential rise in sea level. This conclusion is based on review of the California Coastal Commission's sea level rise policy guidance manual and Humboldt Bay Sea Level Rise Adaptation Planning Project's final Humboldt Bay sea level rise modeling inundation mapping report. (Northern Hydrology, 2015). The Coastal Commission's guidance document includes a

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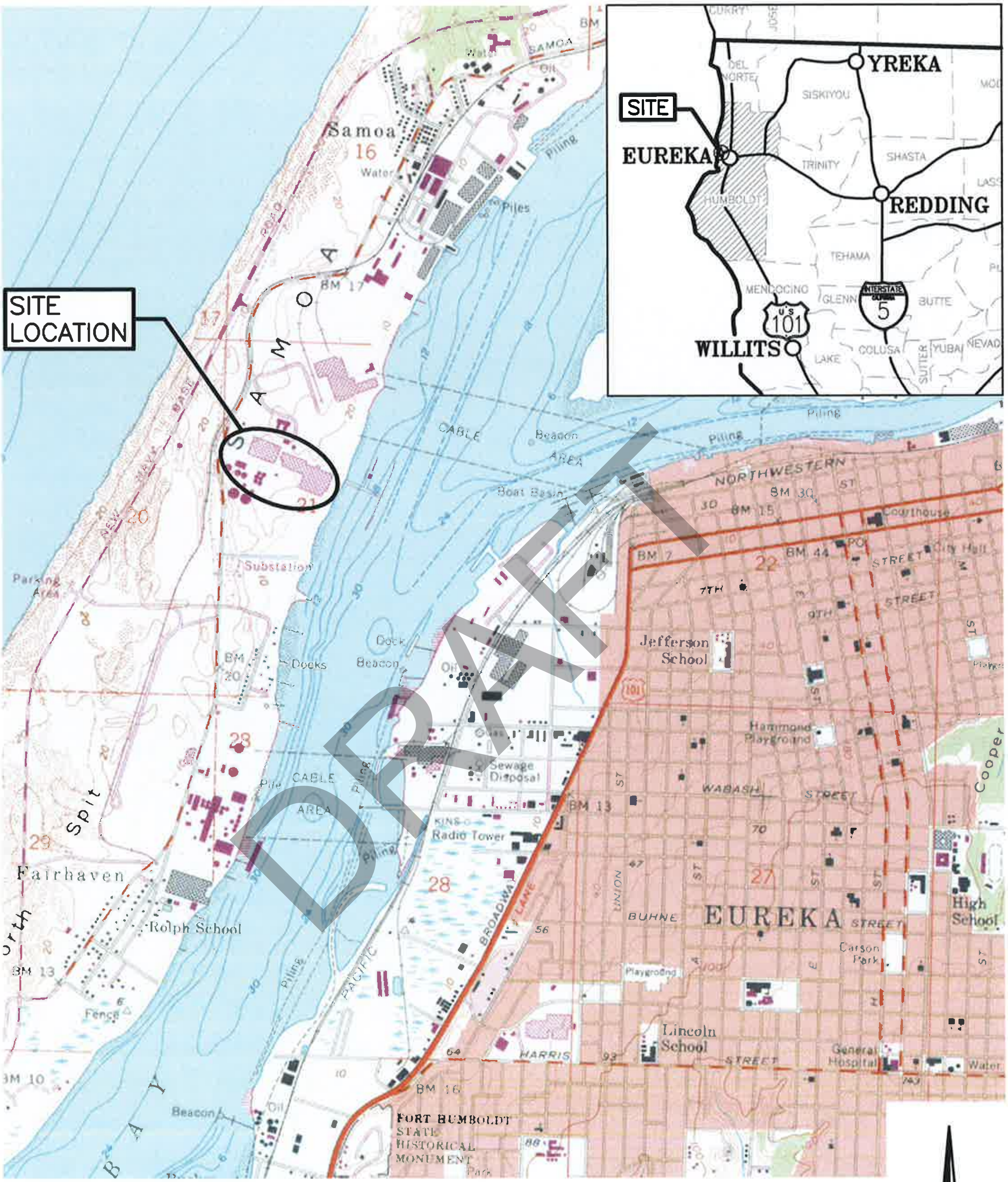

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SOURCE: EUREKA USGS 7.5 MINUTE QUADRANGLE

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SHN Consulting Engineers & Geologists, Inc.	The County of Humboldt Redwood Marine Terminal II Samoa, California	Site Location Map SHN 015147
	January 2016 / 015147-SITE-LCTN	Figure 1

table that outlines the projected magnitude of SLR for the region. For areas north of Cape Mendocino (including the subject site), the projected SLR ranges from 4 inches to as much as 56 inches. Because the site is at an elevation of between 23 and 25 feet, it would appear that even the largest projected amount of SLR along the north coast would not result in inundation at the former pulp mill, even under extreme situations (during a king tide coincident with a storm surge, for example). This interpretation is supported by mapping within the final Humboldt Bay sea level rise modeling inundation mapping report, which includes an image (Figure 6.4) that shows areas around Humboldt Bay vulnerable to inundation from a 2-meter SLR scenario (which is a greater rise in sea level than endorsed by the California Coastal Commission); the former pulp mill site is shown outside the areas vulnerable to SLR. Due to the extensive SLR modeling completed to date for Humboldt Bay, it does not appear that additional studies would be required to verify the absence of SLR-related impacts at the site.

2.0 Existing Infrastructure

Existing infrastructure at the site includes a septic tank and leachfield designed to treat flows from the RMT II site's sanitary sewer system, a MicroFloc industrial water treatment system, and manhole-5 (MH-5) which discharges into the 1.5 mile long ocean outfall with diffuser system (Figure 2).

Currently, DG Fairhaven Power, located in Fairhaven, California, discharges approximately 170,000 gallons per day (gpd) of process water, following treatment, through the RMT II ocean outfall. Discharges from DG Fairhaven Power are regulated by a National Pollutant Discharge Elimination System (NPDES) permit under North Coast Regional Water Quality Control Board (RWQCB) Order No. R1-2012-0027.

2.1 Septic Tank and Leachfield

The sanitary sewer system collects wastewater from facility restrooms and sinks in 6- to 10-inch vitrified clay pipe, and conveys it to a 10,000-gallon septic tank. The septic tank size has been calculated as 16,000 gallons. The cause of the discrepancy is unknown. Prior to 1988, the wastewater from the septic tank was discharged through the site's ocean outfall. The design drawing for a proposed leachfield (dated April 1988) is included in Appendix A, and indicates a dual leachfield system wherein discharge from the septic tank would be split and then distributed to 34, 4-inch diameter, 90-foot long perforated leachlines. The leachlines would be spaced 10 feet apart by way of two separate distribution boxes. The footprint of the leachfield was to be approximately 170 by 180 feet. It is believed that the leachfield was constructed shortly after the date of the design drawings (Figure 2). Measured daily flow of wastewater to the septic tank was 14,700 gpd (Integral, 2014). The existing leachfield is designed to handle effluent flows up to 17,000 gpd. In 2014, the leachfield was split so that half of the leachfield takes mariculture waste (up to 8,500 gpd) and the remainder is dedicated to disposal of domestic waste. Existing aquaculture effluent flows are approximately 2,400 gpd.

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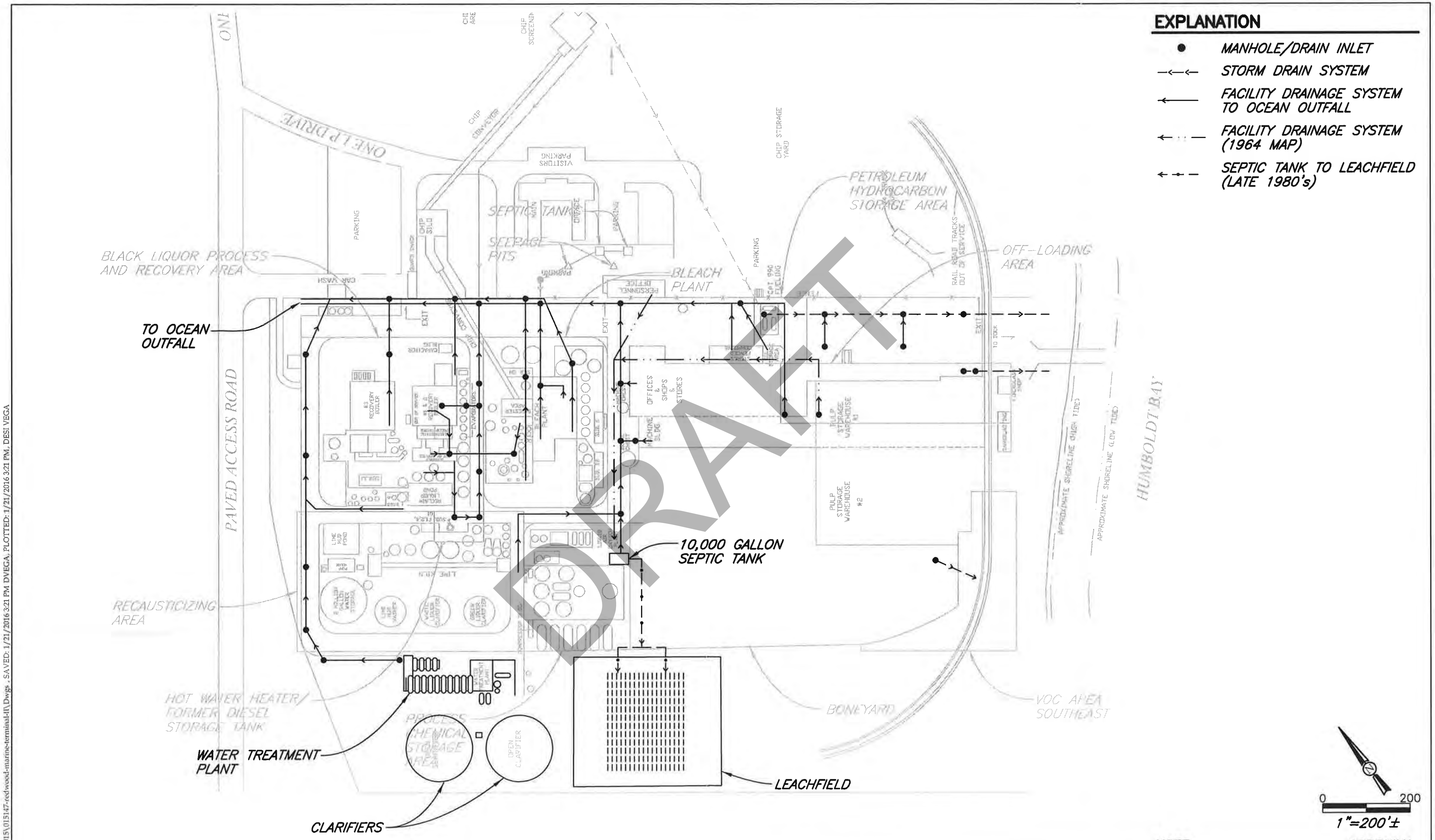

NOTE: ALL LOCATIONS ARE APPROXIMATE

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& Geologists, Inc.

The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Facility Drainage Schematic

SHN 015147

January 2016

015147-FCLTY-DRAIN

Figure 2

2.2 MicroFloc Water Treatment System

A preliminary inspection of the MicroFloc industrial water treatment system was conducted at the RMT II site on September 28, 2015, as a part of the overall assessment of infrastructure at the site. No internal inspections of the filters were conducted at this time, but will be required if the filters are to be placed back in service. The full inspection report is included in Appendix B.

The system includes a chemical feed system, two 1.5 MG clarifiers, ten horizontal pressure filters, four softeners, and a seawater filter. The system was designed for a nominal capacity of 30 MGD (20,800 gallons per minute [gpm]) with a peak flow capacity of 25,000 gpm. The design documentation states that the design influent loading for the filters was 100 nephelometric turbidity units (NTU), which would typically correspond to approximately 100 milligrams per liter (mg/L) suspended solids.

The condition of various components was assessed by means of a walk through. Piping galleries, valves, and related equipment appear to be in reasonably good condition. The control system is as supplied in the 1960s, and the panels appear to be significantly corroded and are outdated. It should be assumed that replacement of controls and field instruments with modern digital devices would be required for any future uses. Although the internals of the pressure filters could not be inspected, it is reasonable to assume that they are in operable condition, based on reports that they were in normal service when the plant was shut down in 2008. This would need to be confirmed by conducting internal inspections of the tanks and filter media. It is also reasonable to assume that most valves would be operational following a minor rebuild. The condition of the softening system could not be assessed, and it should be assumed that the resin would need to be replaced prior to use.

2.3 Ocean Outfall and Diffuser System


Photo 1: MH-5 Ocean Outfall

The existing ocean outfall is an approximately 1.5 mile long, 48-inch diameter pipe with 144 diffuser ports.

The capacity of the outfall is defined by pipe diameter, number of available diffuser ports, and port diameter. Available dilution capacity is controlled by effluent flow rate and density. Detailed modeling was performed by CH2M to assess dilution performance based on varying effluent flow, salinity, and temperature. Key findings include:

- Hydraulic assessment indicates the outfall can discharge up to 40 MGD based on 144, 2.4-inch ports. However, effluent with higher salinity content would reduce dilution.
- Dilution decreases with increase in flow, but target dilution of greater than 100:1 was easily achieved for flows up to 40 MGD for all conditions evaluated with the exception of effluent salinity of 30 practical salinity units (psu).

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- Dilution increases with increased effluent temperature. Effluent temperatures approximating receiving water temperatures provided significantly lower dilution than temperatures above that of the receiving water when salinities were greater than 10 psu.
- Dilution decreases with increased salinity. The target dilution of 100:1 may not be met when effluent salinity is greater than 30 psu.

The complete diffuser performance assessment report is included in Appendix C.

Historically, all onsite industrial process water discharges to MH-5, which discharges into the ocean outfall. The effluent pumps at MH-5 consist of two 350-hp sump pumps.

Photo 2: Effluent Pumps

3.0 Onsite Wastewater Sources

3.1 Aquaculture

Aquaculture has been identified as an industry with opportunities for growth in Humboldt County. The existing facilities at the RMT II could be reused to provide critical infrastructure for aquaculture operations. These facilities include access to both seawater and fresh water, marine dock access, an existing onsite water treatment/disposal facility, and a permitted ocean outfall for discharge of treated water.

Aquaculture operations currently exist at the RMT II facility with the operation of a small scale oyster hatchery. Waste flows from the current operation go to the existing leachfield.

Treatment of aquaculture wastes is a primary concern in planning for the reuse of RMT II infrastructure. A preliminary conceptual level estimation of waste loads was performed for use in planning and scaling of aquaculture facilities. The complete aquaculture waste load analysis is presented in Appendix D, and summarized below.

Waste loads and water requirements are species dependent, particularly when different taxa (such as, finfish and bivalves) are considered. A bivalve hatchery mariculture operation at RMT II would generate only a minimal amount of waste and would in all likelihood qualify for an exemption to NPDES permitting requirements under the Environmental Protection Agency's (EPA) regulation of the Clean Water Act. The EPA requires NPDES permitting only for cold-water operations that produce more than 20,000 pounds of organisms per year and use 5,000 pounds of feed per month. Because algae feed for oyster hatcheries is most often grown onsite by culturing algae cells already present in the source water, trace nutrients, and solar energy, hatcheries are normally exempt from

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these requirements. For example, the private oyster mariculture hatchery operation currently being developed in Humboldt Bay by Coast Seafood will be exempt from NPDES reporting requirements under this criterion.

On the other hand, finfish operations require daily feed to grow fish. The waste loads from a finfish operation would also be higher than bivalve mariculture. As a result, to develop a conservative estimate of aquaculture waste loads, steelhead (*Onchorhynchus mykiss*) was selected as the target species.

Steelhead are essentially anadromous rainbow trout that yield medium-to-high market value and would minimize the use of freshwater at the RMT II site, where previous studies have documented that available freshwater sources are prohibitively expensive for profitable aquaculture use. Steelhead fingerlings are readily available in the area, as are established purchasers for recreational use.

Estimated waste loads based on quantity of fish produced over a 30-week production period are summarized in Table 1.

Table 1
Estimated Waste Production for Steelhead
RMT II Infrastructure Reuse Evaluation, Eureka, California

	Total Fish Production							
	5,000		**50,000**		**250,000**		**500,000**	
Waste Load[1]	**kg**[2]	**lbs/day**[3]	**kg**	**lbs/day**	**kg**	**lbs/day**	**kg**	**lbs/day**
Total Solid Waste (SW)	1,532	16.08	15,324	161	76,622	804	153,244	1,609
Solid N Waste (SW_N)	68	0.71	679	7.13	3,396	35.7	6,792	71.3
Solid P Waste (SW_P)	28	0.29	280	2.94	1,399	14.7	2,799	29.4
Dissolved N Waste (DW_N)	211	2.22	2,108	22.1	10,542	111	21,084	221
NH_4-N Waste ($DW_{NH4\text{-}N}$)	169	1.77	1,687	17.7	8,433	88.5	16,867	177
Dissolved P Waste (DW_P)	17	0.18	167	1.75	833	8.74	1,666	17.5
Total N Waste (TW_N)	279	2.93	2788	29.3	13,938	146	27,876	293
Total P Waste (TW_P)	45	0.47	446	4.68	2,232	23.4	4,464	46.9

1. Waste loads estimated for a 30-week production period
2. kg: kilogram
3. lbs/day: pounds per day, estimate is an average for a 30-week production period.

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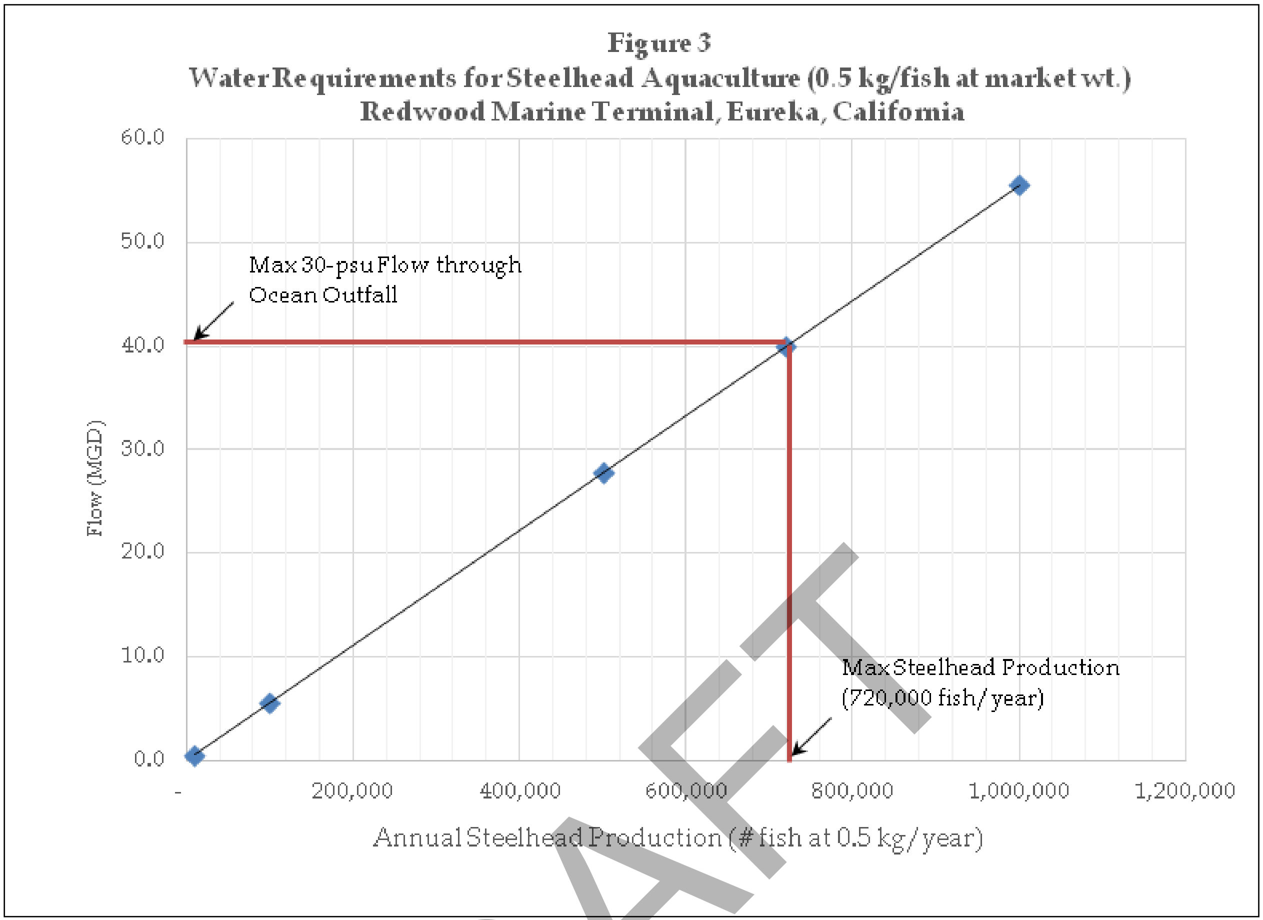
Based on the results of the ocean outfall diffuser modeling summarized in Section 2.3 and presented in detail in Appendix C, the diffuser would have sufficient capacity to hydraulically discharge up to 40 MGD of 30 psu wastewater from a potential finfish aquaculture facility in the absence of any other contributors to the ocean outfall. The quantity of flow-through water available for use at the aquaculture facility would serve as an important constraint on the potential size of the production operation. For an un-aerated steelhead raceway, a conservative estimate of the required water flow rate is approximately one liter per minute per kilogram (kg) of fish. Because a maximum of 40 MGD is available, a total of 360,000 kg of fish could be supported per year. Assuming that the market weight of steelhead is 500 grams, there would be an annual production capacity of 720,000 steelhead per year. Figure 3 illustrates the relationship between water flow rate to the aquaculture facility and the annual production capacity for steelhead.



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Using the mass loading rates developed in detail Appendix C and the flow and finfish production rates developed above, the concentrations of total solids, nitrogen, and phosphorus wastes of the aquaculture effluent can be estimated. Figure 4 summarizes the waste loading rates per kilogram of fish produced, and Table 2 presents the estimated concentrations of total solids, nitrogen, and phosphorus in the aquaculture effluent prior to discharge to the ocean outfall.

Figure 4
Annual Waste Loads
Redwood Marine Terminal, Eureka, California

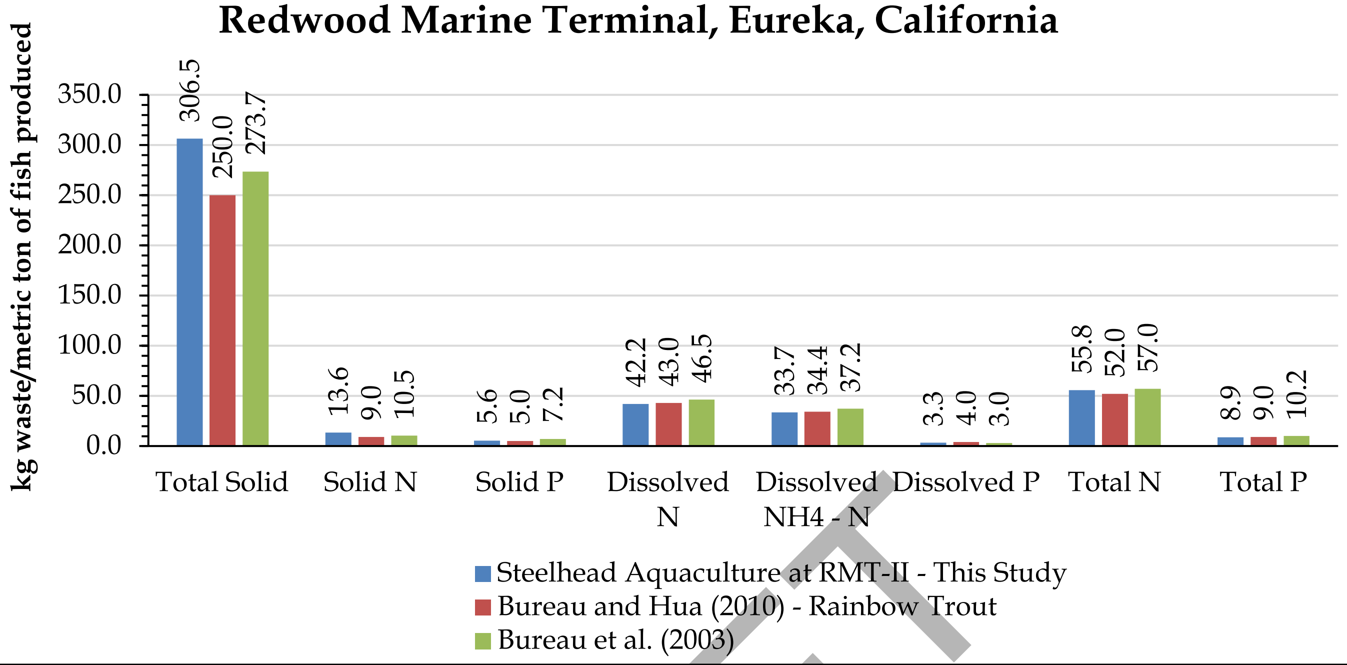

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Table 2
Estimated Waste Concentration of Steelhead Effluent
RMT II Infrastructure Reuse Evaluation, Eureka, California
(in mg/L)[1]

Total Solids Concentration	Total N[2] Concentration	Total P[3] Concentration
1.99	0.36	0.06

1. mg/L: milligrams per liter
2. N: nitrogen
3. P: phosphorous

As described in detail in Appendix B, the minimum dilution factor applicable to the maximum flow and salinity, and the minimum water temperature was estimated to be at least 75. This would result in post-dilution concentrations of 26 micrograms per liter (ug/L) of total solids, 5 ug/L of total nitrogen, and less than 1 ug/L of total phosphorus in the receiving water, far below the maximum levels allowed in the Ocean Plan.

3.2 Dredge Slurry

Disposal of approximately 30,000 cubic yards of dredge solids is required as part of annual maintenance dredging operations in Humboldt Bay. Dredge spoils have a low solids content and require dewatering prior to final disposition. For potential discharge through the ocean outfall at RMT II, dredge slurry effluent turbidity must be reduced to less than 75 NTU (approximately 75 mg/L suspended solids) (SWRCB, 2012).

3.2.1 MicroFloc Water Treatment System

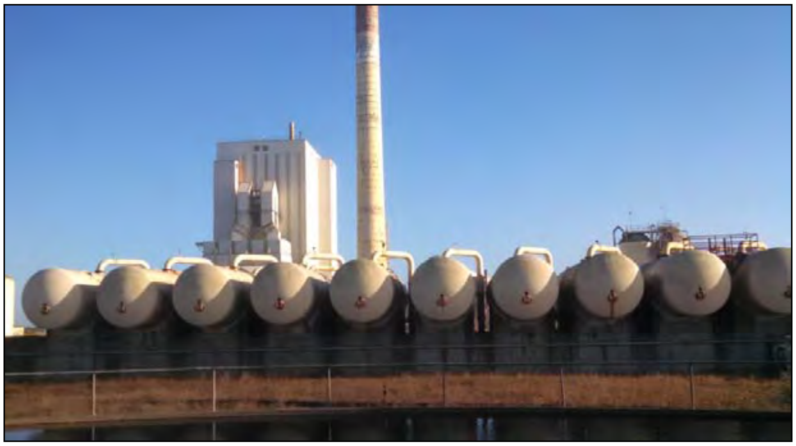

Photo 3: MicroFloc Filters

A preliminary analysis of dredge spoils processing using the existing MicroFloc system at the RMT II site has been developed by HWE. The full dredge spoils processing report is included in Appendix E.

Under this concept, the dredge slurry would pump directly to the existing water treatment system and be directed to one of the two clarifiers. The clarifier basins would be modified by removing the existing rake arms and installing a porous base/underdrain system covering the existing floor to prevent dredged solids from entering the hoppers in the floor, while allowing drainage of water. The drained water would be pumped away using the existing waste pumps, supplemented with new vertical can pumps installed near the center of each clarifier. Free water would also be allowed to overflow the clarifiers by means of existing weirs. The overflowed water would be combined with the pumped drain water in the clarifier effluent sump in the filter building.

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Water quality standards for the outfall require turbidity to be below 75 NTU. It is unknown whether the discharge would meet this standard without filtering, and it should be assumed that three of the existing filters, possibly with coagulant, would be needed. If coagulant is required, an NPDES permit for the discharge may also be required.

Pumping would be alternated between the two clarifiers weekly. One clarifier would be receiving dredge slurry, while the other would be allowed to drain free water and excavate/remove solids using traditional mobile machinery.

In addition to renovations to the clarifier, described above, and improvements needed to get the filters into operable condition, a new system to provide backwash water will be required. The existing filtration system requires at least four filters in operation to provide sufficient backwash water for a single filter. The backwash requirement for each filter is approximately 5,700 gpm and a total volume of approximately 56,000 gallons. It is proposed that the existing seawater filtration storage tank, with a capacity of 100,000 gallons, be used to store

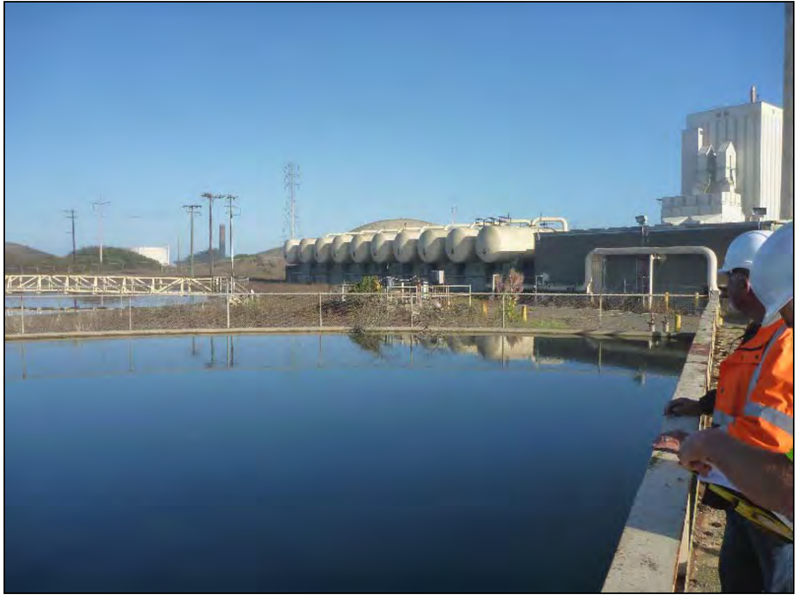

Photo 4: Existing Clarifier

water for backwash. This will require additional infrastructure, including new 75-100 hp pumps, new piping and valves, and modifications to the piping manifold serving the filters. See Appendix E for a detailed description of recommended infrastructure additions.

3.2.2 Geotubes

Dewatering of dredge spoils using geotextile tubes, or geotubes, is proposed as an alternative to retrofitting and using the existing water treatment system. Dewatering using geotubes is accomplished by injecting a polymer into the dredge slurry and pumping it into the geotubes. Water filters through the wall of the tubes during multiple fill cycles. Tubes are then allowed to drain, and are cut open to remove solids.

Assuming a total volume of 30,000 cubic yards of dredge solids and a geotube width of approximately 16 feet and a height of approximately 5 feet, approximately 4 acres will be required for geotubes and related drainage structures, and equipment access. The 4-acre field would be graded to drain to a single location and lined with an impervious material with a sand cover. Geotubes would be placed on top of the sand layer. The shape of the required area is flexible; geotubes can be ordered in varying lengths, and arranged as needed. A proposed geotube area is shown on Figure 5. A reduction in acreage may be achieved by stacking the geotubes. Water from the drainage structures will be piped to the ocean outfall by way of MH-5. It is assumed that geotube effluent will meet the California Ocean Plan turbidity limit of 75 NTU (SWRCB, 2012). Additional testing will be required to ensure that all permit limits are met. If turbidity does not meet the limit, standard stormwater best management practices (BMPs) or the existing clarifiers may be used for additional turbidity reduction.

Using polymer to process dredge slurry would increase permitting requirements. Water decanted from dredging activities is eligible for discharge under Section 404 of the Clean Water Act and the discharger may apply for coverage under the United States Army Corps of Engineers (ACOE) Nationwide Permit No. 16. However, whether polymer is added to the dredged material or is processed for offsite use, the discharge would no longer qualify under Section 404, and would not be eligible for Nationwide Permit No. 16. Instead, it would need to be covered under an individual NPDES permit.

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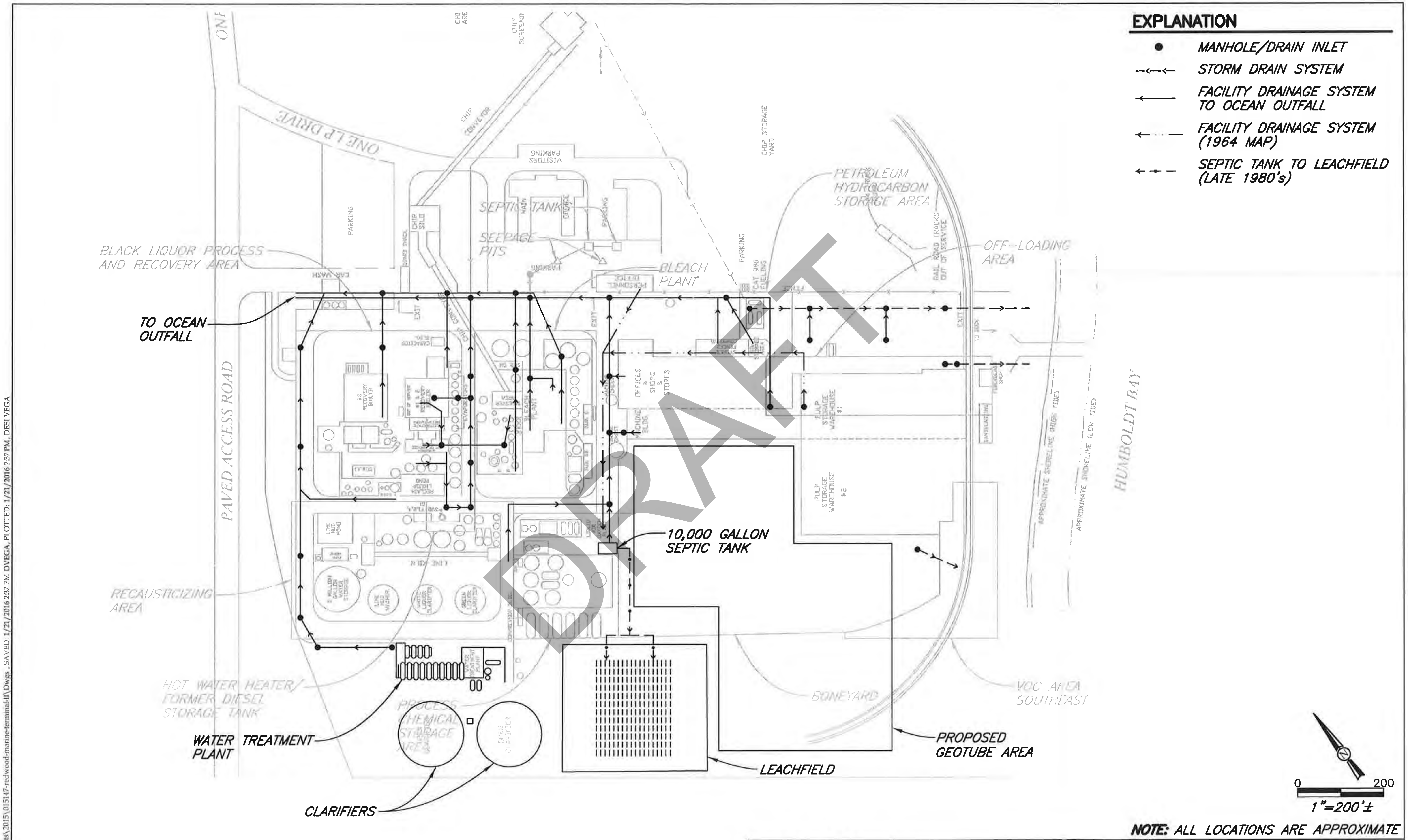
4.0 Offsite Wastewater Sources

Three potential offsite wastewater sources were evaluated for disposal at the existing Redwood Marine Terminal permitted ocean outfall. These include the City of Eureka (City), and the communities of Samoa and Fairhaven.

Future residential, commercial, or industrial development in the communities of Fairhaven and Samoa require improved wastewater treatment and disposal facilities. Both communities are listed as severely economically disadvantaged communities, which are communities having an annual median household income less than 60 percent of the statewide average (CDWR, 2016). Improved infrastructure will promote both affordable housing and job opportunities in these communities, and improve the environmental health of these communities.



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The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Proposed Geotube Area

SHN 015147

January 2016

015147-PROP-GEOTUBE-AREA

Figure 5

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4.1 City of Eureka

The City of Eureka currently disposes of treated wastewater from the Elk River wastewater treatment facility (WWTF) pursuant to RWQCB Order No. R1-2009-0033. The facility serves approximately 45,000 people from the city and unincorporated areas within the Humboldt Community Services District (RWQCB, 2009).

Currently, the Elk River WWTF discharges treated wastewater to Humboldt Bay through a 3,000-foot outfall line that terminates on the east side of the shipping channel at a depth of 30 feet (RWQCB, 2009) Discharge is only permitted on an ebb tide to ensure that effluent is conveyed to the Pacific Ocean. Treated wastewater is stored in an 8-MG equalization basin at Elk River WWTF, to be discharged during an ebb tide.

4.1.1 Wastewater Flows

The average annual flow (AAF), the maximum monthly average wet weather flow with a 20% probability of occurrence ($MMWWF_5$), the peak daily average flow associated with a 5-year, 24-hour storm ($PDAF_5$), and peak instantaneous flow attained during a 5-year PDAF (PIF_5) were estimated using daily effluent data provided by the treatment plant for January 2010 through October 2015.

The AAF was estimated using data from the calendar year 2010. The years 2011 through 2015 were not used in this estimation, because of unusually dry conditions during that period. The AAF for the Elk River WWTF is 5.91 MGD.

The $MMWWF_5$ represents the wettest wet season monthly average flow that is anticipated to have a five-year recurrence interval.

Based on monthly total precipitation data from the Eureka Rainfall Station, the rainfall with a 1-in-5 year recurrence interval in January is 8.73 inches. On Figure 6, this corresponds to a $MMWWF_5$ of 8.07 MGD.

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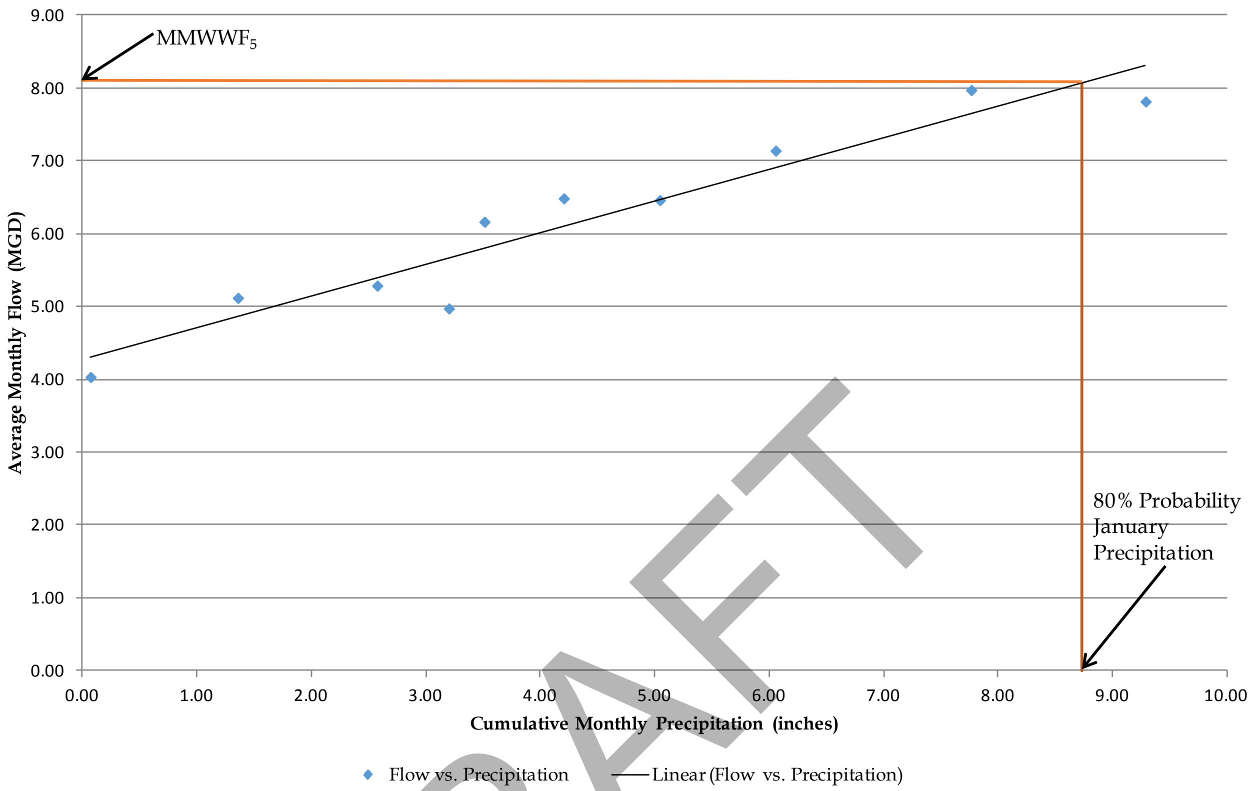
Figure 6
Elk River WWTF Flow vs. Precipitation
Redwood Marine Terminal, Eureka, California



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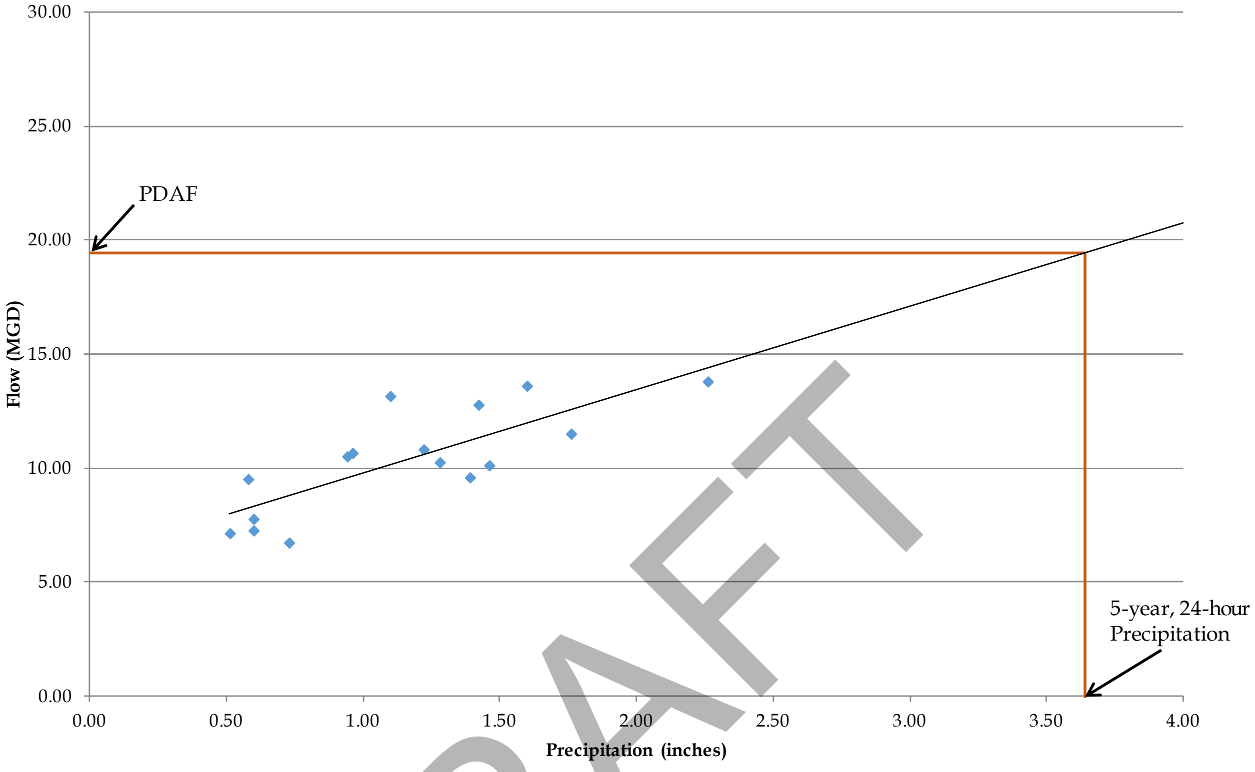
The PDAF$_5$ is the largest daily flow associated with a 5-year, 24-hour precipitation event. The peak day average flow has a 0.27% probability of occurrence or 1 day in 365 days of any given year. Estimation of peak day flow is based on a regression analysis of daily plant flows during or immediately following wet season significant rainfall events. PDAF$_5$ is shown on Figure 7.

Because the increased influent flow to the WWTF during wet weather is highly correlated with rainfall, evaluation of this regression can be used to define peak day flow associated with a specific rainfall event. The PDAF$_5$ event is determined from a plot of the recorded daily flow that occurred during, or 24 hours after, a significant rainfall event (Figure 7).

Figure 7
Elk River WWTF PDAF$_5$
Redwood Marine Terminal, Eureka, California



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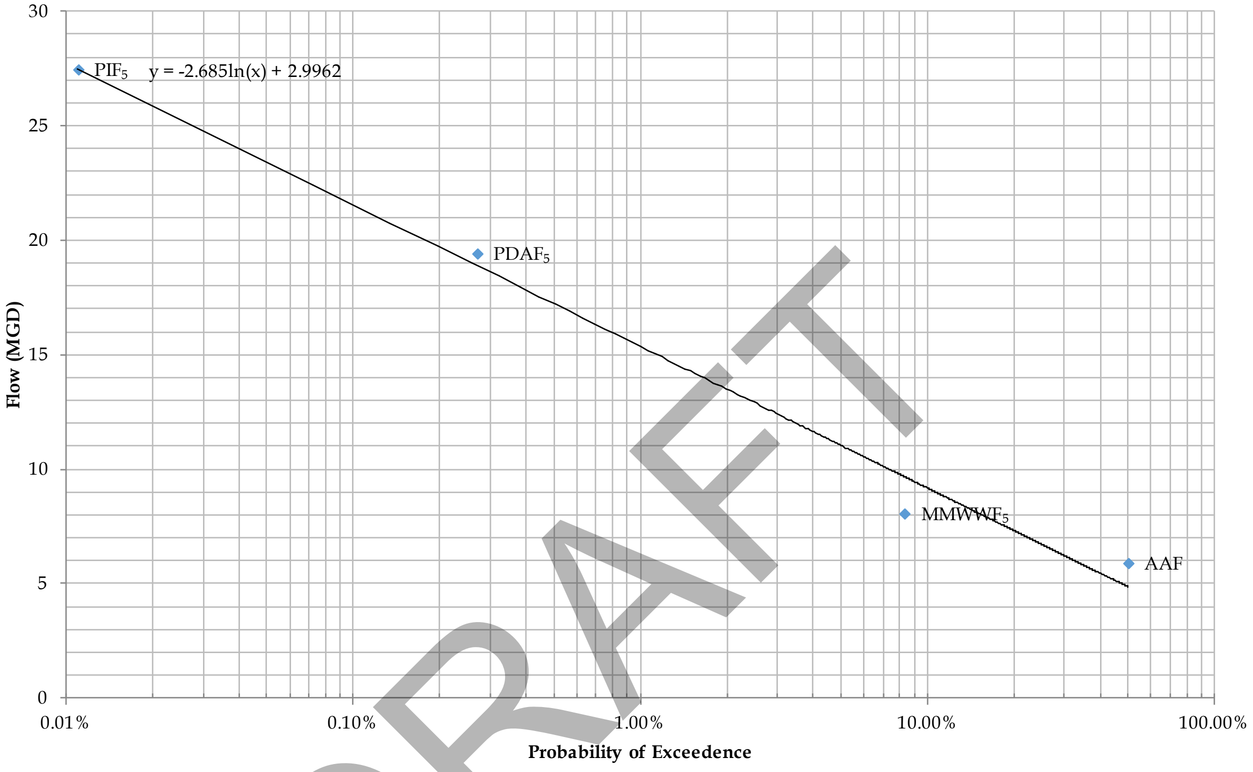
By performing a regression analysis of data, a linear relationship is established, as shown in Figure 7. The PDAF$_5$ is based on the intercept of this line with the 5-year, 24-hour precipitation event. To calculate the estimated PDAF$_5$, the 5-year, 24-hour precipitation event for the Eureka area was set equal to 3.64 inches (NOAA, 2015). Based on the regression analysis shown in Figure 7, the resulting PDAF$_5$ for a 3.64-inch event is equal to approximately 19.43 MGD.

The PIF$_5$ is the highest sustained hourly flow rate during wet weather. The PIF$_5$ has 0.011% probability of occurrence (1 hour in 8,760 hours of the year). Hydraulic design of channels and pumps at a treatment facility is usually based on this flow.

The PIF_5 attained during a 5-year, 24-hour storm event is determined from a probability projection of the AAF, $MMWWF_5$, and the $PDAF_5$ parameters. The projection plot shown in Figure 8 shows that the PIF_5 for the Elk River WWTF is estimated to be 27.47 MGD.

Figure 8
Elk River WWTF Peak Instantaneous Flow
Redwood Marine Terminal, Eureka, California



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Although the PIF_5 is typically used to design channels and pumps, the $PDAF_5$ (19.43 MGD) was considered more appropriate for this project. Instantaneous and hourly peaks will be equalized using the existing 8-MG equalization basin.

4.1.2 Wastewater Characterization

Effluent biochemical oxygen demand (BOD) and total suspended solids (TSS) for the Elk River WWTF were obtained from the facilities 2013 Annual Report (City of Eureka, 2014). Maximum and average concentrations are summarized in Table 3.

Table 3
Flow and Loading Estimates
RMT II Infrastructure Reuse Evaluation, Eureka, California

Location	Flow Description	Flow (MGD)[1]	BOD_5[2] (mg/L)[3]	BOD_5 (lb/day)[4]	TSS[5] (mg/L)	TSS (lb/day)	Settleable Solids (ml/L)[6]
Fairhaven[7,8]	Avg.	0.027	30	6.8	30	6.8	NA[9]
Samoa	Avg. [10]	0.061	30[11]	7.6	30	30	0.1[11]
	Peak[10]	0.131	30[11]	22	30	30	0.2[11]
Eureka[12]	AAF[13]	5.91	11.7[14]	353[14]	11[14]	345[14]	NA
	PDAF$_5$[15]	19.43	24[16]	599[16]	28[16]	765[16]	NA

1. MGD: million gallons per day
2. BOD_5: five day biochemical oxygen demand as milligrams oxygen consumed per liter
3. mg/L: milligrams per liter
4. lb/day: pounds per day
5. TSS: total suspended solids
6. ml/L: milliliter per liter
7. The flow rate for Fairhaven was determined by adding estimated flows from businesses, residents, and apartments. Flow rates for businesses were determined on a per employee basis using typical commercial flow rates from Davis, M. L. (2011). Flow rates for residents were determined using an average domestic daily flow rate of 380 liters per day (Davis, M. L. 2011). The number of houses in Fairhaven was estimated using Google Earth, and a conservative value of 2.94 people/household from the US Census Bureau (2015) was used to determine the total number of residents.
8. BOD_5 and TSS based on typical regulatory limits
9. NA: not available
10. Full build out for proposed wastewater treatment facility that serves existing town and post development (SHN, 2015)
11. Discharge limitations for treated effluent from proposed Samoa WWTF, Order No. R1-2014-0031–would not need to meet if we met ocean outfall plan and secondary treat standards.
12. Effluent BOD_5 and TSS from City of Eureka 2013 Annual Report (City of Eureka, 2014)
13. AAF: average annual flow, based on plant flow data from 2010
14. Average effluent BOD and TSS for 2013 (City of Eureka, 2014)
15. PDAF$_5$: peak daily average flow attained during the 5-year, 24-hour storm; estimated using plant data from January 2010 to April 2015
16. Peak effluent BOD and TSS based on maximum daily values in 2013

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4.2 Samoa

The Town of Samoa is located northeast of the RMT II on the Samoa peninsula (Figure 9). The population during the 2010 census was 258 people (U.S. Census Bureau, 2015). The town of Samoa is identified as a severely economically disadvantaged community, which is defined as having an annual median household income less than 60 percent of the statewide average (CDWR, 2016). The Town of Samoa has a master plan to subdivide and redevelop the town in two phases. Phase 1 will include rehabilitation of existing homes and an 80-unit affordable housing complex. Funding for the affordable housing project is contingent on construction beginning in 2016. Phase 2 will include construction of additional new homes, as well as new commercial and industrial business parks. Phase 1 will require the construction of a new WWTF to provide services for the new and existing homes and businesses.

4.2.1 Wastewater Flows

The Town of Samoa is served by two disposal systems. The eastern system serves approximately 75 homes, the downtown retail area, and the Samoa Cookhouse, and has an average dry weather flow of 17,000 gpd, and an average wet weather flow of 32,000 gpd. The western system serves approximately 25 homes and has an average flow of 7,500 gpd (RWQCB, 2014).

Following implementation of Phase 1 and Phase 2, development average influent flows are anticipated to be 61,000 gpd, with peak flows of approximately 131,000 gpd (SHN, 2015).

4.2.2 Wastewater Characterization

A WWTF is proposed to replace the eastern and western systems and treat the additional wastewater from Phase 1 and Phase 2 developments. The proposed Samoa WWTF is subject to permit requirements under Draft Waste Discharge Requirements (WDR) Order No. R1-2014-0031. Concentration limits[1] for BOD and settleable solids are included in the existing permit, and summarized in Table 3.

Wastewater discharged through the RMT II ocean outfall would be subject to the Ocean Plan, and would be required to meet EPA secondary effluent standards.

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4.3 Fairhaven

Fairhaven is an unincorporated community located on Samoa Peninsula, southwest of the RMT II (see Figure 9). The community consists of approximately 83 single-family residences (Google Earth) and the Fairhaven Business Park. The community of Fairhaven is identified as a severely economically disadvantaged community, which is defined as having an annual median household income less than 60 percent of the statewide average (CDWR, 2016)

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[1] Discharge limitations for treated effluent from proposed Samoa WWTF, Order No. R1-2014-0031.

4.3.1 Wastewater Flows

Currently, no wastewater collection infrastructure exists within the community of Fairhaven. Individual properties maintain onsite septic tanks, leachfields, or other individual wastewater treatment and disposal systems. Costs for maintenance and repair of aging septic and leachfield systems are currently the responsibility of individual property owners within the community.

An approximate wastewater flow of 27,000 gpd was estimated using literature values for typical wastewater production from residential and commercial sources. Existing businesses include offices, a dive shop, a boat yard, and a water bottling facility. Residential population was estimated to be 244 people based on an estimated 83 houses and an estimated 2.94 persons per household (U.S. Census Bureau, 2015).

4.3.2 Wastewater Characterization

Wastewater effluent strength for the community of Fairhaven was estimated based on typical regulatory standards. It is assumed that wastewater effluent will be treated so that concentrations of BOD and TSS will be less than 30 mg/L. Estimated BOD and TSS values are included in Table 3.

4.4 Projected Growth

Humboldt County has a projected annual growth rate of 0.44%, based on the Department of Finance population database. The City of Eureka uses a 0.5% growth rate for planning purposes (City of Eureka, 2011). Using a 0.5% growth rate, the total population increase expected from the combined communities of Fairhaven, Samoa, and the City of Eureka is approximately 5,000 people by 2030. Using a standard literature value for domestic wastewater of 100 gallons per capita per day, this population equates to an increase in wastewater flows of approximately 0.5 MGD.

5.0 Conceptual Plan for Treatment of Onsite Industrial Wastewater

Photo 5: Clarifier

The existing leachfield has been modified for disposal of effluent flows from aquaculture. The maximum daily flow is 8,500 gpd. Any aquaculture flows in excess of 8,500 gpd would need to be routed to the ocean outfall.

Section 3.0 indicates that wastewater from onsite users could include aquaculture wastes and free water from dredge slurry decanted in the onsite clarifiers. Depending on the configuration of the onsite finfish aquaculture facility, the accumulation of solid wastes in the basins could be managed either by the removal of settled wastes directly from the aquaculture raceways or by settling in separate basins. Whichever method the aquaculture facility were to employ to collect settled solids, a post-

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equalization/settled solids storage tank could be provided by the HBHRCD to facilitate the continuous discharge of settled aquaculture waste to the ocean outfall, rather than the high-strength batch loading that would occur when the aquaculture facility would periodically harvest the solids. Such a solids storage system could be as simple as an HDPE tank and a small centrifugal pump.

The storage volume of the tank and the capacity of the pump would depend on the design of the aquaculture facility. However, the settling zone volume required to accommodate 660 pounds of daily total solid waste produced by steelhead at the facility's maximum annual production capacity was estimated to be 440 gallons, assuming that solids in the settling zones are 18 percent dry solids. If the facility were to discharge solids to the storage tank weekly, the required useable HDPE tank volume would be roughly 3,080 gallons and the pumping rate to discharge that volume over a continuous interval would be 18 gallons per hour. This system could, therefore, be comprised of a 4,000-gallon HDPE tank and a small positive displacement pump designed for high solids. At a conceptual-level, this equipment might be estimated to cost from $30,000 to $50,000 to purchase, install, and integrate.

Installation of a new drainage line from the proposed solids settling tank to the discharge line to the ocean outfall would be required. A proposed alignment for this line is shown on Figure 10.

6.0 Conceptual Plan for Disposal of Offsite Wastewater

The proposed infrastructure consists of approximately 18,000 linear feet of 30-inch diameter sewer line from the outfall of the existing equalization basin at the Elk River WWTF to MH-5 located at the RMT II (Figure 9). This line would transport treated wastewater from the Elk River WWTF and the community of Fairhaven to the RMT II for discharge at the RMT II permitted ocean outfall. Installation would be performed in three sections:

1. The City of Eureka line–from the Elk River WWTF equalization basin to the eastern shore of Humboldt Bay (Figure 11)
2. The horizontal directional drill (HDD) line–approximately 3,200 feet from the eastern shore of Humboldt Bay to the community of Fairhaven on the western side of Humboldt Bay (Figure 12)
3. The Fairhaven line–from the western shore of Humboldt Bay, through the community of Fairhaven, to MH-5 on the RMT II property (Figure 13)

An additional 4,000 linear feet of 4-inch diameter sewer line also would be installed from the future site of the Samoa WWTF to MH-5 (Figure 14).

The installation of pump stations would be required in all three communities.

6.1 City of Eureka Line

Effluent flows from the Elk River WWTF range from a minimum of 2.2 MGD to an estimated peak hour flow of 27.5 MGD, with an average of approximately 5.91 MGD. From January 2010 through October 2015, the maximum daily flow coinciding with a rainfall event was 18.77 MG, and flows exceeding 15 MGD typically occurred on two to three days per year. To achieve appropriate minimum and maximum pipe velocities, it is assumed that the existing 8-MG equalization basin would be used to regulate flows to between 5 and 19 MGD. A pump station with a minimum

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pumping capacity of 5,500 gpm will be required to ensure minimum velocities are great enough to prevent solids settling in the pipes.

The proposed alignment for the City of Eureka force main begins at the outfall of the existing 8 MG equalization basin and extends approximately 4,500 feet to the proposed location to the entry pit for the HDD line (Figure 11). A pump station would also be required with a capacity to pump 5 to 19 MGD.

6.2 Horizontal Directional Drill

The potential alignment for the HDD line is shown on Figure 12. Based on information obtained from the ACOE, the dredge depth in Humboldt Bay is approximately 48 feet below the mean lower low water elevation of 0 feet North American Vertical Datum, 1988 (NAVD88). The HDD line would be installed approximately 20 feet below the minimum dredge elevation. The estimated length of pipe required from the entry pit to the exit location reaching the required depth is approximately 3,200 feet.

6.3 Fairhaven Line

6.3.1 With City of Eureka

The Fairhaven line would convey flows from the HDD line approximately 10,000 feet to the connection point with the ocean outfall pipe on RMT II property. The 30-inch line would also collect flows from the community of Fairhaven.

A pump station to pump effluent from the community of Fairhaven into the 30-inch line from Eureka would be required. This would consist of a manhole/wet well with duplex pumps capable of pumping approximately 100 gpm.

6.3.2 Fairhaven Only Alternative

In the event that disposal is required for the community of Fairhaven, but no effluent from the City of Eureka will be routed to the RMT II, a 4-inch diameter line would be installed from an assumed small community wastewater treatment facility, located on the northern side of the community, to MH-5 (Figure 15). Treated effluent would be pumped approximately 1.25 miles from the WWTF to MH-5 for disposal. A pump station consisting of a manhole/wet well with duplex pumps capable of pumping approximately 100 gpm would be required.

6.4 Samoa Line

Effluent from the proposed Samoa WWTF would be routed to the connection point with the ocean outfall at RMT II by approximately 5,200 feet of 4-inch diameter line. A pump station consisting of a manhole/wet well with duplex pumps capable of pumping approximately 150 gpm would be required.

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SHN Consulting Engineers & Geologists, Inc.	The County of Humboldt Redwood Marine Terminal II Samoa, California	Project Overview SHN 015147
	January 2016 · 015147-OVERVIEW	Figure 9

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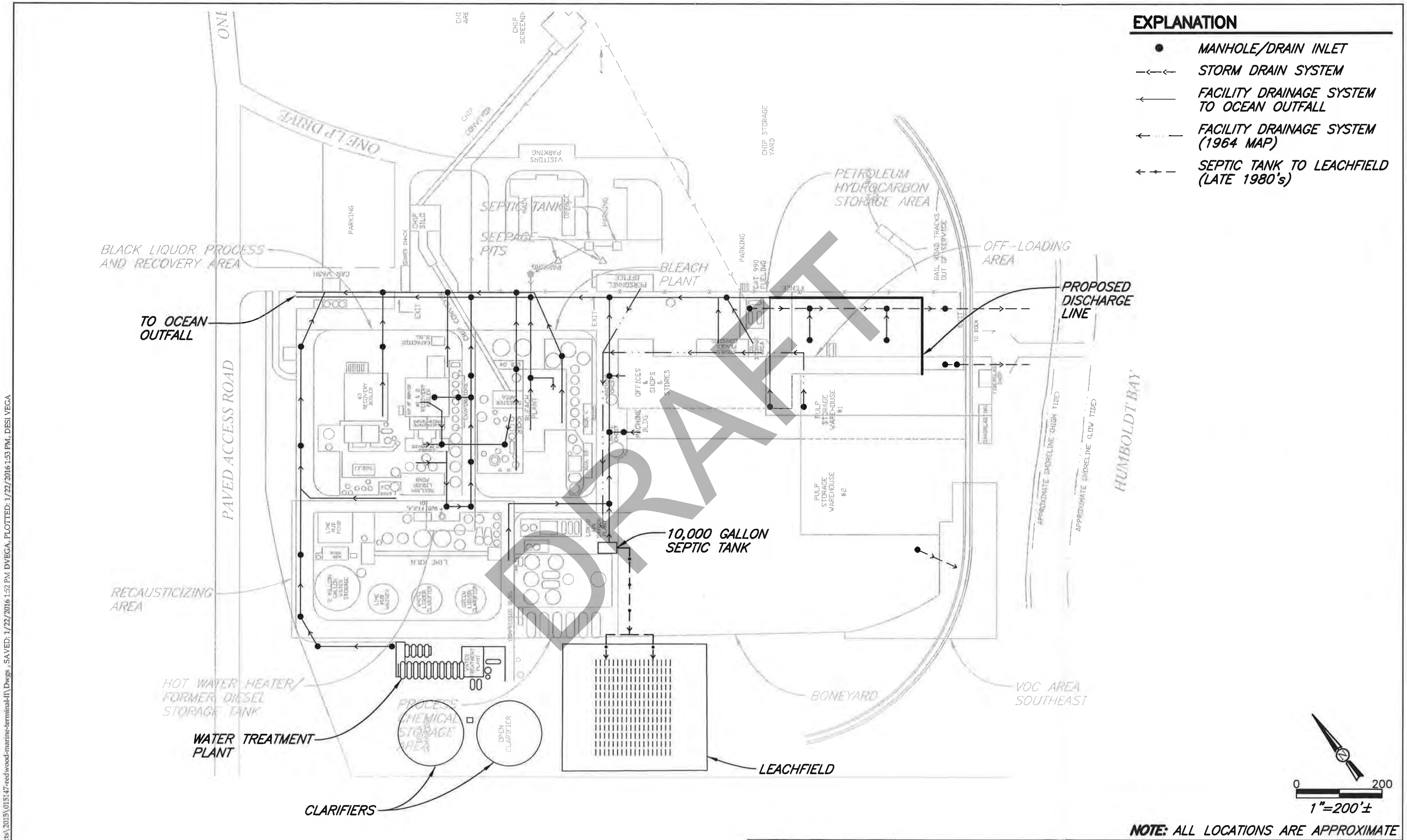

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The County of Humboldt
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Samoa, California

Aquaculture Discharge Line

SHN 015147

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Figure 10

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The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Eureka Alignment

SHN 015147

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015147-EKA-ALIGN

Figure 11

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The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Horizontal Directional Drill

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Figure 12

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The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Fairhaven Alignment

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Figure 13

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The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Samoa Alignment

SHN 015147

January 2016

015147-SAMOA-ALIGN

Figure 14

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The County of Humboldt
Redwood Marine Terminal II
Samoa, California

Fairhaven Only Alignment

SHN 015147

January 2016

015147-FRHVN-ONLY-ALIGN

Figure 15

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7.0 Cost Analysis

Cost estimates presented in the following sections are for planning and feasibility assessment purposes only.

7.1 Permitting

This section addresses special studies, California Environmental Quality Act (CEQA) compliance, and permits anticipated to be needed for three potential project options: 1) the entire wastewater conveyance and ocean outfall disposal project discussed previously in this document 2) wastewater conveyance from Fairhaven and Samoa to RMT II including maintenance and repair of (and disposal through) the ocean outfall; and 3) maintenance and repair of the ocean outfall only.

7.1.1 Special Studies

A variety of special studies would be needed in support of the project engineering design, permit applications, and CEQA compliance. Necessary special studies would likely include many of the following, although the full range of required documentation would depend upon specific agency requirements following their review of detailed project applications. Not all of these studies may be required. Estimated cost ranges are very approximate given the current limitations on project definition and agency concerns. Estimated timeframes are provided per task; many timeframes would presumably overlap with the preparation of other special studies and the initiation of the permit processes. Table 4a presents anticipated special studies for the entire project. Table 4b presents anticipated special studies for wastewater conveyance from Fairhaven and Samoa to RMT II including maintenance and repair of (and disposal through) the ocean outfall. Table 4c presents anticipated special studies for maintenance and repair of the ocean outfall only.

Table 4a
Anticipated Special Studies, Entire Project
RMT II Infrastructure Reuse Evaluation, Eureka, California

Special Study	Estimated Cost Range	Estimated Timeframe
Natural resources assessment	\$6,000-\$12,000	3-6 months
Biological assessment(s)	\$6,000-\$15,000	3-6 months
Wetland/riparian/other waters delineation	\$6,000-\$15,000	3-6 months
Biological mitigation, monitoring, and reporting plan	\$5,000-\$10,000	2-4 months
Cultural resources study	\$6,000-\$12,000	2-4 months
Greenhouse gas emissions analysis	\$5,000-\$10,000	2-4 months
Geotechnical report with hydraulic fracture analysis (Eureka effluent line only)	\$40,000-\$50,000	2-4 months
TOTAL	**\$74,000-\$124,000**	**3-9 months**

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Table 4b
Anticipated Special Studies, Wastewater Conveyance and Disposal from Fairhaven and Samoa to RMT II
RMT II Infrastructure Reuse Evaluation, Eureka, California

Special Study	Estimated Cost Range	Estimated Timeframe
Natural resources assessment	$6,000-$12,000	3-6 months
Biological assessment(s)	$6,000-$12,000	3-6 months
Wetland/riparian/other waters delineation	$6,000-$15,000	3-6 months
Biological mitigation, monitoring, and reporting plan	$5,000-$10,000	2-4 months
Cultural resources study	$6,000-$12,000	2-4 months
Greenhouse gas emissions analysis	$5,000-$10,000	2-4 months
TOTAL	**$34,000-$71,000**	**3-9 months**

Table 4c
Anticipated Special Studies, Ocean Outfall Maintenance/Repair Only
RMT II Infrastructure Reuse Evaluation, Eureka, California

Special Study	Estimated Cost Range	Estimated Timeframe
Biological assessment(s)	$5,000-$10,000	2-4 months
TOTAL	**$5,000-$10,000**	**2-4 months**

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Natural Resources Assessment. The natural resources assessment would characterize the environmental setting and habitat at the site, query databases for special status species and habitats reported in the project vicinity, and assess the project's potential impacts to special status species and habitats. It would also include seasonally-appropriate floristic survey(s) if applicable, which need to occur during spring-summer, depending upon the species of concern. The 3- to 6-month timeframe assumes that the natural resources assessment fieldwork would be conducted during the appropriate time of year. The cost of the natural resources assessment would be higher the more variety of habitat types is involved and the larger the project footprint.

Biological Assessment(s). The U.S. Army Corps of Engineers (ACOE) typically consults with National Marine Fisheries Service (NMFS) and/or U.S. Fish & Wildlife Service (USFWS) regarding impacts to federally listed species and their habitats (such as, salmonids and certain whales). For actions that "may affect" federally listed species, these agencies require preparation of a biological assessment. Depending on which species are involved, biological assessments may need to be prepared for both NMFS and USFWS. Biological assessment(s) are anticipated to be needed regardless of which project element(s) go forward. The cost would be higher depending on how many federally listed species require Section 7 consultation and whether consultation with one or both the NMFS and USFWS are required.

Wetland/Riparian/Other Waters Delineation. A delineation of wetlands, riparian areas, and/or other jurisdictional waters will be needed if the project involves work in or near such features. The delineation would be used to quantify the project's impacts to jurisdictional waters pursuant to permitting and CEQA compliance. The cost would be higher with more potential wetlands/waters present.

Biological Mitigation, Monitoring, and Reporting Plan. Impacts to special status species, wetlands, and/or other jurisdictional waters may require mitigation to meet agency permit requirements. This may include revegetation efforts or other mitigation plantings, which would need to be monitored for a period of typically five years with annual reporting to the agencies. The biological mitigation, monitoring, and reporting plan would detail necessary mitigation efforts, and would be made a condition of approval of the various permits. A biological mitigation, monitoring, and reporting plan may be needed for any ground disturbing project element, depending on biological impacts. The cost would be higher with more biological impacts.

Cultural Resources Study. Agency requirements would likely include the preparation of a cultural resources study, which would investigate the project's potential to have an adverse effect on historical, archaeological, or paleontological resources. A cultural resources study would likely be required for any project involving ground disturbing activity, especially in previously undisturbed locations. The cost would be higher the more ground disturbance is included.

Greenhouse Gas Emissions Analysis. The CEQA lead agency may require an analysis of the project's contributions to greenhouse gas (GHG) emissions, pursuant to CEQA compliance. GHG emissions from both construction and operation would be considered. The cost of GHG analysis would be higher with inclusion of more project elements.

Geotechnical Report with Hydraulic Fracture Analysis. A geotechnical report with hydraulic fracture analysis would be needed for appropriate design of the HDD and identification of appropriate mitigation measures for potential hydraulic fracture. This study would only be needed for project elements involving HDD (at this time, limited to conveyance of Eureka's wastewater under Humboldt Bay).

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7.1.2 California Environmental Quality Act

CEQA compliance would occur concurrently with the permit processes, but permitting agencies will need a completed CEQA document prior to issuing permit approvals. The most likely CEQA lead agency for the entire project would be the HBHRCD, a state funding agency, or the RWQCB. For the wastewater conveyances from Fairhaven and Samoa to RMT II only or ocean outfall repair/maintenance only, the most likely CEQA lead agency would be the HBHRCD.

The most likely CEQA documentation for the entire project or for the wastewater conveyances from Fairhaven and Samoa to RMT II only would be an initial study/mitigated negative declaration, which could cost $10,000-$20,000 plus necessary special studies (described above). If the lead agency determines that an environmental impact report (EIR) is required, the cost would be substantially higher. The most likely CEQA documentation for the ocean outfall repair/maintenance only would be a categorical exemption (class 1 existing facilities, Class 2 replacement or reconstruction, and/or Class 4 minor alterations to land) which could cost $1,000-$2,000 plus any necessary special study (described above).

The CEQA cost would be higher with the full project and lower with a reduced scope project. The CEQA cost is subject to numerous uncertainties at this stage given the current limitations on project definition, site-specific conditions, and agency concerns.

It is noted that the CEQA documentation and associated costs discussed here are understood to be for the wastewater conveyance and ocean outfall disposal project discussed previously in this document (the entire project or portions thereof). CEQA compliance for potential aquaculture project(s), dredging project(s), and/or other development project(s) would likely require additional or separate CEQA compliance.

7.1.3 Permitting

Permits or approvals required for the project are expected to include, but are not necessarily limited to, the following: Table 5a presents anticipated permits and authorizations for the entire project. Table 5b presents anticipated permits and authorizations for wastewater conveyance from Fairhaven and Samoa to RMT II including maintenance and repair of (and disposal through) the ocean outfall. Table 5c presents anticipated permits and authorizations for maintenance and repair of the ocean outfall only.

Table 5a
Anticipated Permits and Authorizations, Entire Project
RMT II Infrastructure Reuse Evaluation, Eureka, California

Agency	Permit/Authorization	Estimated Cost Range[1]	Estimated Timeframe[2]
US Army Corps of Engineers	Section 404/Section 10 Permit	$5,000-$10,000	6-12 months
USFWS[3]	Biological Opinion	$3,000-$9,000	3-9 months
NMFS[4]	Biological Opinion	$3,000-$9,000	3-9 months
RWQCB[5]	Section 401 Water Quality Certification	$8,000-$16,000	3-6 months
RWQCB	NPDES[6] Permit(s)	$30,000-$60,000	6-12 months
SWRCB[7]	Construction General Permit	$5,000-$8,000	1-2 months
CDFW[8]	Streambed Alteration Agreement	$6,000-$12,000	3-6 months
CA Coastal Commission	Coastal Development Permit (consolidated[9])	$15,000-$50,000	6-12 months
CA State Lands Commission	CSLC[10] Lease	$6,000-$9,000	3-6 months
HBHRCD[11]	Harbor District Development Permit	$3,000-$6,000	3-6 months
City of Eureka	Conditional Use Permit	$8,000-$13,000	3-6 months
County of Humboldt	Conditional Use Permit	$8,000-$13,000	3-6 months
	TOTAL	**$100,000-$215,000**	**9-18 months**

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Table 5a
Anticipated Permits and Authorizations, Entire Project
RMT II Infrastructure Reuse Evaluation, Eureka, California

Agency	Permit/Authorization	Estimated Cost Range[1]	Estimated Timeframe[2]

1. Estimated cost ranges include estimated agency permit fees (ACOE-$100 fee; RWQCB 401-$3,000 fee; RWQCB NPDES-$2,000 fee; SWRCB-$700 fee; CDFW-$1,500 fee; California Coastal Commission-$6,000 fee; CSLC-$3,000 fee; HBHRCD-$100 fee; City-$3,000 fee; County-$3,000 fee)
2. Timeframes provided are following submission of a complete permit application.
3. USFWS: United States Fish and Wildlife Service
4. NMFS: National Marine Fisheries Service
5. RWQCB: North Coast Regional Water Quality Control Board
6. NPDES: National Pollutant Discharge Elimination System
7. SWRCB: State Water Resources Control Board
8. CDFW: California Department of Fish & Wildlife
9. Coastal development permits from California Coastal Commission, City of Eureka, and/or County of Humboldt would be consolidated to the California Coastal Commission
10. CSLC: California State Lands Commission
11. HBHRCD: Humboldt Bay Harbor, Recreation and Conservation District

Table 5b
Anticipated Permits and Authorizations, Wastewater Conveyance and Disposal from Fairhaven and Samoa to RMT II
RMT II Infrastructure Reuse Evaluation, Eureka, California

Agency	Permit/Authorization	Estimated Cost Range[1]	Estimated Timeframe[2]
US Army Corps of Engineers	Section 404/Section 10 Permit	$4,000-$8,000	6-12 months
USFWS[3]	Biological Opinion	$3,000-$6,000	3-9 months
NMFS[4]	Biological Opinion	$3,000-$6,000	3-9 months
RWQCB[5]	Section 401 Water Quality Certification	$8,000-$14,000	3-6 months
RWQCB	NPDES[6] Permit(s)	$30,000-$60,000	6-12 months
SWRCB[7]	Construction General Permit	$5,000-$8,000	1-2 months
CDFW[8]	Streambed Alteration Agreement	$6,000-$12,000	3-6 months
CA Coastal Commission	Coastal Development Permit (consolidated[9])	$15,000-$40,000	6-12 months
CA State Lands Commission	CSLC[10] Lease	$6,000-$9,000	3-6 months
County of Humboldt	Conditional Use Permit	$8,000-$13,000	3-6 months
	TOTAL	**$88,000-$176,000**	**9-18 months**

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Table 5b
Anticipated Permits and Authorizations, Wastewater Conveyance and Disposal from Fairhaven and Samoa to RMT II
RMT II Infrastructure Reuse Evaluation, Eureka, California

Agency	Permit/Authorization	Estimated Cost Range[1]	Estimated Timeframe[2]

1. Estimated cost ranges include estimated agency permit fees (ACOE-$100 fee; RWQCB 401-$3,000 fee; RWQCB NPDES-$2,000 fee; SWRCB-$700 fee; CDFW-$1,500 fee; California Coastal Commission-$6,000 fee; County-$3,000 fee)
2. Timeframes provided are following submission of a complete permit application.
3. USFWS: United States Fish and Wildlife Service
4. NMFS: National Marine Fisheries Service
5. RWQCB: North Coast Regional Water Quality Control Board
6. NPDES: National Pollutant Discharge Elimination System
7. SWRCB: State Water Resources Control Board
8. CDFW: California Department of Fish & Wildlife
9. Coastal development permits from California Coastal Commission and County of Humboldt would be consolidated to the California Coastal Commission
10. CSLC: California State Lands Commission

Table 5c
Anticipated Permits and Authorizations, Ocean Outfall Maintenance/Repair Only
RMT II Infrastructure Reuse Evaluation, Eureka, California

Agency	Permit/Authorization	Estimated Cost Range[1]	Estimated Timeframe[2]
US Army Corps of Engineers	Section 404/Section 10 Permit	$4,000-$8,000	6-12 months
USFWS[3]	Biological Opinion	$3,000-$6,000	3-9 months
NMFS[4]	Biological Opinion	$3,000-$6,000	3-9 months
RWQCB[5]	Section 401 Water Quality Certification	$8,000-$12,000	3-6 months
RWQCB	NPDES[6] Permit(s)	$30,000-$60,000	6-12 months
CA Coastal Commission	Coastal Development Permit (or waiver)	$10,000-$35,000	4-12 months
CA State Lands Commission	CSLC[7] Lease	$6,000-$9,000	3-6 months
	TOTAL	**$64,000-$136,000**	**9-18 months**

1. Estimated cost ranges include estimated agency permit fees (ACOE-$100 fee; RWQCB 401-$3,000 fee; RWQCB NPDES-$2,000 fee; California Coastal Commission-$1,000-$6,000 fee)
2. Timeframes provided are following submission of a complete permit application.
3. USFWS: United States Fish and Wildlife Service
4. NMFS: National Marine Fisheries Service
5. RWQCB: North Coast Regional Water Quality Control Board
6. NPDES: National Pollutant Discharge Elimination System
7. CSLC: California State Lands Commission

Actual permitting requirements will depend upon detailed project information and additional coordination with the various agencies. Estimated cost ranges are very approximate given the current limitations on project definition and agency concerns. Estimated timeframes would presumably overlap during the permitting processes.

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ACOE Section 404/Section 10 Permit. An ACOE Clean Water Act Section 404/Section 10 permit would be required if the project were to involve filling of or work in Waters of the U.S. As part of its permit process, the ACOE typically consults with NMFS and/or USFWS regarding impacts to federally listed species and their habitats (such as, salmonids and certain whales). For this project, an ACOE permit is anticipated to be needed regardless of which project element(s) go forward. Work at the ocean outfall, HDD under Humboldt Bay, and/or impacts to other jurisdictional surface waters or wetlands would all trigger the need for an ACOE permit. The cost would be affected by how many federally listed species require Section 7 consultation, whether one or both the NMFS and USFWS require consultations, and whether Section 7 consultation is informal or formal.

USFWS Biological Opinion. A biological opinion would be required from USFWS if the ACOE/ USFWS's Section 7 Endangered Species Act consultation proceeds to formal consultation. The cost would be affected by how many federally listed species require Section 7 consultation with USFWS.

NMFS Biological Opinion. A biological opinion would be required from NMFS if the ACOE/ NMFS's Section 7 Endangered Species Act consultation proceeds to formal consultation. The cost would be affected by how many federally listed species require Section 7 consultation with NMFS.

RWQCB Section 401 Water Quality Certification. An RWQCB Clean Water Act Section 401 water quality certification would be required if an ACOE permit were required or if the project were to involve filling of or work in Waters of the State. For this project, a water quality certification is anticipated to be needed regardless of which project element(s) go forward. The cost would be affected by the magnitude of the permit fee, which is impact-dependant.

RWQCB NPDES Permit(s). NPDES permits, also referred to as waste discharge requirements, are issued to regulate the discharge of municipal wastewater or industrial process, cleaning, or cooling, wastewaters; commercial wastewater; treated groundwater from cleanup projects; or other wastes to surface waters (in this case; the Pacific Ocean). It is anticipated that various potential users will provide appropriate treatment and discharge through the single (joint) ocean outfall owned and operated by HBHRCD.

There has been a variety of approaches by regulatory agencies to this type of situation. As is the case for this project, when one entity owns the outfall (and may discharge its own effluent), but the outfall is used for multiple discharges, each discharge would have a separate NPDES discharge permit. Each effluent would need to meet water quality standards (WQS) independently. In some cases, there may be a trade-off between discharges that allows one effluent to exceed WQS if the combined discharge meets WQS. However, because various discharges for this project are yet to be determined and may come online at different times, the actual permitting process is not clear. One approach would be to apply for permits for individual discharges as needed, and modifying existing permits as needed at the time the new discharger is permitted, with the objective being to synchronize the permit expiration dates. However, as each discharge is added, consultation with the RWQCB would be required to determine the process to be followed. For this project, NPDES permitting is anticipated to be needed regardless of which project element(s) go forward. The cost would be affected by the number of NPDES permits required and the extent of necessary effluent and receiving water characterization and specific calculations.

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SWRCB Construction General Permit. The project will require coverage under the SWRCB construction general permit (including preparation of a stormwater pollution prevention plan) if it involves one acre or more of ground disturbance.

California Department of Fish & Wildlife (CDFW) Streambed Alteration Agreement. Fish and Game Code Section 1602 requires an entity to notify the CDFW prior to commencing any activity that may do one or more of the following:

- substantially divert or obstruct the natural flow of any river, stream, or lake;
- substantially change or use any material from the bed, channel, or bank of any river, stream, or lake; and/or
- deposit debris, waste, or other materials that could pass into any river, stream, or lake.

CDFW requires a Lake and Streambed Alteration (LSA) Agreement when it determines that the activity, as described in a complete LSA Notification, may substantially adversely affect existing fish or wildlife resources. LSA Notification is anticipated to be required if any project element involves work in a CDFW-jurisdictional watercourse or ditch (or its associated riparian vegetation). However, there is a low probability that this project would require an LSA and streambed alteration agreement. The cost would be affected by the magnitude of the permit fee, which is project-cost-dependant.

CA Coastal Commission Coastal Development Permit. The full project includes components located within the coastal development permit (CDP) jurisdiction of the Coastal Commission, County of Humboldt, and City of Eureka. Regardless of which project element(s) may go forward, the CDP process is expected to be consolidated to the Coastal Commission resulting in a single CDP. The permit fee and level of effort required to demonstrate project consistency with the California Coastal Act are difficult to predict, resulting in the wide cost range.

California State Lands Commission (CSLC) Lease. The CSLC’s jurisdiction includes the beds of California's naturally navigable rivers, lakes, and streams, as well as the State's tide and submerged lands that extend from the shoreline out to three miles offshore. Therefore a CSLC lease is anticipated to be required for the HDD under Humboldt Bay and potentially for the use of the ocean outfall if a SLCS lease is not already in place for that. The $3,000 fee estimate is based on a public agency lease; however if CSLC determines the project is commercial or industrial, the fee could be $25,000.

HBHRCD Development Permit. A development permit from HBHRCD may be required depending on what entity is the project proponent and what project element(s) go forward. The cost also depends on what project element(s) go forward.

City of Eureka Conditional Use Permit. A conditional use permit from City of Eureka may be required for the pipeline section within the City limits. If the project did not include that element, this permit would be unnecessary.

County of Humboldt Conditional Use Permit. A County conditional use permit may be required for the pipeline sections within County jurisdiction. However, if the project is seen as exclusively a municipal/public project, this permit may not be required.

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7.2 Offsite Wastewater Sources

Offsite wastewater sources originate from several communities on the Samoa peninsula, and the City of Eureka. The HBHRCD would not be responsible for paying for the improvements (effluent lines and effluent pump stations) and associated permitting listed in this section for the offsite wastewater sources. In addition, the HBHRCD would receive fees from these communities for the use of the outfall structure. The rate the HBHRCD would assess each community would be based on the each community's proportional share of the total volume discharged (averaged over a year) and the HBHRCD's operation and maintenance costs of the ocean outfall and MH-5 effluent pump station, and reserves necessary for eventual replacement of the outfall and effluent pumps.

Infrastructure costs to dispose of treated effluent from offsite wastewater sources are detailed in Table 6.

Table 6
Infrastructure Estimated Costs, Offsite Water Users
RMT II Infrastructure Reuse Evaluation, Eureka, California

Name	Description	Unit	Quantity	Unit Cost	Total Cost
Eureka Line	30-inch line	ft(1)	4,800	$ 500	$ 2,400,000
Samoa Line	4-inch line	ft	4,000	$ 90	$ 360,000
Fairhaven Line	30-inch line	ft	10,000	$ 500	$ 5,000,000
Horizontal Direction Drill	30-inch line	ft	3,200	$ 700	$ 2,240,000
Samoa Pump Station	Site Work	LS[2]	1	$ 10,000	$ 10,000
	Wet well	LS	1	$ 20,000	$ 20,000
	Mechanical	LS	1	$ 20,000	$ 20,000
	Electrical	LS	1	$ 5,000	$ 5,000
Fairhaven Pump Station	Site Work	LS[2]	1	$ 10,000	$ 10,000
	Wet well	LS	1	$ 15,000	$ 15,000
	Mechanical	LS	1	$ 20,000	$ 20,000
	Electrical	LS	1	$ 5,000	$ 5,000
Eureka Pump Station	Site Work	LS	1	$ 25,000	$ 25,000
	Wet well	LS	1	$ 100,000	$ 100,000
	Mechanical	LS	1	$ 350,000	$ 350,000
	Electrical	LS	1	$ 75,000	$ 75,000
				Subtotal	$ 10,655,000
				Mobilization (10%)	$ 1,065,000
				Contingency (20%)	$ 2,130,000
				Engineering (20%)	$ 2,130,000
				Total Cost	**$ 15,980,000**

1. ft. feet 2. LS: lump sum

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Table 7 details costs to install infrastructure for the communities of Fairhaven and Samoa if the City of Eureka does not use the ocean outfall at RMT II.

Table 7
Infrastructure Costs, Fairhaven and Samoa
RMT II Infrastructure Reuse Evaluation, Eureka, California

Name	Description	Unit	Quantity	Unit Cost	Total Cost
Fairhaven Line	4-inch line	ft[1]	7,000	$ 90	$ 630,000
Fairhaven Pump Station	Site Work	LS[2]	1	$ 10,000	$ 10,000
	Wet well	LS	1	$ 15,000	$ 15,000
	Mechanical	LS	1	$ 20,000	$ 20,000
	Electrical	LS	1	$ 5,000	$ 5,000
Samoa Line	4-inch line	ft	4,000	$ 90	$ 360,000
Samoa Pump Station	Site Work	LS[2]	1	$ 10,000	$ 10,000
	Wet well	LS	1	$ 20,000	$ 20,000
	Mechanical	LS	1	$ 20,000	$ 20,000
	Electrical	LS	1	$ 5,000	$ 5,000
				Subtotal	**$ 1,095,000**
				Mobilization (10%)	$ 109,500
				Contingency (20%)	$ 219,000
				Engineering (20%)	$ 219,000
				Total Cost	**$ 1,642,500**

1. ft. feet
2. LS: lump sum

7.3 Onsite Wastewater Sources

Cost estimates for various onsite wastewater sources of the existing infrastructure are presented in the following sections. All costs are for planning and feasibility purposes only.

7.3.1 Dredge Spoils

7.3.1.1 MicroFloc Water Treatment System

Estimated costs to dewater dredge spoils using the onsite wastewater treatment system are summarized in Tables 8 and 9. Table 8 summarizes full costs to rehabilitate the MicroFloc system, including clarifiers and filters. Table 9 lists the cost of components to rehabilitate the clarifiers only. This cost assumes that the clarifier effluent meets regulatory requirements for turbidity without filtration. Costs do not include permitting costs for discharge of supernatant or disposal of solids following dewatering. It is assumed that repairs to filters will be minor and existing media is in usable condition.

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Table 8a
Dredge Spoils Processing, MicroFloc Rehabilitation Costs–Clarifiers and Filters
RMT II Infrastructure Reuse Evaluation, Eureka, California

Description	Units	Quantity	Unit Cost	Cost
Empty & clean clarifier tanks	LS[1]	1	$ 10,000	$ 10,000
Remove & store two bridge/collector mechanisms	LS	1	$ 20,000	$ 20,000
Perforated plate covers over sludge hoppers	EA[2]	2	$ 1,500	$ 3,000
18" layer rock on clarifier floors	CY[3]	1,960	$ 40	$ 78,400
Perforated pipe laterals; 6″ diameter	LF[4]	720	$ 20	$ 14,400
Geotextile fabric, installed	SY[5]	4,100	$ 5.00	$ 20,500
Dredge discharge pipe connections	LS	1	$ 15,000	$ 15,000
Excavator access ramps	LS	1	$ 8,000	$ 8,000
Supernatant pump systems, piping	EA	2	$ 10,000	$ 20,000
Pipe from waste sump to clarifier effluent sump; 6"	LF	60	$ 55	$ 3,300
Backwash pumps	EA	2	$ 8,000	$ 16,000
Refurbish two filter feed pumps	LS	2	$ 4,000	$ 8,000
Backwash supply piping; 18"	LF	200	$ 170	$ 34,000
Backwash valves	EA	3	$ 5,000	$ 15,000
Backwash waste piping to flash mix basin; 18"	LF	20	$ 170	$ 3,400
Filter controls package	LS	1	$ 30,000	$ 30,000
Filter valve overhaul	LS	1	$ 10,000	$ 10,000
Miscellaneous improvements filter system	LS	1	$ 40,000	$ 40,000
			Subtotal	$349,000
			Mobilization (10%)	$ 34,900
			Contingency (20%)	$ 69,800
			Engineering (20%)	$ 69,800
			Total Cost	**$ 523,500**

1. LS: lump sum
2. EA: each
3. CY: cubic yard
4. LF: linear foot
5. SY: square yard

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Table 8b
Dredge Spoils Processing, MicroFloc Rehabilitation Costs–No Filtration Required
RMT II Infrastructure Reuse Evaluation, Eureka, California

Description	Units	Quantity	Unit Cost	Cost
Empty & clean clarifier tanks	LS[1]	1	$ 10,000	$ 10,000
Remove & store two bridge/collector mechanisms	LS	1	$ 20,000	$ 20,000
Perforated plate covers over sludge hoppers	EA[2]	2	$ 1,500	$ 3,000
18" layer rock on clarifier floors	CY[3]	1,960	$ 40	$ 78,400
Perforated pipe laterals; 6″ diameter	LF[4]	720	$ 20	$ 14,400
Geotextile fabric, installed	SY[5]	4,100	$ 5.00	$ 20,500
Dredge discharge pipe connections	LS	1	$ 15,000	$ 15,000
Excavator access ramps	LS	1	$ 8,000	$ 8,000
Supernatant pump systems, piping	EA	2	$ 10,000	$ 20,000
Pipe from waste sump to clarifier effluent sump; 6"	LF	60	$ 55	$ 3,300
			Subtotal	$192,600
			Mobilization (10%)	$ 19,260
			Contingency (20%)	$ 38,520
			Engineering (20%)	$ 38,520
			Total Cost	**$ 288,900**

1. LS: lump sum
2. EA: each
3. CY: cubic yard
4. LF: linear foot
5. SY: square yard

7.3.1.2 Geotubes

Estimated costs to dewater dredge spoils using geotubes are provided in Table 9. Costs do not include additional infrastructure that may be required to meet discharge limitations for turbidity, disposal of sediment following dewatering, or potential permitting costs. Polymer requirements vary significantly depending on the chemical makeup and solids content of the slurry, and require a bench test of dredge spoils to for a final estimate.

An NPDES permit will be required for the discharge of water from dredge spoils if polymer is used, or the dredge spoils are processed in any way for offsite use.

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Table 9
Dredge Spoils Processing, Geotube Costs
RMT II Infrastructure Reuse Evaluation, Eureka, California

Description	Units	Quantity	Unit Cost	Cost
Geotubes (950 CY[1] capacity)	EA[2]	32	$ 11,200	$ 358,400
Polymer	tote	10	$ 6,500	$ 65,000
Geotube supervisor	days	60	$ 2,800	$ 168,000
Polymer Skid	month	2	$ 29,200	$ 58,400
Geosynthetic Liner	SF[3]	175,000	$ 0.85	$ 148,750
Earthwork	LS[4]	1	$ 150,000	$ 150,000
			Subtotal	$ 948,550
			Mobilization (10%)	$ 94,850
			Contingency (20%)	$ 189,700
			Engineering (5%)	$ 47,450
			Total Cost	**$1,280,550**

1. CY: cubic yard
2. EA: each
3. SF: square feet
4. LS: lump sum

7.3.2 Aquaculture

The existing leachfield can accept up to 8,500 gpd of aquaculture flows. Any flow in excess of 8,500 gpd would need to be routed to the ocean outfall.

Estimated costs associated with wastewater disposal for increased aquaculture operations at RMT II are summarized in Table 10. Necessary infrastructure will include the settling tank discussed in Section 5.0, a discharge line, and manhole and pumps in MH-5. Costs for the rehabilitation of the ocean outfall are discussed in Section 7.4.

Table 10
Aquaculture Wastewater Disposal Infrastructure Costs
RMT II Infrastructure Reuse Evaluation, Eureka, California

Description	Units	Quantity	Unit Cost	Cost
Settling Tank	LS[1]	1	$ 50,000	$ 50,000
Proposed Drain Line	LF[2]	500	$ 150	$ 75,000
New Manhole	LS	1	$ 10,000	$ 10,000
			Subtotal	$ 135,000
			Mobilization (10%)	$ 13,500
			Contingency (20%)	$ 27,000
			Engineering (20%)	$ 27,000
			Total Cost	**$ 202,500**

1. LS: lump sum
2. LF: linear feet

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7.4 Ocean Outfall

Table 11 presents the estimated costs for complete cleaning and rehabilitation of the ocean outfall. Costs are based on MMDiving's rate of $14,750 per 10-hour day, operating from the HBHRCD's Fire 1 vessel. This daily rate has been averaged to include the weekend rate, due to the uncertain nature of daily conditions. The estimate includes three days for exposing the diffuser section; ten days for clearing the diffuser internally; and five days to inspect, take a cathodic protection reading, and install anodes for cathodic protection. An additional 30-percent contingency for inclement weather delays has been applied in order to hedge against the frequent unstable operating weather.

Table 11
Ocean Outfall Rehabilitation Costs
RMT II Infrastructure Reuse Evaluation, Eureka, California

Description	Units	Quantity	Unit Cost	Cost
Expose Diffuser Section	Days(1)	3	$ 14,750	$ 44,250
Clear Diffuser Internally	Days	10	$ 14,750	$147,500
Inspect, Take CP Readings, Install Cathodic Protection	Days	5	$ 14,750	$ 73,750
Mobilization/Demobilization	LS(2)	1	$ 10,000	$ 10,000
Internal Jet Fabrication & Consumables	LS	1	$ 5,000	$ 5,000
Inclement Weather Contingency (30%)	LS	1	$ 84,000	$ 84,000
MH-5 Pumps[3]	LS	1	$ 220,000	$ 220,000
			Subtotal	$ 584,500
			Mobilization (10%)	$ 58,400
			Contingency (20%)	$ 116,800
			Engineering (20%)	$ 116,800
			Total Cost	$ 876,750

1. MM Diving Rate w/Harbor District's Fire 1 Vessel per 10 hr day
2. LS: lump sum
3. MH-5 pumps required only when flows to ocean outfall exceed 15 million gallons per day.

8.0 Proposed Schedule

Figure 16 presents a proposed schedule of when anticipated discharges would be added. Please note these are only anticipated time lines and many factors that are beyond the HBHRCD's control influence the proposed schedules.

8.1 Rehabilitation of Ocean Outfall and MH-5

Work on the ocean outfall is based upon when the expanded discharges will be added. If the outfall will be used to discharge treated water from dredging operations in Fall 2016, then the outfall rehabilitation should occur this summer. Otherwise, the HBHRCD should link the ocean outfall repair to the addition of the Samoa discharge or the expansion of aquaculture discharge when it exceeds the 8,500 gpd limit of the existing leachfield.

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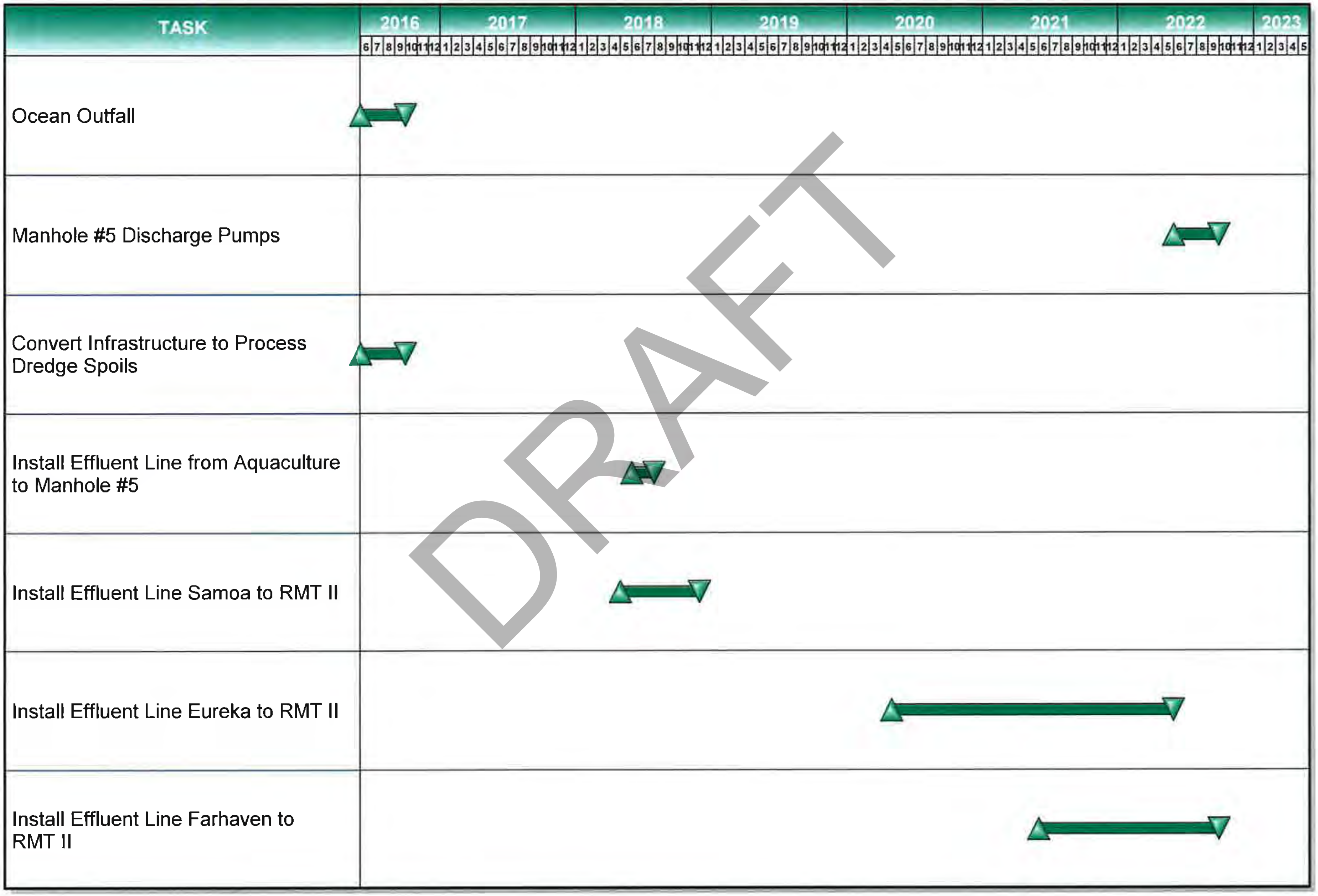
Figure 16
Proposed Schedule
Wastewater Infrastructure RMT II



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The repair to the two 350-hp discharge pumps at MH-5 will only be necessary when the cumulative discharge in the outfall reaches 15 MGD. The only discharge options that would require rehabilitation of the outfall pumps are the City of Eureka discharging treated effluent to the ocean outfall or onsite aquaculture operations approaching 15 MGD. For the purposes of this study, we anticipate rehabilitation of the ocean outfall pumps in 2022.

8.2 Onsite Wastewater Sources

8.2.1 Aquaculture

Currently, all waste discharges from onsite aquaculture operations discharge to the existing leachfield are estimated to be 2,400 gpd. If the HBHRCD elects to expand aquaculture operations beyond the capacity of the existing leachfield (approximately 8,500 gpd) the HBHRCD would need to discharge aquaculture effluent to the ocean outfall. It is anticipated the HBHRCD would start using the ocean outfall for aquaculture waste in 2018.

8.2.2 Dewatering Dredge Spoils

The HBHRCD recently purchased a cutterhead suction dredge and is in the process of permitting a pilot scale dredging and dewatering operation. If permitting for maintenance dredging of Humboldt Bay is in place, the HBHRCD anticipates using the RMT II facility to dewater dredge material as soon as Fall 2016.

8.3 Offsite Wastewater Sources

8.3.1 Samoa

The community of Samoa is very interested in discharging its treated effluent to the ocean outfall. Preliminary discussions with the HBHRCD have already occurred. Assuming the town of Samoa decides to pursue the ocean outfall alternative by this spring and begin permitting and design, Samoa could begin construction in Spring 2018 and be online by Fall 2018.

8.3.2 Fairhaven

Currently, there is no requirement for the community of Fairhaven to upgrade its method of wastewater disposal (on site). It is assumed for this study, that Fairhaven would participate with the City of Eureka if Eureka were to install an effluent line to the ocean outfall. For this study, we have assumed this would occur in 2022.

8.3.3 Eureka

Currently, the City of Eureka discharges to Humboldt Bay during an outgoing (ebb) tide. At this time, the City is not interested in extending a wastewater effluent line to the ocean outfall. However, the RWQCB has expressed interest in the City pursuing use of the ocean outfall option. If the City were to pursue this alternative, it would take several years to permit, design, and install the effluent line from Eureka to Samoa. For this study, we have assumed a period of 5 years for that process. Assuming the City initiates this alternative in 2017, the estimated timeline for the City to discharge into the ocean outfall would be in 2022.

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9.0 Summary

Several potential onsite and offsite uses were evaluated for use of existing infrastructure at RMT II. In addition, we evaluated what improvements would be required for the potential uses; associated planning level costs were presented in Section 7.0.

9.1 Existing Infrastructure

Existing infrastructure at RMT II has reuse potential for discharge of treated wastewater effluent, processing of dredge spoils, and aquaculture activities. All potential uses require investment in infrastructure and coordination with various regulatory agencies to acquire necessary permits.

9.2 Aquaculture

Aquaculture facilities are currently operating at the site. Wastewater from these operations is discharged to the existing septic tank and leachfield system. The existing leachfield capacity is approximately 8,500 gpd. Expanded aquaculture operations producing more than 8,500 gpd would require infrastructure improvements, including rehabilitation of the existing ocean outfall; the addition of a solids settling tank; a discharge line; and, for flows exceeding 15 MGD, pumps for MH-5.

Based on the estimated flow required per kilogram of fish and the waste loadings produced by finfish operations, solids, total nitrogen, and total phosphorous concentrations in the discharge would be well below limits set by the Ocean Plan. Therefore, nutrient treatment would not be required for finfish operations, and bivalve production may be exempt from NPDES permitting requirements.

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9.3 Dredge Spoils Processing

Disposal of approximately 30,000 cubic yards of solids is required as part of annual dredging operations in Humboldt Bay. Two options for dredge spoils processing were examined in this report. The first option would use the existing onsite MicroFloc water treatment system. This option would alternate pumping of dredge slurry between the two existing clarifiers, then filtering the supernatant using three of the existing filters. The supernatant would be discharged through the ocean outfall, and the solids would be excavated from the clarifiers and either stored elsewhere onsite, or sent off site for disposal. The second option would use geotubes to dewater dredge spoils, and either pump supernatant to the ocean outfall or return it to the bay through standard stormwater BMPs. Planning level cost estimates are presented in Section 7.0.

Both options for dredge spoils processing may require the use of a coagulant to reduce effluent turbidity below relevant limits. The ocean plan requires discharge turbidity to be below 75 NTUs, which corresponds to approximately 75 mg/L TSS. The use of a coagulant may require the discharge to be regulated by an NPDES permit. Please note that construction of a temporary storage site for dredge material dewatering was not evaluated.

9.4 Offsite Water Sources

The ocean outfall at RMT II can be used as a disposal point for treated wastewater effluent from surrounding communities. Expected quantities and characteristics of treated effluent were estimated for the City of Eureka, and the communities of Samoa and Fairhaven (Section 4.0). Required infrastructure for each line is discussed in detail in Section 6.0, but generally includes pipelines from each community to MH-5 at the RMT II, and pumping facilities commensurate with expected flows from each community. Installation of a pipeline from the City of Eureka would include installation of a pipeline below Humboldt Bay using HDD.

Permitting the installation of pipelines is fairly complex, and requires permits from numerous agencies. Most permits take anywhere from 1 to 12 months, but it is assumed that the application process for most permits would occur concurrently. Most permits are required regardless of which portions of the project are implemented, although costs are reduced if the project scope is reduced.

Each individual community would be responsible for costs associated with installation of pipelines from their community. Individual communities also would be responsible for maintaining individual NPDES permits and meeting required effluent standards.

9.5 Outfall

The existing ocean outfall is an approximately 1.5-mile long, 48-inch diameter pipe with 144 diffuser ports. It is currently used to discharge approximately 170,000 gpd of process water from DG Fairhaven Power. The total hydraulic capacity of the outfall is estimated at 40 MGD, for discharges with a salinity less than 30 psu. Expanded use of the outfall will require cleaning and rehabilitation of the existing diffuser ports. Estimated costs for the rehabilitation are presented in Section 7.4.

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10.0 References

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A

1988, LP Pulp Mill Plan and Location Drawing

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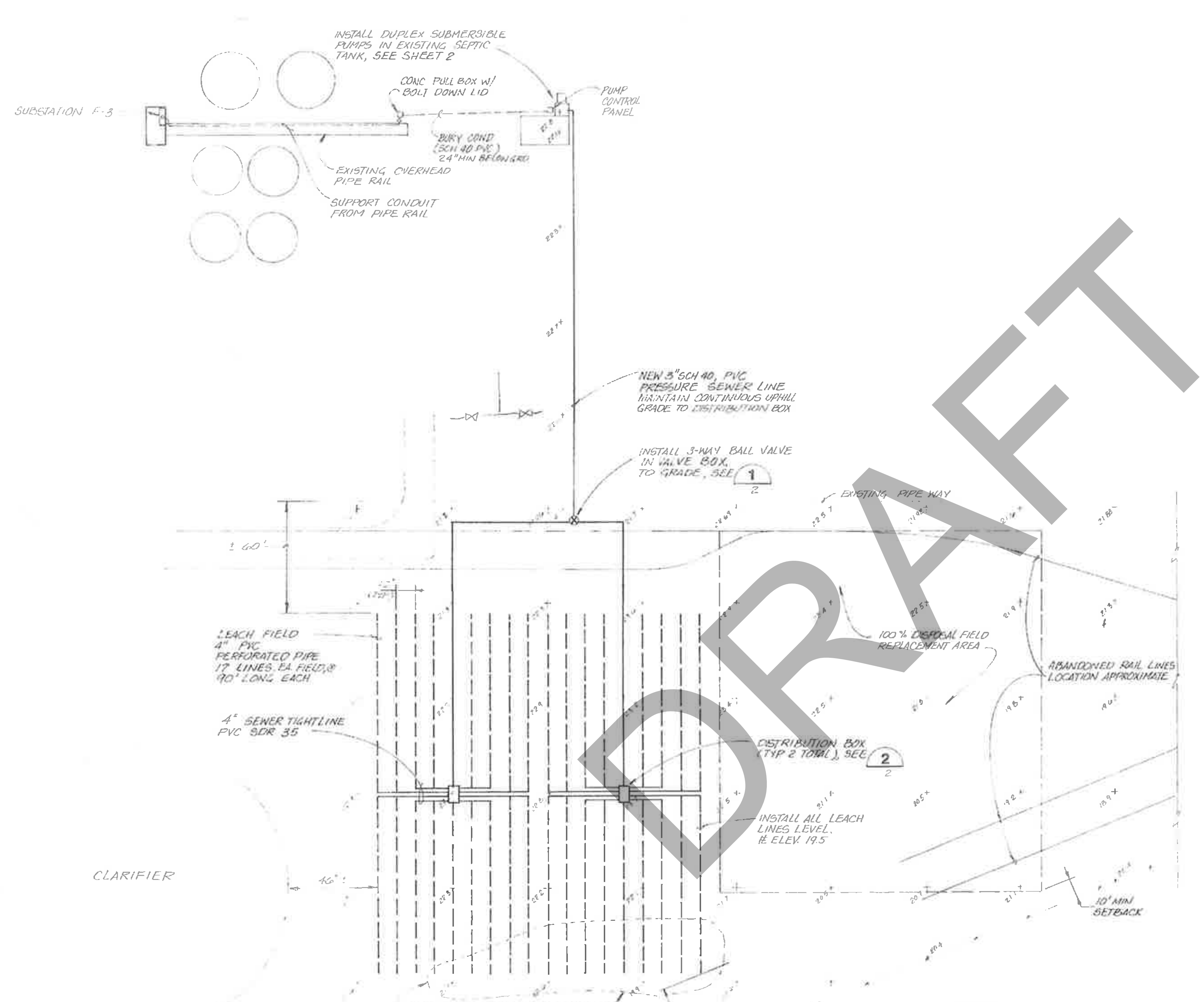
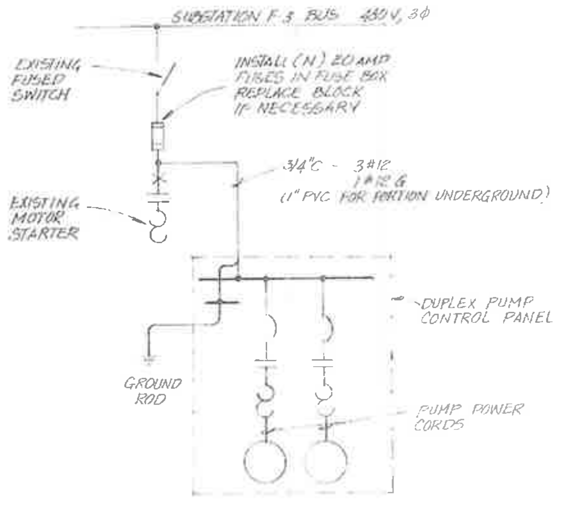


NOTE:

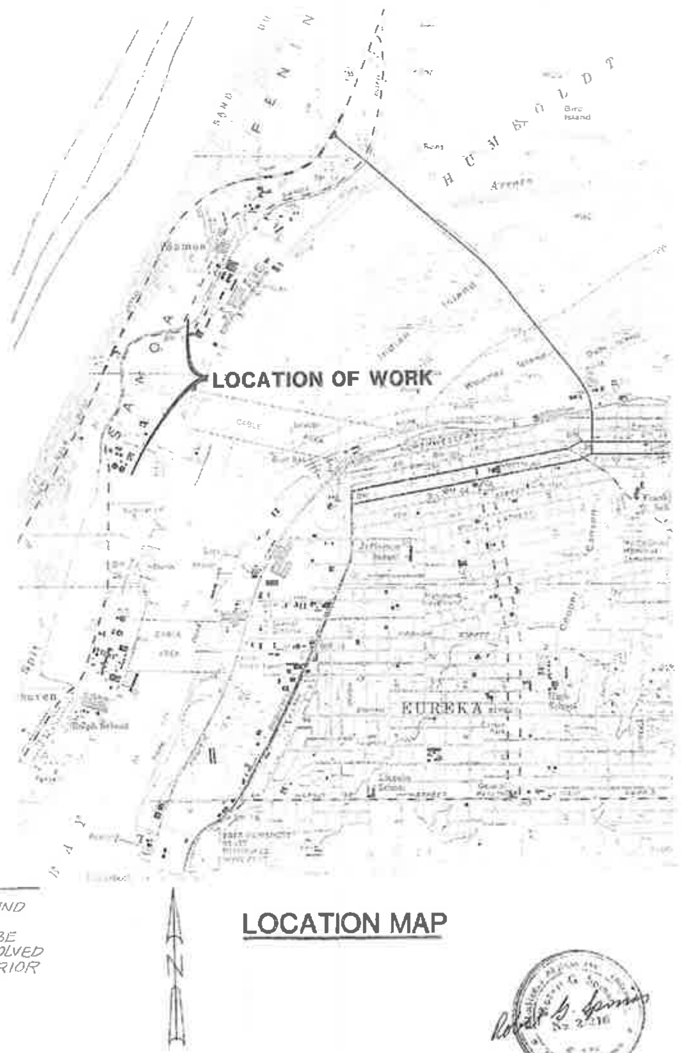
INFORMATION PERTAINING TO EXISTING UNDERGROUND FACILITIES AS SHOWN ON THESE PLANS IS FOR INFORMAL PURPOSES ONLY. CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING AGENCIES INVOLVED AND SHALL LOCATE ALL EXISTING FACILITIES PRIOR TO EXCAVATING IN ANY AREA.

PLAN

1" = 30'-0"



ELECTRICAL ONE-LINE DIAGRAM



LOCATION MAP

Exp 12/31/87

D07-429

SELVAGE • HEBER • NELSON & ASSOCIATES
CONSULTING ENGINEERS (707) 444 0427
2600 HARRISON AVE. EUREKA, CA. 95501

SHN

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PULP MILL LEACHFIELD
AND PUMP STATION
PLAN & LOCATION

1 of 3

D07-429

B

HWE Preliminary Review of Existing MicroFloc Treatment System

DRAFT

Memorandum

To:	Mike Foget, PE/SHN Consulting Engineers and Geologists, Inc.		
From:	Brian Hemphill	Project:	Redwood Marine Terminal II
CC:			
Date:	January 15, 2016	Job No:	
Re:	Preliminary Review of Existing Microfloc Treatment System		

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INTRODUCTION

This memorandum presents the results of the preliminary inspection of the existing Microfloc industrial wastewater treatment system at the Samoa facility. This is a part of the overall assessment of infrastructure at the site, and development of potential future uses.

A site visit was conducted on September 28, 2015. It consisted of a walk-through of the site and treatment facilities. No internal inspections were completed; these are deferred to a later point at which specific potential uses have been identified and a detailed condition assessment will be required.

SYSTEM DESIGN BASIS

Some of the original design documents were found at the site. These reveal that the system was originally designed in 1966 for the Georgia-Pacific paper mill. A simplified flow schematic of the system is provided in Figure 1 on the following page.

The system includes a chemical feed system; two large clarifiers to settle solids; ten horizontal pressure filters to further remove fine solids; four softeners that remove dissolved solids from filtered water; and a sea water filter intended to produce water to regenerate the softeners. The softening system is designed to treat a portion of the filtered water. The fully softened product is blended with filter effluent, which results in a partially softened water that is suitable for general process requirements.

The system was designed for a nominal capacity of 30 million gallons per day (mgd), which is equivalent to 20,800 gallons per minute (gpm). Peak flow capacity is 25,000 gpm.

Other pertinent design parameters taken from design documentation are provided in Table 1.

FIGURE 1. MICROFLOC TREATMENT SYSTEM SCHMATIC

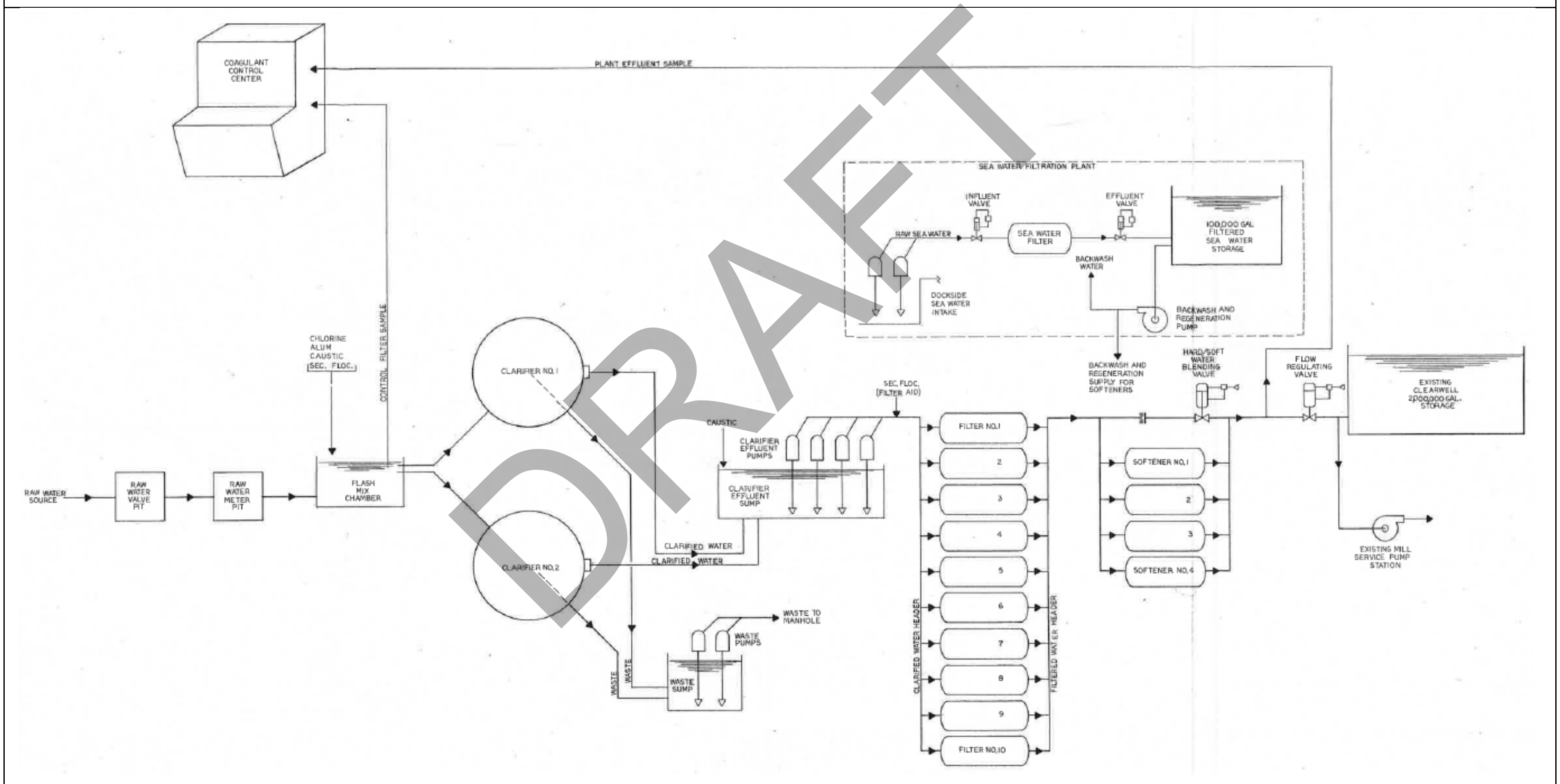

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TABLE 1. WATER TREATMENT SYSTEM DESIGN SUMMARY

PROCESS EQUIPMENT	
Number of Clarifiers	2
Diameter	150 ft.
Sidewater Depth	8.0 ft.
Total Clarifier Surface Area	35,343 sq. ft.
Clarifier Volume, Each	1,470,000 gallons
Number of Filters	10
Filter Dimensions	10' diameter x 37' long
Total Filter Surface Area	3,700 sq. ft.
Design Capacity, Nominal @ Load Rate	20,800 gpm @ 5.6 gpm/ sq. ft.
Design Capacity, Maximum	25,000 gpm @ 6.7 gpm/ sq. ft.

The design documentation states that the design influent loading for the filters was 100 NTU (nephelometric turbidity units), which would typically correspond to about 100 mg/l of suspended solids.

The system employs the method of using filter effluent as the source of backwash water. This avoids the need for a storage tank for filtered water and separate backwash supply pumps, and is common in installations with multiple independent filters. However, this method requires that at least four other filters are operating while another is in backwash, since the required backwash water flow rate is typically 3-5 times the filter effluent flow.

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ASSESSMENT OF SYSTEM CONDITION

The system was assessed by means of a walk-through. It is reported to not having been operational since 2008. It was not possible to operate any of the machinery.

The system is equipped throughout with pneumatically-actuated butterfly valves, which is typical for this type of system. It appears that many of the valves are original, and some have been replaced. The piping galleries, valves, and related equipment appear to be in reasonably good condition.

The control system is as supplied in the 1960s, based on electromechanical control devices and pneumatically powered instruments and actuators. The panels appear to be significantly corroded, and it should be assumed that the control devices themselves are no longer serviceable. Even if they were, they are obsolete. Any future operation should assume replacement of the controls and field instruments (such as level and pressure sensors) with modern digital devices.

It was not feasible to inspect the internals of the pressure filters because of difficult access conditions and the requirement to observe confined space entry procedures. It was reported that the filters were in normal service when the plant was shut down in 2008, with the expectation that they would be restarted. It turned out that they were not restarted. It is reasonable to assume that the filter media and underdrain system in the filters are still in operable condition. This would need to be confirmed based on an internal inspection of the tanks and the filter media. It is probably reasonable to assume that most of the valves would be operable following a minor rebuild.

The condition of the softening system is more difficult to assess. The longevity of the resin in the filters is unknown. To be safe, it should be assumed that the resin would be replaced if it is to be used again for softening.

SYSTEM CAPABILITIES

The combination of clarifiers and pressure filters provides a robust treatment system that could produce high quality water from a wide range of contaminated feed streams. This system is designed to remove suspended particles, including very small particles and certain dissolved organic and inorganic substances (such as natural color and dissolved iron and manganese) that can be coagulated or precipitated using chemical treatment such as alum or ferric chloride.

The design surface loading rate of 5.6 gpm/sq. ft. (nominal) is conservative by modern design standards, so the rated capacity of 30 mgd would be valid for most applications.

Specific applications need to be carefully reviewed.

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C

CH2M Diffuser Performance Assessment

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Final

Diffuser Performance Assessment Report for the Redwood Marine Terminal II Ocean Outfall

DRAFT

Prepared for:

County of Humboldt and
Humboldt Bay Harbor, Recreation and Conservation District

Project Funding Provided by:
HUD Community Development Block Grant 14-CDBG-9890

February 2016

ch2m
2525 Airpark Drive
Redding, CA 96001

Contents

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Acronyms and Abbreviations

°C	degrees Celsius
cfs	cubic feet per second
DGPS	differential global positioning system
EPA	U.S. Environmental Protection Agency
ft	feet
fpsec	feet per second
in	inches
m	meters
m/s	meters per second
MGD	million gallons per day
NPDES	National Pollutant Discharge Elimination System
NOAA	National Oceanic and Atmospheric Administration
Psi	Pounds per square inch
psu	practical salinity units
TM	technical memorandum

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SECTION 1.0

Introduction

CH2M has conducted a planning-level feasibility analysis of the use of the Redwood Marine Terminal II (RMT II) ocean outfall/diffuser system to dispose of process wastewater under varying effluent flow, salinity, and temperature ranges. The Humboldt Bay Harbor, Recreation and Conservation District (HBHRCD) is interested in utilizing the ocean outfall/diffuser system for the purposes of discharging effluent from a variety of possible municipal, commercial, and/or industrial clients. The exact makeup of the future clientele and of the effluent flow and characteristics is not yet fully known.

1.1 Purpose

This Technical Memorandum (TM) provides a planning level feasibility analysis of potential ocean outfall/diffuser performance (port velocities, head loss, and initial dilution) under a range of effluent conditions and diffuser configurations. This information will be used to assess potential future National Pollutant Discharge Elimination System (NPDES) permitting and mixing zone needs. It is anticipated that the range of effluent flows, effluent densities, and diffuser configurations (number of open ports) selected as model inputs will provide a sufficient range of effluent discharge conditions to demonstrate outfall suitability for the majority of potential outfall users.

Ambient receiving water conditions were based on existing receiving water hydrographic profiles collected around the outfall for a previous mixing zone assessment study. The report also documents the input variable selection of the hydraulic and dilution models used in the assessment and the corresponding results demonstrating diffuser performance.

1.2 Background

The headworks of the ocean outfall are located on the Samoa Peninsula between Humboldt Bay and the Pacific Ocean near Eureka in Humboldt County, California (Figure 1). The outfall was formerly used to discharge approximately 15 million gallons per day (MGD) of treated industrial wastewater from the Evergreen Pulp Mill into the Pacific Ocean (Figure 2). A detailed description of the outfall and diffuser and provided in Section 2.1. At the time this TM was produced, the pulp mill facility was no longer in operation and the outfall was being used to dispose of less than 200,000 gallons per day of industrial process water from the DG Fairhaven Power Plant.

The HBHRCD is the current owner of the outfall, headworks, former Evergreen facility, and associated property. The HBHRCD has received HUD Community Development Block Grant funding to investigate potential future uses of the land, facilities, and outfall system. Possible uses include aquaculture/mariculture, consolidation of regional wastewater treatment plant effluent for disposal, temporary decanting and drying of dredge spoils, and industrial clients. This TM examines the performance of the ocean outfall's diffuser under the range of effluent flows and densities that could be anticipated with these potential discharges.

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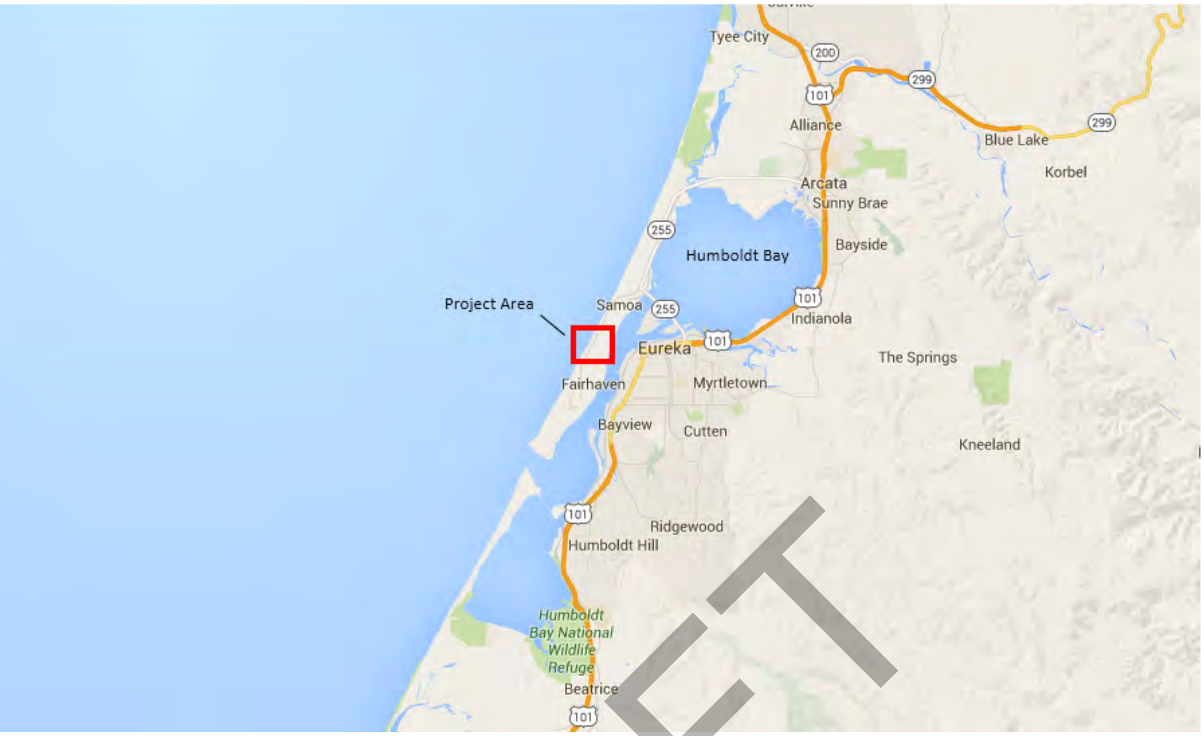

Figure 1. A map of the general area near Eureka, California, where the ocean outfall, outlined in red, is located.

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Figure 2. A picture of the location of the RMT II ocean outfall and diffuser.

1.3 Approach

The approach to evaluating the effectiveness and performance of an outfall/diffuser system used in this TM involves the following:

- Define the physical attributes of the existing outfall and diffuser system.
- Characterize the receiving water physical properties needed to evaluate diffuser performance.
- Characterize the effluent flow and properties of the potential discharge.
- Evaluate expected port velocities required to conform to the regulatory requirements of a high rate diffuser and the corresponding head required for the flow ranges considered. The model selected for use is CH2M's HYDRO model.
- Evaluate the expected dilution performance that such an outfall/diffuser system would provide using an initial dilution model. The model selected for use is the U.S. Environmental Protection Agency's UDKHDEN model.

1.4 Scope and Limitations

This TM is a planning-level feasibility evaluation. At the time of this analysis, the expected daily flow rate is unknown and will be dependent on the combined volume of future clients. In addition, the effluent density will be dependent on waste flows potentially from both freshwater and seawater effluent streams. As a result, a range of various effluent flows and salinities was modeled to allow greater flexibility in the utility of modeled results. Receiving water data needed for the model input came from existing data sets and no new field measurements were collected.

This document provides the rational for model input variable selection, model inputs used, and corresponding dilution and mixing zone dimensions. Calculation of parameter specific dilution is not addressed here and is dependent on effluent and receiving water concentrations of the specific parameter of interest. However, based on known effluent flow rate and density, the modeled dilution closest to the conditions of interest can be used to calculate final dilution or compare dilution required to predicted available dilution.

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SECTION 2.0

Model Selection and Input Requirements

The hydraulics of the existing diffuser were modeled using CH2M's HYDRO model for multiport diffusers. The results of this model provide the flow distributions through the ports and the head loss through the diffuser under varying effluent flows and numbers of open ports. The EPA's initial dilution model UDKHDEN was used to predict diffuser dilution performance. The model predicts the initial dilution and plume trapping level (depth below the surface) for each flow and port configuration considered. The dilution model also provides the Froude number (Frρ) for use in assessing seawater intrusion (back flooding and clearing requirements) and potential port wear. The remainder of this section addressed the model input data requirements for the models and values selected.

2.1 Outfall and Diffuser Description

The on-shore end of the outfall is located on the narrow North Spit of the Samoa Peninsula between the coast of the Pacific Ocean and the north arm of Humboldt Bay (Figure 1). Effluent would be discharged through an existing submerged outfall that is approximately 8,200 feet (2,497 m) long and terminates in an 852-foot (258-meter) multiport diffuser aligned perpendicular to the shoreline. The diffuser contains a total of 144 ports, each with a diameter of 2.4 inches Ports are paired, so that there are 72 ports on each side of the barrel (pipe) with a spacing of 12 feet (3.66 m) on center between ports (Figure 3). The diffuser has a 36-inch (0.91-m) internal diameter, and its ports discharge at a 45-degree vertical orientation, as shown on Figure 4. The diffuser is approximately 82 feet (25 meters maximum depth) below the surface.

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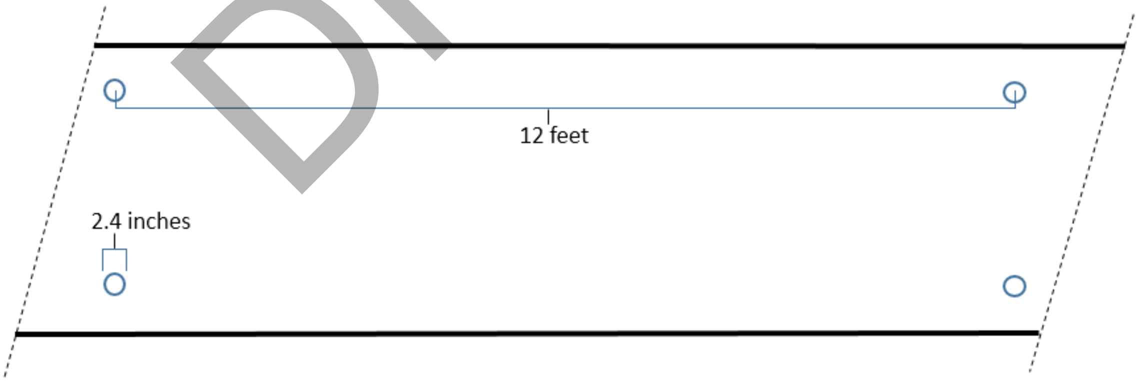

Figure 3. A plan view diagrams of a section of the diffuser showing port pairing, diameter, and spacing.

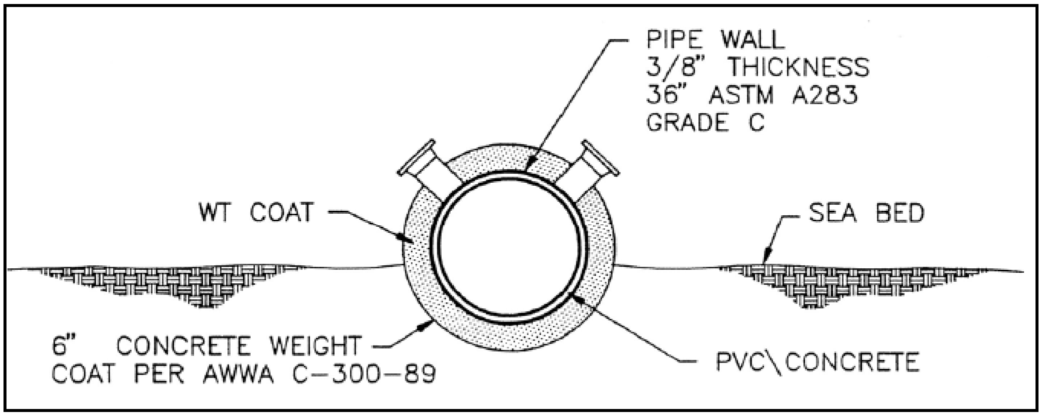

Figure 4. A diagram of the pipeline and diffuser cross-section showing pipe diameter and port orientation.

Model input variables use to characterize the diffuser include the following:

- Pipe diameter= 36-inch (0.91 m)
- Port diameter= 2.4-inch (0.06 m)
- Port elevation= 3.9 inches (0.01 m)
- Vertical Angle= 0
- Horizontal angle= 45 degrees (also exits at 135 degrees)
- Number of ports= 144 (72 on left side of pipe and 72 on right side in parallel)
- Port Spacing= 12 ft (3.66 m)
- Ave. port depth= 79 ft (24 m; range 22.9 to 25.0 m)

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2.2 Receiving Water Hydrographic Data

In 2007, CH2M performed a study of the dissolved oxygen (DO) and sediment effects of the outfall discharge when the outfall was used by Evergreen Pulp, Inc[1]. As part of that study, CH2M reviewed existing data records of hydrographic data collected in the vicinity of the outfall. Because that data had only limited utility for model application, CH2M also performed two field sampling surveys to collected higher quality, site-specific hydrographic data. A series of profiles and current measurements were collected in June and October 2007. No additional hydrographic profile or current data from the outfall is known to have been collected since this study. The data collected in 2007, representing two seasons and providing profile data from the depth of the diffuser to the surface, is considered the best available data and was therefore selected to be representative of ambient conditions for the purposes of model input data.

The profiles screened for use in the dilution model to represent ambient receiving water (seawater) conditions are provided in Attachment 1 and include density profiles, temperature profiles, and salinity profiles. The temperature and salinity data of Cast 1 from June 2007 were used for dilution modeling. This is the same profile used for dilution modeling in the 2007 Dissolved Oxygen study footnoted above. Salinity and temperature values used in the model are provided in Table 1.

---

[1] CH2M. *2007 Receiving Water Monitoring Report – Evaluation of Dissolved Oxygen and Sediment Effects.* Prepared for Evergreen Pulp, Inc. Prepared by CH2M. December 2007.

Table 1. Salinity and Temperature Data Selected for the Dilution Model.

Depth* m	Salinity psu	Temperature °C	Depth* m	Salinity psu	Temperature °C
0	33.85	10.95	13	34.02	9.99
2	33.85	10.95	14	34.03	9.96
3	33.91	10.66	15	34.03	9.95
4	33.97	10.43	16	34.04	9.94
5	33.98	10.27	17	34.04	9.94
6	34.00	10.18	18	34.03	9.94
7	34.01	10.12	19	34.03	9.93
8	34.02	10.07	20	34.04	9.89
9	34.02	10.04	20	34.04	9.89
10	34.03	10.01	21	34.05	9.80
11	34.03	10.02	22	34.08	9.64
12	34.03	10.01	24	34.08	9.64

* Depth below the surface.

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2.2.1 Current Speed and Direction

During the 2007 dissolved oxygen study hydrographic profiling field event, current speed was estimated using speed and direction data recorded from drogue tracking. The depth averaged current speed was reported as 0.072 m/s. Drogue tracking data from the 2007 study are provided in Attachment 2. Coastal currents along the northern Californian coast generally trend southward and are dominated by the California Current (Figure 5). Although there can be near-shore counter-currents, the general current trend along the North Spit of the Samoa Peninsula would be expected to be parallel to the coastline which runs roughly north-south. The diffuser extends into the ocean perpendicular to the coastline which would result in currents running perpendicular to the diffuser (an angle of 90 degrees to the diffuser barrel).

Figure 5. A map of ocean current directions (NOAA).

Model input variables use to characterize the ambient currents include the following:

• Current speed	0.072 m/s
• Current direction	90 degrees (to diffuser)

2.3 Effluent Characteristics

Effluent flow, salinity, and temperature are required by the initial dilution model. Effluent volume (flow) and density (salinity and temperature) will depend on the wastewater contributors with which the HBHRCD partners to use the outfall.

Discharge through the diffuser is controlled by pipe diameter, port size, port discharge rate (port velocity), and the number of available ports. The maximum port diameter and number of ports are fixed at 2.4 inches and 144 ports, respectively. A minimum port velocity of 10 fps is generally required by the permitting agencies to meet the definition of a high rate diffuser. Port velocity can be calculated as follows:

Port velocity (per port) = flow (cfs) / total port area (in sq ft).

For example, using the existing port diameter with all ports open would yeild:

At 25 MGD (38.6817 cfs), 2.4 inch ports (0.2 ft), and 144 open ports would yield

Port velocity = 38.6817 cfs/(PI x (0.2 ft/2)^2) x 144) = 8.55 fps

At 30 MGD (46.4181 cfs), 2.4 inch ports (0.2 ft), and 144 open ports would yield

Port velocity = 46.4181 cfs/(PI x (0.2 ft/2)^2) x 144) = 10.26 fps

A table of port velocity vs. flow and number of ports is provided in Attachment 3. A summary of required number of open ports to achieve target port velocities at selected flow increments are provided in Section 3. Flow was modeled incrementally at 1, 5, 10, 15, 20, 25, 30, 35, and 40 MGD.

Dilution occurs as the effluent plume disperses after exiting the diffuser. Dilution is increased as the plume rises through the water column. Plume properties that increase plume rise, such as lower salinity and increased temperature compared to the receiving water, increase dilution. Conversely, effluent salinity and temperature that are similar to the receiving water salinity and temperature would reduce dilution. Effluent with a density greater than the receiving water could significantly reduce dilution and result in the plume contacting the seabed which can increase the complexity of NPDES permitting.

A series of effluent temperatures was selected ranging from 10°C (ambient seawater) to 25°C (potential industrial wastewater). Salinity input data ranged from 0.1 psu (predominantly freshwater) to 30 psu (predominantly seawater).

Model input variables use to characterize the effluent include the following:

• Flow	1, 5, 10, 15, 20, 25, 30, 35 and 40 MGD
• Temperature	10, 15, 20, 25, and 30 °C
• Salinity	0.1, 1, 10, 20, and 25 psu

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SECTION 3.0

Model Results

3.1 Port Velocity

The number of open ports on the diffuser controls the velocity of flow through each port. A high-rate diffuser is commonly defined by regulatory agencies as a diffuser with port velocities of ten feet per second or greater. However, port velocities in excess of roughly fifteen feet per second (fps) or greater can result in damage to the diffuser pipe and ports. As a result, the range of port velocities targeted in this study were between ten and fifteen feet per second.

Port velocities and the range of open ports ranging from numbers 1 to 144 (1 to 72 ports showing each port and 74 to 144 at paired port intervals) are provided for the selected flows (1, 5, 10, 15, 20, 25, 30, 35, and 40 MGD) in Attachment 3. Figure 6 provides a plot of port velocity (in MGD) vs. number of open ports for each flow increment. Boundaries for 10 and 15 fps are indicated. A summary of the range of open ports for each flow increment is provided in Table 2. It is noted that when the flow rate is held constant, port velocity decreases as additional ports are opened. This range of ports is then used to model head loss, Froude number, and dilution.

Table 2. Ranges of Port Velocities and Open Ports for Select Flows.

Flow Rate	Calculated Port Velocity Range	Range of Open Ports
MGD	fps	count
1	9.85 to 16.42	5 to 3
5	10.26 to 15.39	24 to 16
10	10.05 to 14.92	49 to 33
15	9.98 to 15.08	74 to 49
20	10.05 to 14.92	98 to 66
25	10.09 to 15.02	122 to 82
30	10.26 to 15.08	144 to 98
35	11.97 to 15.12	144 to 114
40	13.68 to 14.92	144 to 132
45	>15.39	144

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Table 2 provides averaged port velocities. Minor variation in individual ports is expected and the variation increases with the number of open ports. In addition, differences in density (that is temperature and salinity) can also generate minor differences in port velocity. The model HYDRO was used to evaluate individual port velocities and assess variation attributed to temperature and salinity for the ranges considered in this TM. Attachment 4 provides the summary of minimum, maximum, and average port velocities for 0.1 psu and 30 psu and 10°C and 25°C cases for each flow rate. At the maximum flow rate (40 MGD) and greatest temperature and salinity, the variation in port velocity was less than 6 percent of the average port velocity.

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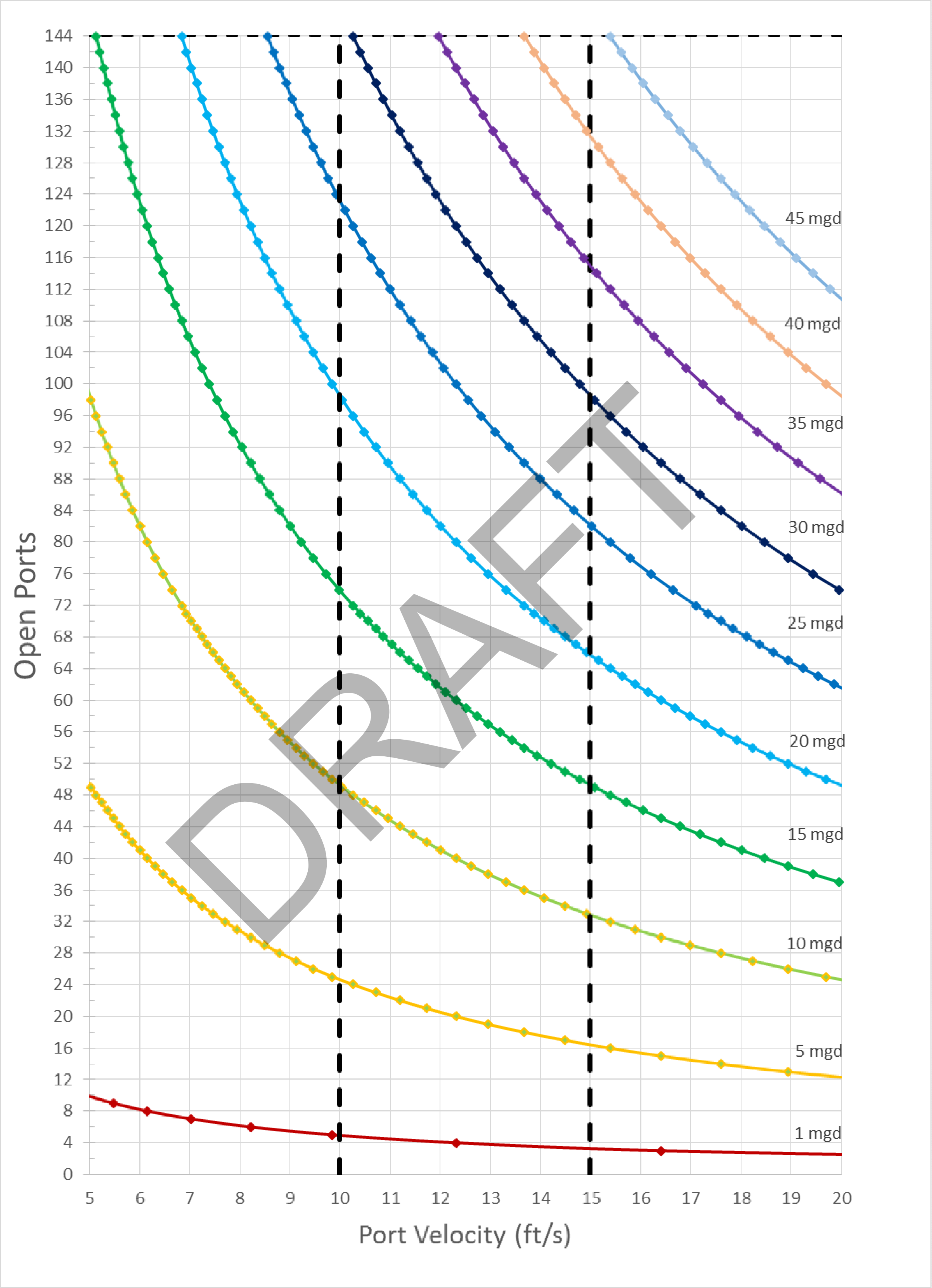

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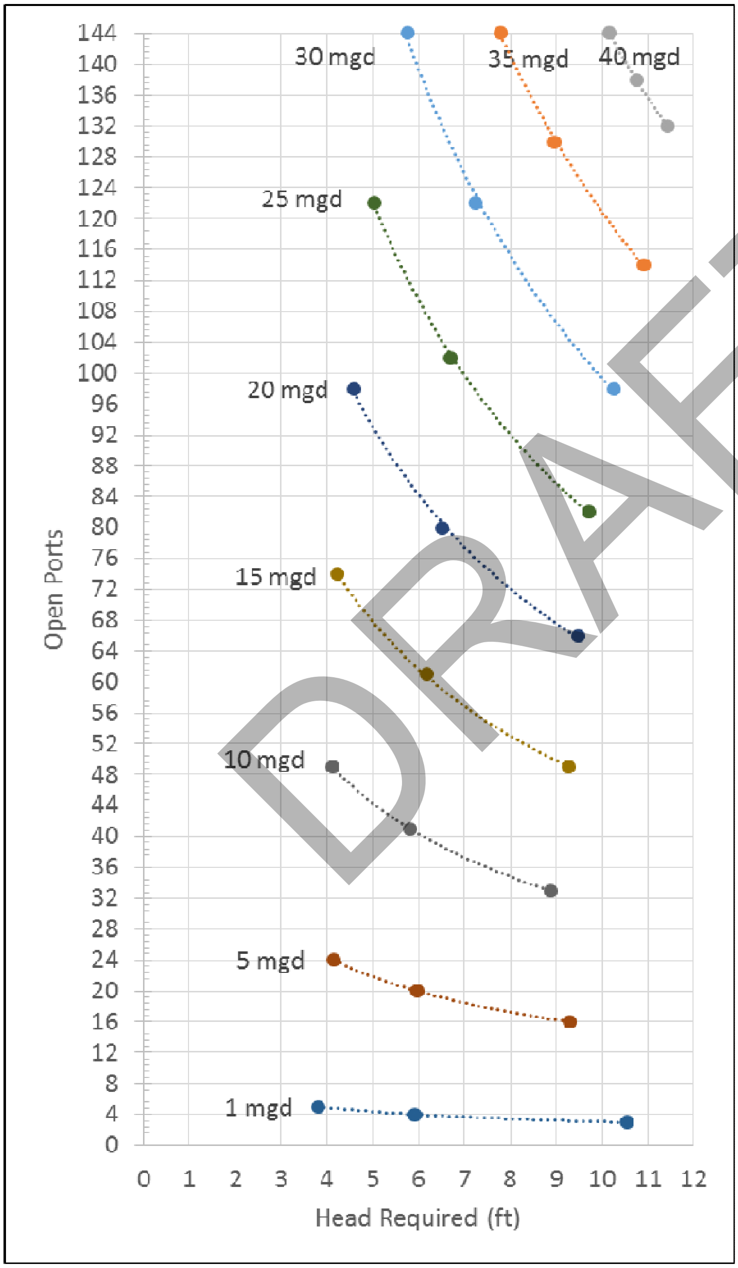
Figure 6. Port Velocities vs. Open Ports for Modeled Flow Increments.

3.2 Head Loss

The model HYDRO was used to calculate head loss (required head) for the flow, salinity, and temperature cases assessed. Variation in head loss attributed to temperature and salinity for a given discharge rate where insignificant at less than 0.02 feet (see Attachment 4 for individual values). Figure 7 provides the required head and pressure based on flow increments modeled.



Flow (MGD)	Open Ports	Head (feet)	Pressure (psi)
1	3	10.55	4.57
	4	5.93	2.57
	5	3.80	1.65
5	16	9.30	4.03
	20	5.97	2.58
	24	4.15	1.80
10	33	8.87	3.84
	41	5.81	2.52
	49	4.12	1.78
15	49	9.27	4.01
	61	6.17	2.67
	74	4.22	1.83
20	66	9.47	4.10
	80	6.51	2.82
	98	4.58	1.98
25	82	9.72	4.21
	102	6.69	2.90
	122	5.04	2.18
30	98	10.26	4.44
	122	7.25	3.14
	144	5.75	2.49
35	114	10.90	4.72
	130	8.97	3.88
	144	7.78	3.37
40	132	11.42	4.94
	138	10.74	4.65
	144	10.15	4.39

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Figure 7. Required Head and Pressure for Model Flow Rates

3.3 UDKHDEN Model Results

Dilution modeling was performed for a range of flows up to 40 MGD starting at 1 MGD and increasing at 5 MGD increments from 5 to 40 MGD. The maximum flow of 40 MGD was selected based both on port velocity assessment and the hydraulic limitation of the diffuser with all ports open. For each flow increment, three diffuser configurations (number of open ports) were selected to bracket target port velocities. The number of open ports that yielded port velocities closest to 10 fps and 15 fps, respectively (refer to Table 2), and a port configuration of approximately midway between the two selected. For each flow increment and port configuration, salinity and temperature were varied to provide a representative range of effluent densities. As described above, salinity increments consisted of 0.1, 1, 10, 20, and 30 psu and temperature ranges consisted of 10, 15, 20, and 25ºC.

A total of 520 model runs were performed. Individual model run outputs are provided on CD. Model run name, flow, number of ports, salinity, temperature, port spacing, and resulting Froude number, trapping level, and dilution are listed in Attachment 5. Mixing zone size associated with a given model run are included in the model output files but were not summarized for this planning level study.

Effluent salinity has a more significant effect on dilution than does temperature at the ranges selected. Therefore data assessment and data presentation are in terms of dilution vs salinity. A summary of the range of open ports, trapping levels, and dilution that could be expected for a given flow under modeled salinity ranges are provided in Table 3. Graphical representation of the modeled dilution for each salinity and temperature range are provided in Figures 8 through 16.

High-rate diffusers are generally designed to provide at least a 100:1 dilution. As shown in Table 3, dilution decrease as effluent flow increases. At the coldest temperature (10°C) and highest salinity (30 psu), dilution falls below 100:1 and becomes dependent on the number of open ports.

Table 3. Modeled Dilution

Flow MGD	Range of Open Ports	Salinity (psu)	Trapping Level Below the Surface (m)	Plume Dilution
1	3 to 5	0.1	7.27 to 9.21	589.71 to 856.94
		1.0	7.36 to 9.28	588.40 to 846.95
		10.0	8.39 to 13.36	529.80 to 673.25
		20.0	13.22 to 19.09	245.68 to 497.23
		30.0	20.05 to 21.26	88.63 to 150.01
5	16 to 24	0.1	7.46 to 9.12	618.76 to 828.38
		1.0	7.53 to 9.23	615.31 to 821.22
		10.0	8.59 to 13.29	556.56 to 773.21
		20.0	13.37 to 18.77	256.65 to 509.42

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Table 3. Modeled Dilution

Flow MGD	Range of Open Ports	Salinity (psu)	Trapping Level Below the Surface (m)			Plume Dilution		
		30.0	20.15	to	21.23	91.85	to	147.09
10	33 to 49	0.1	7.50	to	9.20	635.25	to	837.35
		1.0	7.57	to	9.29	630.05	to	833.68
		10.0	8.83	to	13.32	569.13	to	787.04
		20.0	13.43	to	19.01	246.46	to	498.27
		30.0	20.17	to	21.24	92.79	to	150.88
15	49 to 74	0.1	6.93	to	8.53	507.07	to	755.90
		1.0	6.95	to	8.67	503.93	to	745.80
		10.0	7.80	to	9.64	468.50	to	681.17
		20.0	12.99	to	15.15	309.60	to	465.92
		30.0	20.12	to	21.16	86.65	to	143.14
20	66 to 98	0.1	6.36	to	7.69	434.10	to	644.17
		1.0	6.41	to	7.81	432.76	to	641.09
		10.0	7.37	to	9.29	405.10	to	587.73
		20.0	9.28	to	13.92	271.59	to	423.55
		30.0	19.70	to	21.08	77.77	to	134.27
25	82 to 122	0.1	5.82	to	7.16	375.82	to	512.68
		1.0	5.85	to	7.22	374.65	to	509.58
		10.0	6.82	to	8.53	349.13	to	481.57
		20.0	8.70	to	13.60	273.81	to	421.40
		30.0	19.20	to	21.08	73.65	to	115.66
30	98 to 144	0.1	5.80	to	7.11	375.71	to	505.22
		1.0	5.85	to	7.22	373.77	to	503.33
		10.0	6.78	to	8.36	349.05	to	474.43
		20.0	8.54	to	13.57	273.38	to	368.46
		30.0	19.20	to	21.09	73.51	to	115.80
35	114 to 144	0.1	6.07	to	6.70	411.10	to	450.67
		1.0	6.20	to	6.77	408.98	to	448.27
		10.0	7.15	to	7.75	382.83	to	421.74
		20.0	9.12	to	13.21	276.26	to	371.38
		30.0	19.45	to	21.01	75.51	to	113.41
40	132 to	0.1	5.79	to	6.29	377.53	to	410.62

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Table 3. Modeled Dilution

Flow MGD	Range of Open Ports	Salinity (psu)	Trapping Level Below the Surface (m)			Plume Dilution		
	144	1.0	5.90	to	6.39	374.83	to	407.20
		10.0	6.81	to	7.48	350.25	to	385.10
		20.0	8.54	to	9.67	305.93	to	341.44
		30.0	19.21	to	20.86	73.86	to	108.14

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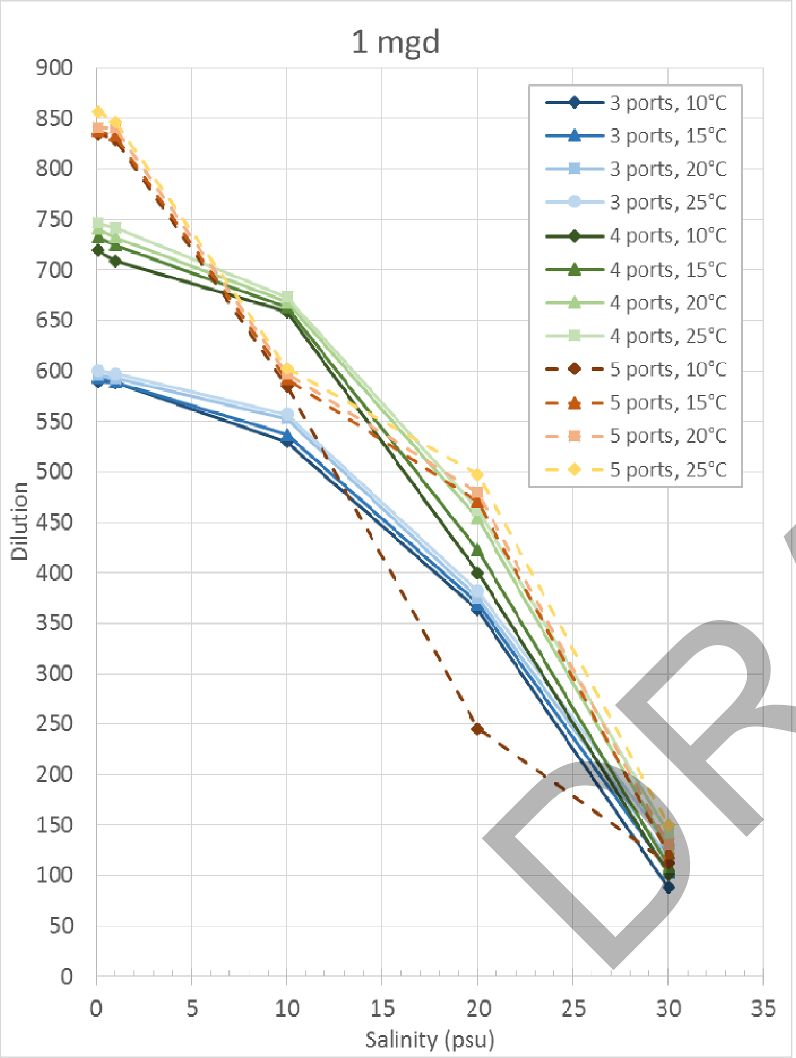

Figure 8. Dilution vs. Salinity for Selected Open Ports at 1 MGD.

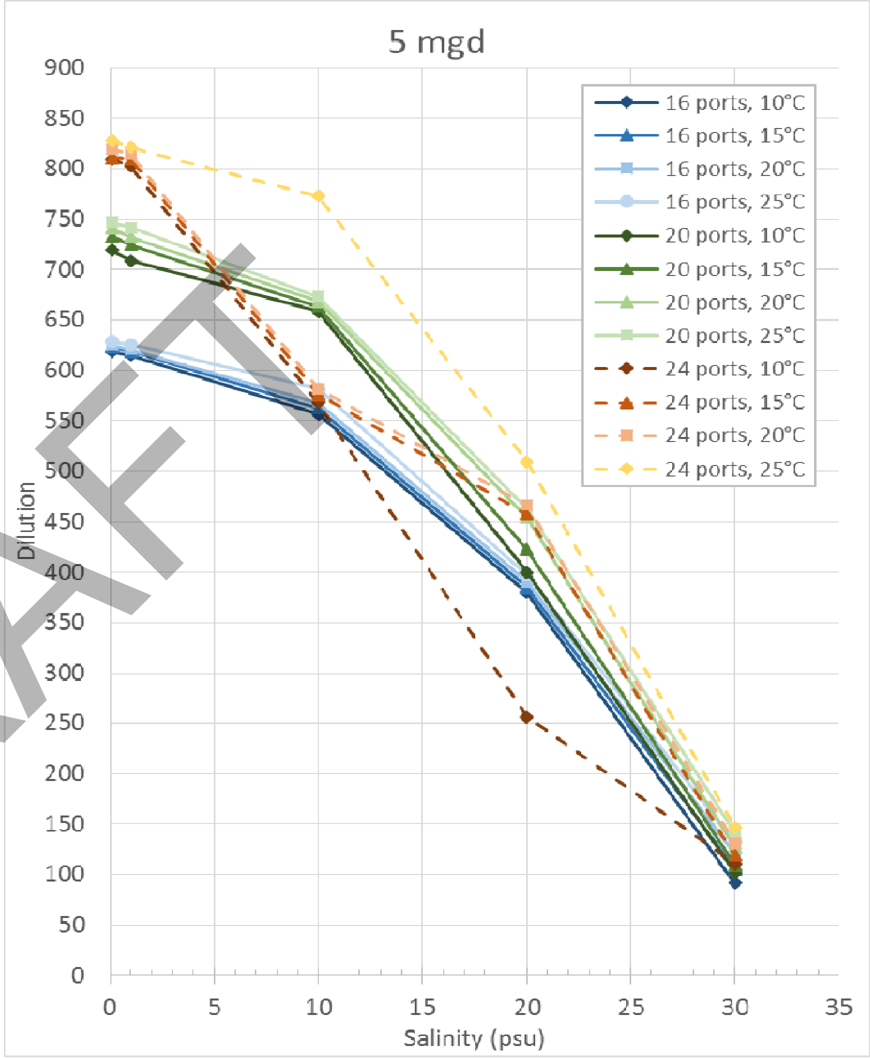

Figure 9. Dilution vs. Salinity for Selected Open Ports at 5 MGD.

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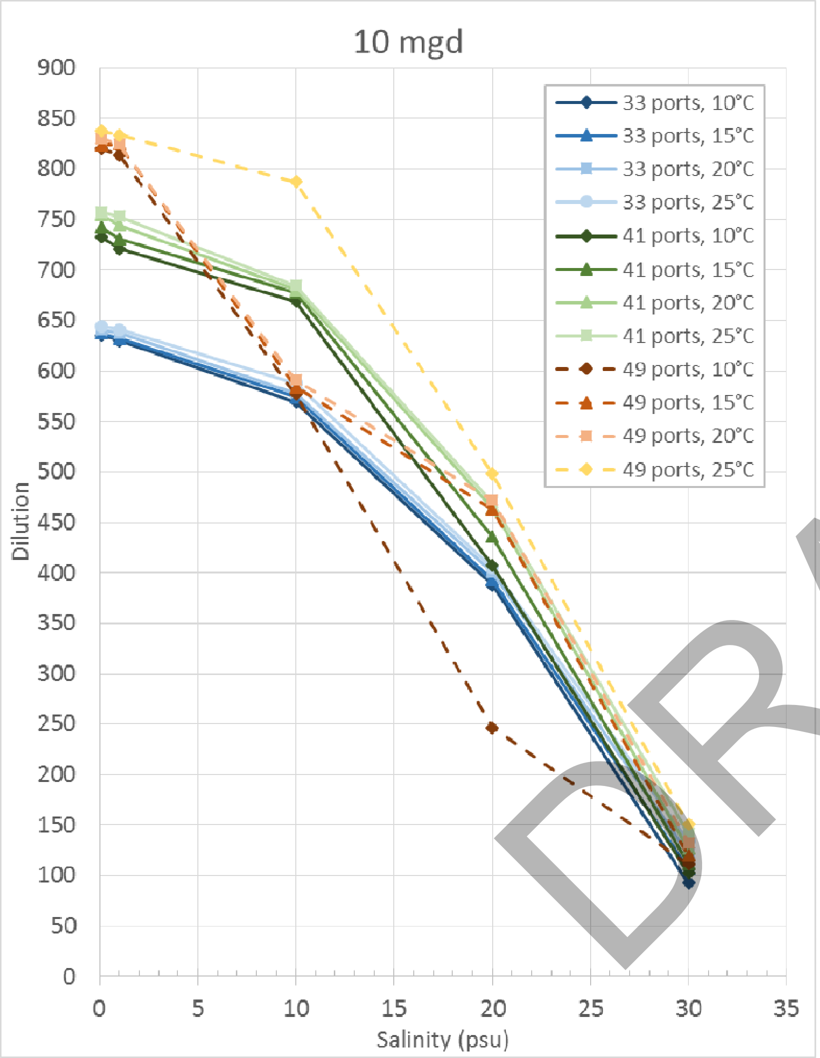

Figure 10. Dilution vs. Salinity for Selected Open Ports at 10 MGD.

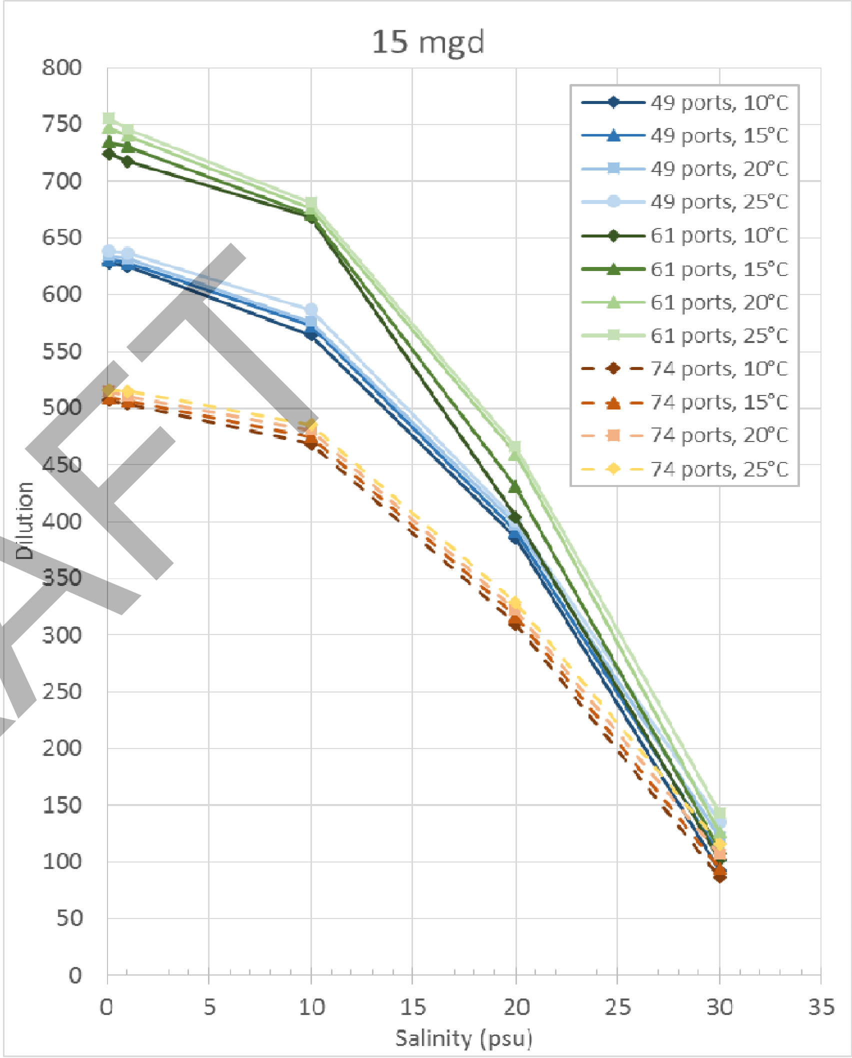

Figure 11. Dilution vs. Salinity for Selected Open Ports at 15 MGD.

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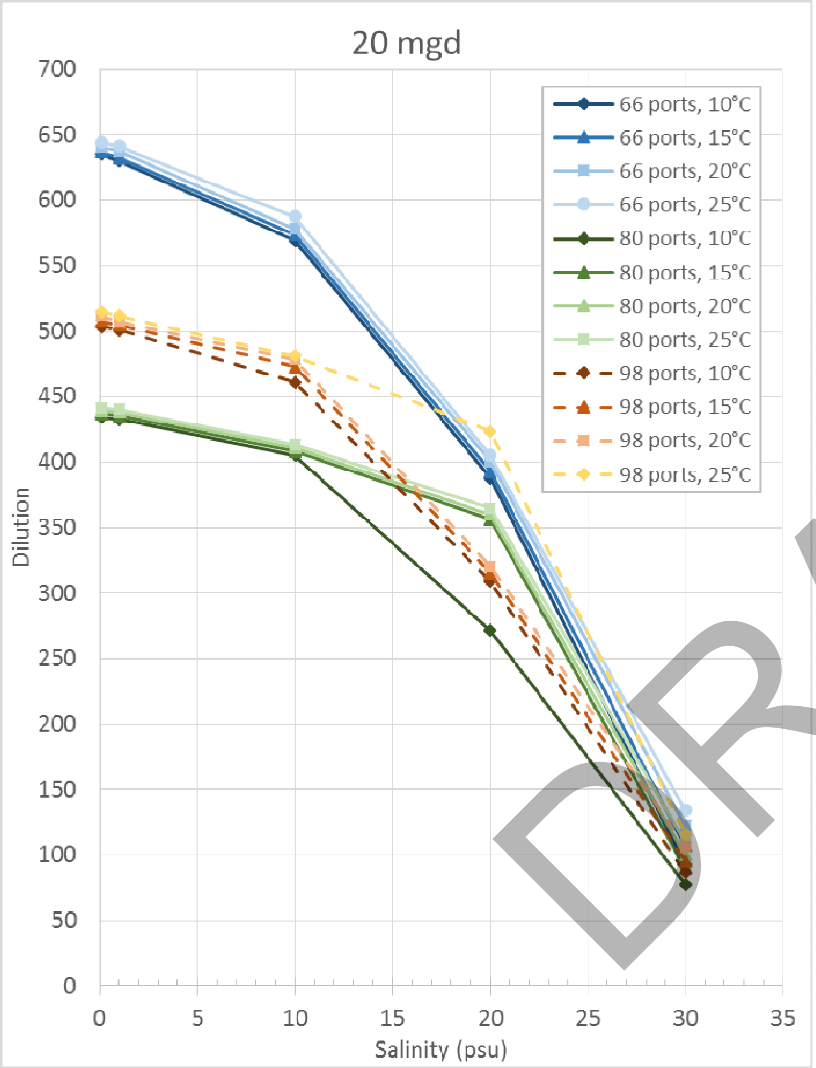

Figure 12. Dilution vs. Salinity for Selected Open Ports at 20 MGD.

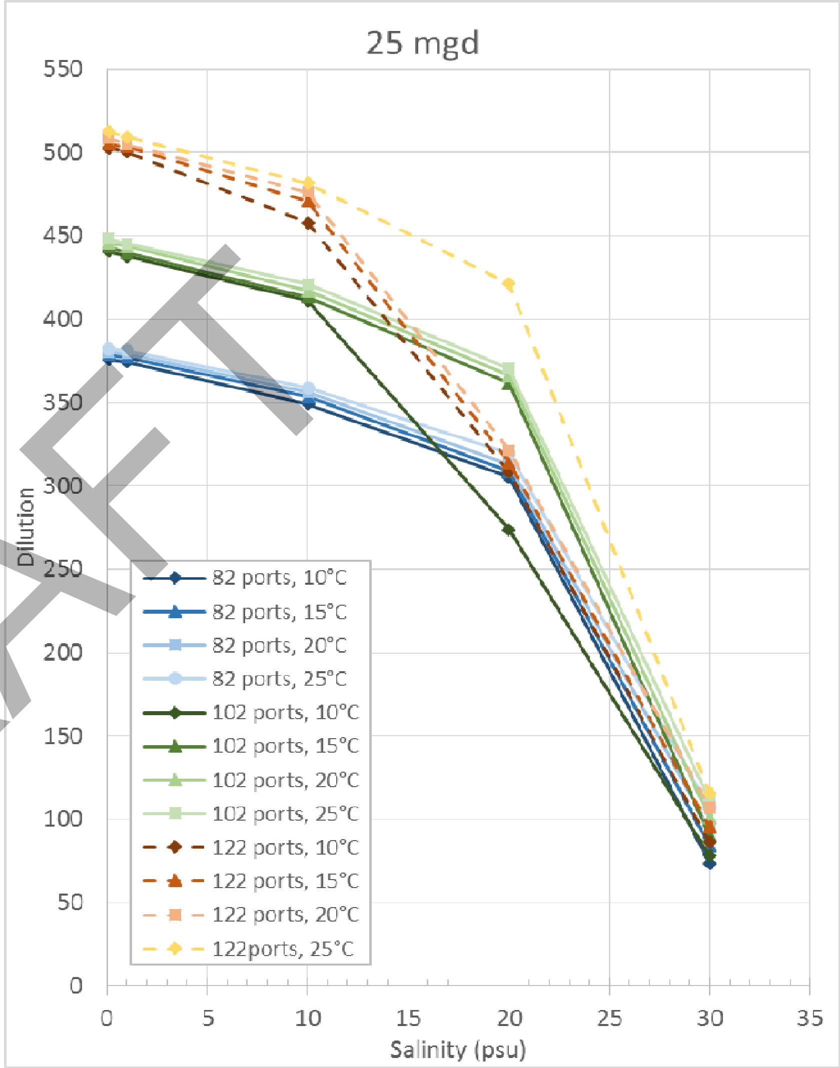

Figure 13. Dilution vs. Salinity for Selected Open Ports at 25 MGD.

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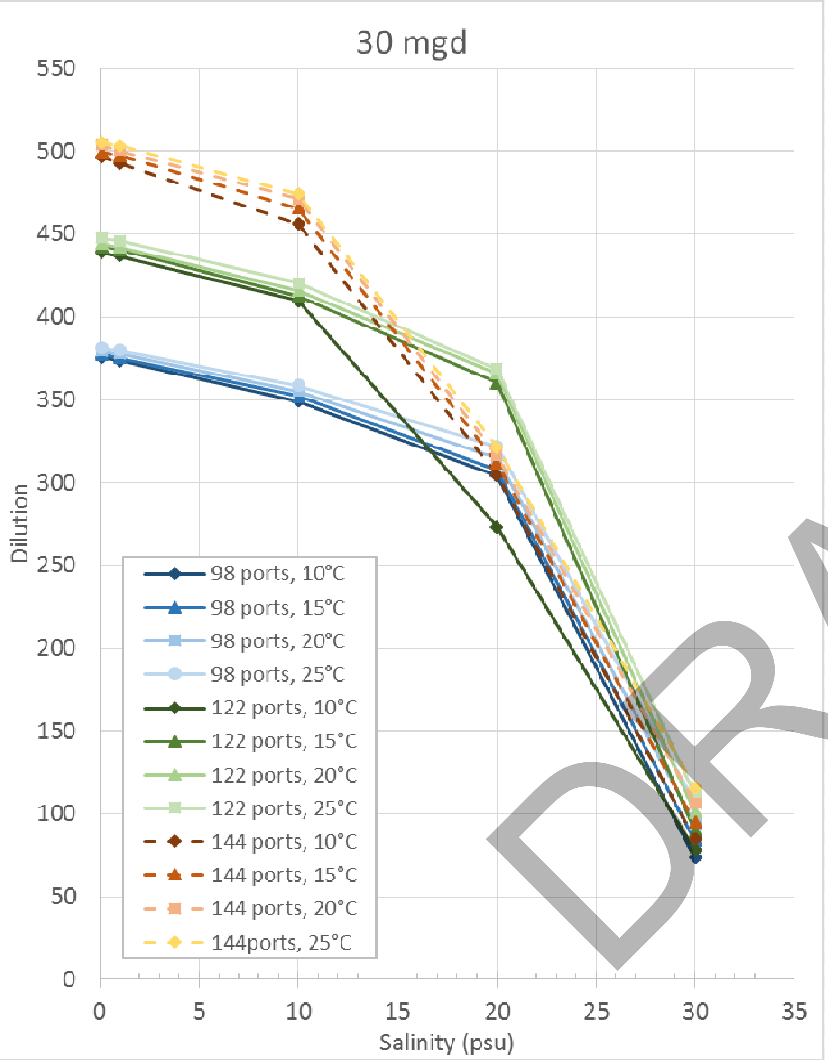

Figure 14. Dilution vs. Salinity for Selected Open Ports at 30 MGD.

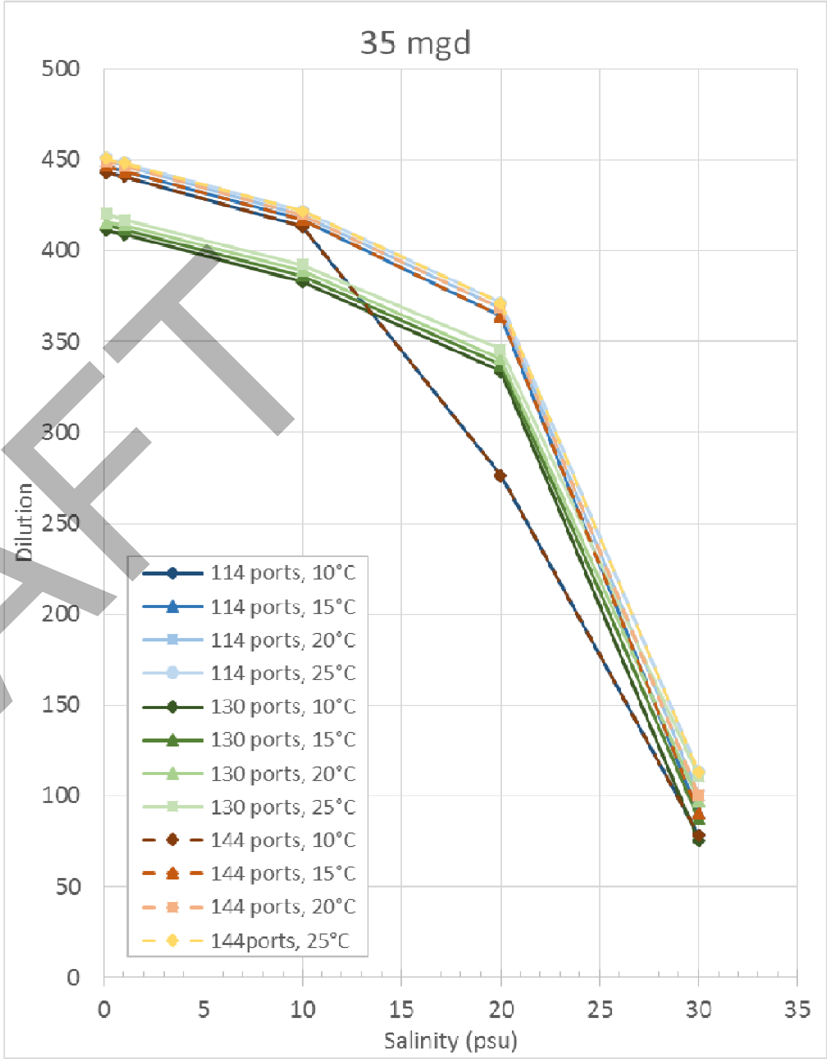

Figure 15. Dilution vs. Salinity for Selected Open Ports at 35 MGD.

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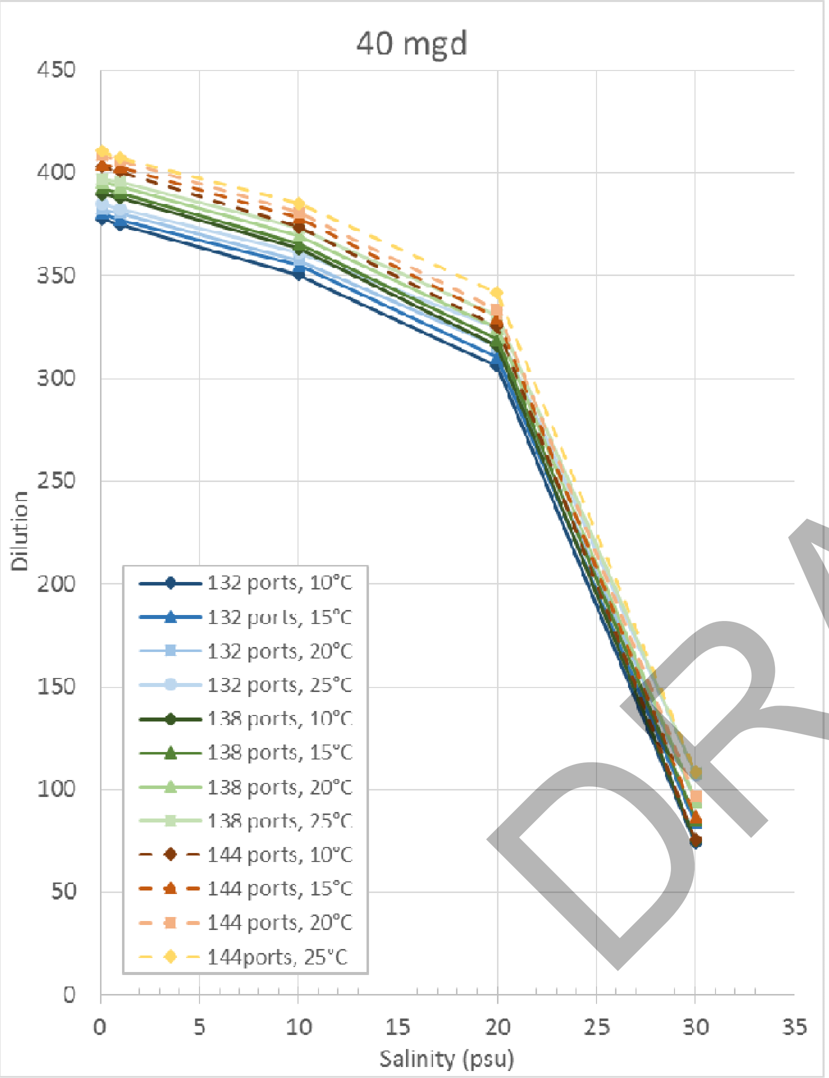

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Figure 16. Dilution vs. Salinity for Selected Open Ports at 40 MGD.

SECTION 4.0

Discussion and Recommendations

The capacity of the Samoa Peninsula outfall is defined by pipe diameter, number of available diffuser ports, and port diameter. Available dilution capacity is controlled by effluent flow rate and density. Detailed modeling was performed to assess dilution performance based on varying effluent flow, salinity, and temperature. Key findings include:

- Hydraulic assessment indicates the outfall can discharge up to 40 MGD based on 144 2.4-inch ports, however effluent with a higher salinity content will reduce dilution.
- Targeted diffuser port velocities (10-15 fps) are achievable for flows between 1 and 40 MGD under existing diffuser design by establishing a port opening schedule.
- Required head for the target port velocities evaluated ranged from 3.8 to 11. 4 feet (1.65 to 4.94 psi).
- Dilution decreases with increased flow, but target dilution of greater than 100:1 was easily achieved for flows up to 40 MGD for all conditions evaluated with the exception of effluent salinity of 30 psu. At this salinity, lower dilution must be accepted at some conditions.
- Dilution increases with increased effluent temperature. Effluent temperatures approximating receiving water temperatures provided significantly lower dilution than temperatures above that of the receiving water when salinities were greater than 10 psu.
- Dilution decreases with increased effluent salinity. A target dilution of greater than 100:1 is easily achieved for the range of flows evaluated with salinities up to 20 psu. Salinities between 20 and 25 psu, while not specifically modeled, appear to maintain dilution greater than 100:1 under flow and temperature regimes tested based on trend line analysis. Salinities of 30 psu start to fall below the target dilution of 100:1 as effluent temperature decreases.
- Salinities between 30 and 35 psu (full strength seawater) can be discharged from the outfall, but dilution would be lower than that expected for the regulatory definition of a high rate diffuser. For example, effluent at 5 MGD at 32 psu at 15°C would yield a dilution of 84:1. If all effluent parameters met end of pipe water quality standards, that is, did not require a mixing zone, straight seawater could be discharged for purely disposal purposes.

Modeling was performed based on existing hydrographic profile data and current speed data collected in the vicinity of the outfall. Prior to applying for an NPDES permit for the outfall, it is recommended that additional hydrographic profiles and higher quality current data be collected. The hydrographic profile used in this study was representative of ambient conditions, but may not represent the critical conditions that would yield the lowest dilution for regulatory purposes. It is recommended that additional hydrographic

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profiles (conductivity, temperature, and pressure to calculate density, salinity, and depth) be collected over a time frame encompassing seasonal variation to establish a critical density profile. Further, it is recommended that an acoustic Doppler current profiler (ADCP) be placed in the vicinity of the outfall to collect current speed and direction data at various seasonal increments recording data for a minimum of 24 hours during each deployment to capture the full range of tidal variation. Dilution modeling should be performed again once better resolution of the nature of the effluent and the receiving water is available.

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Attachment 1

Hydrographic Profiles from June and October 2007

Figure 1. Hydrographic Profile Measurement Locations from June 6, 2007.

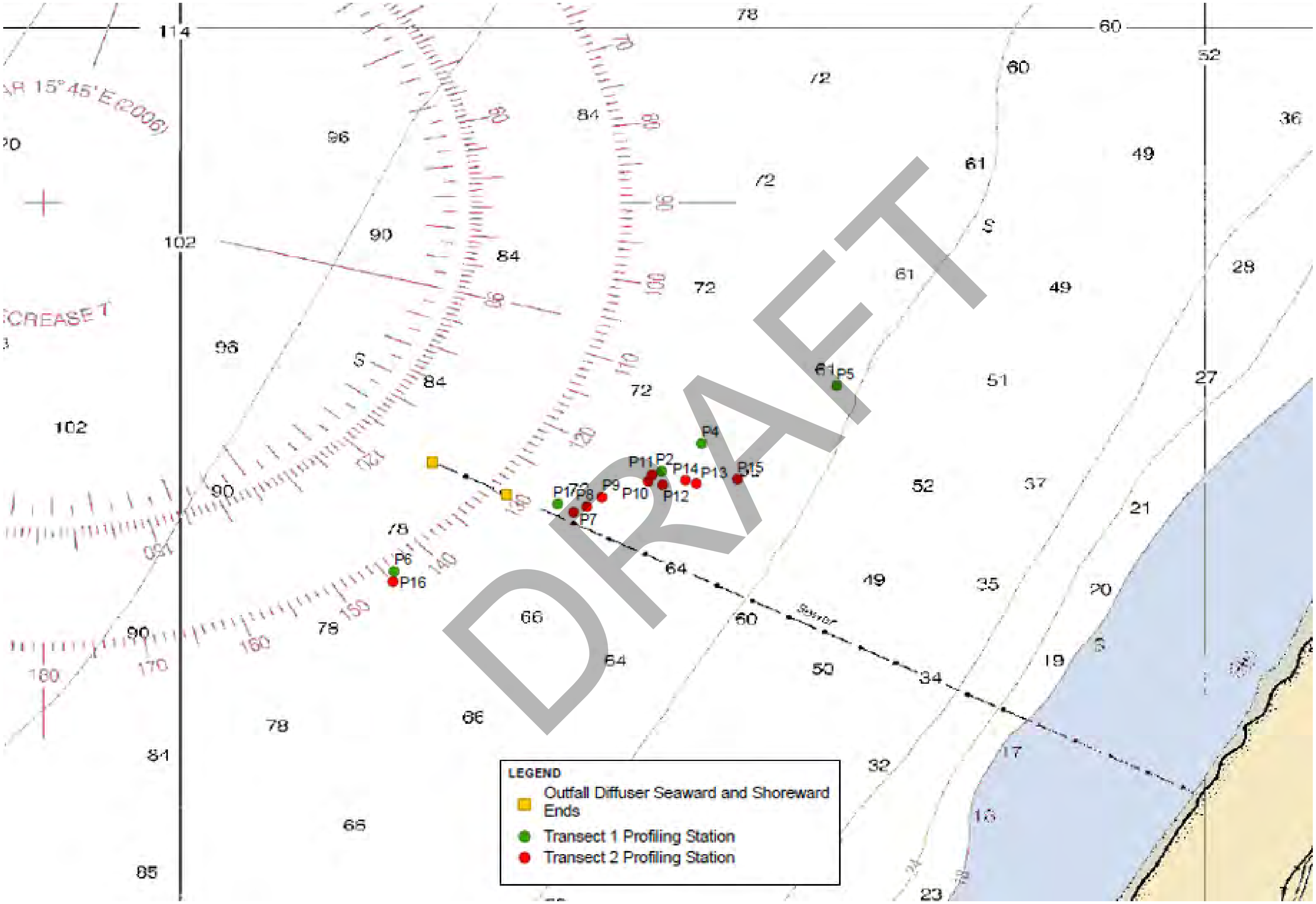

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Figure 2. Hydrographic Profile measurement Locations from October 8, 2007.

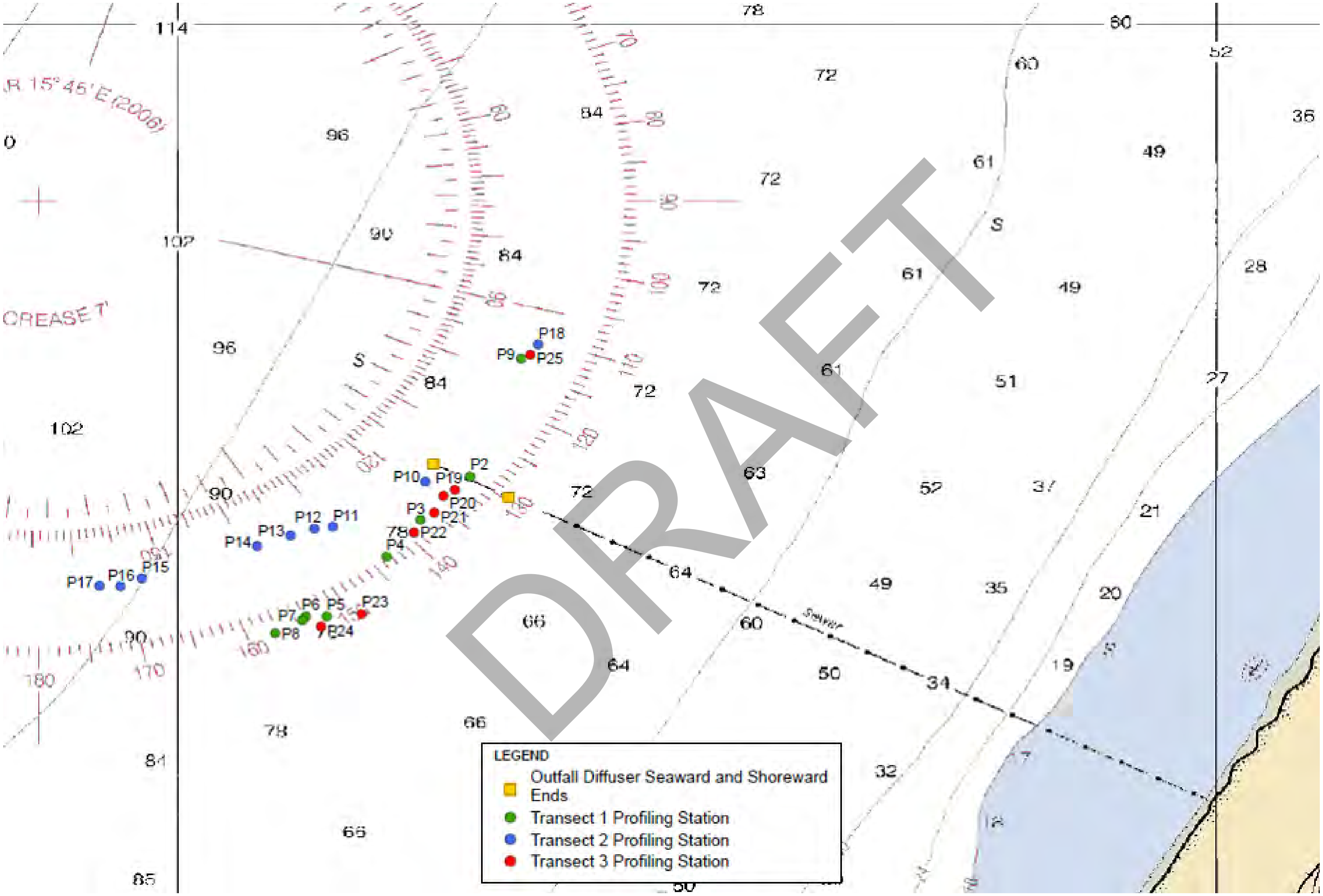

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Figure 1. Plots of Density Profiles Based on Temperature and Salinity Data Collected on June 6, 2007 from Around the Samoa Peninsula Outfall.

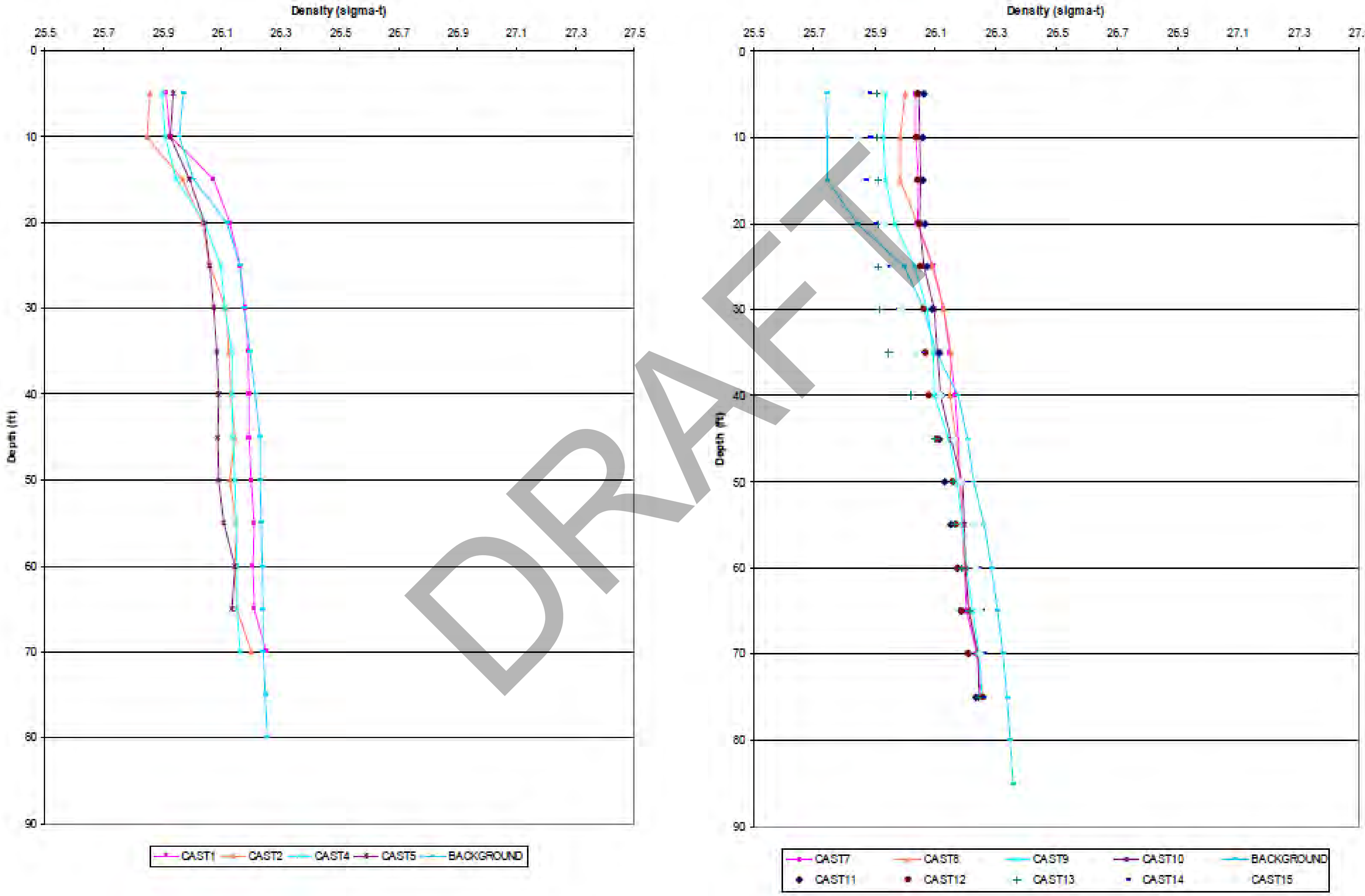

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Figure 2. Plots of Density Profiles Based on Temperature and Salinity Data Collected on October 8, 2007 from Around the Samoa Peninsula Outfall.

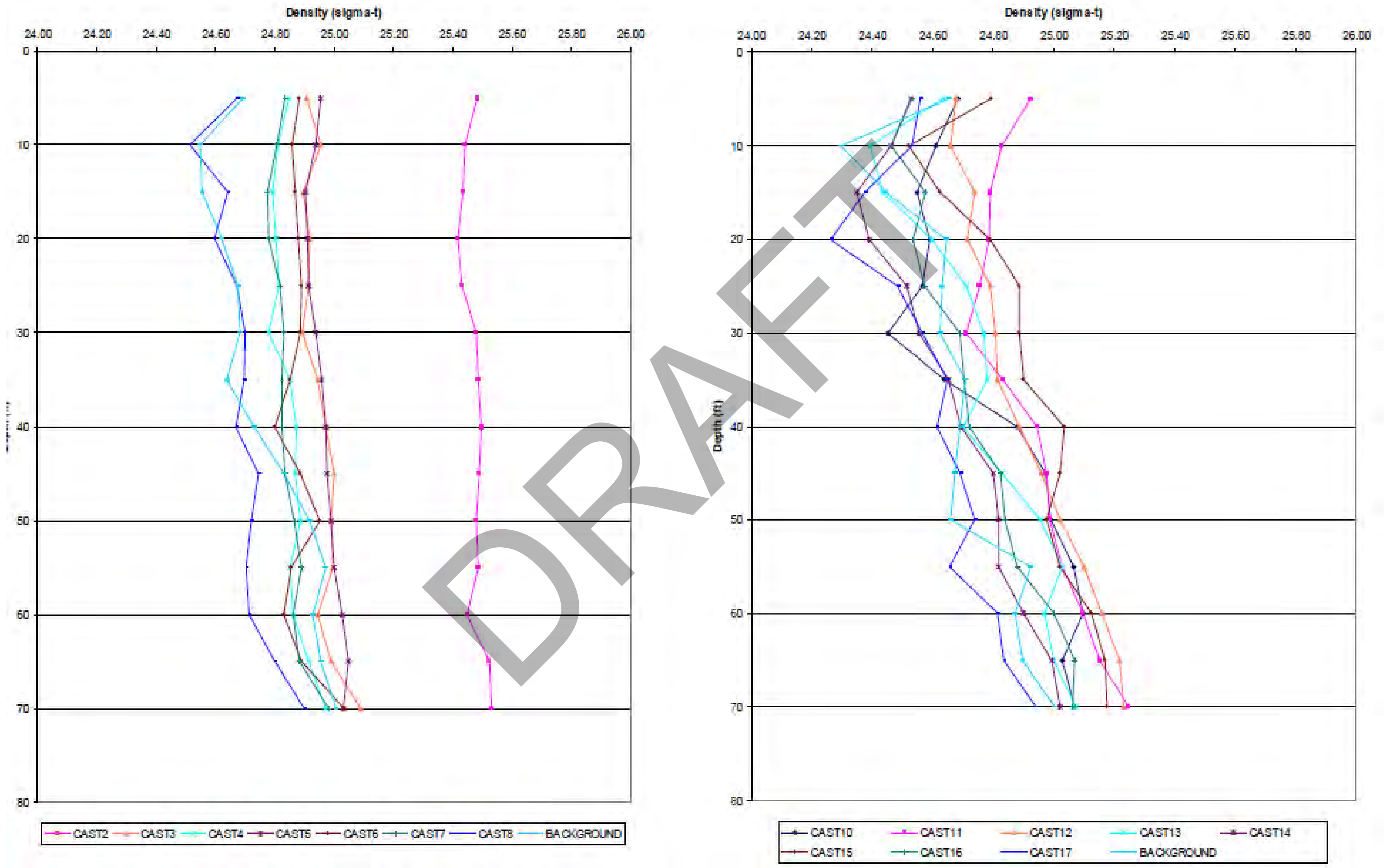

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Figure 2 continued. . Plots of Density Profiles Based on Temperature and Salinity Data Collected on October 8, 2007 from Around the Samoa Peninsula Outfall.

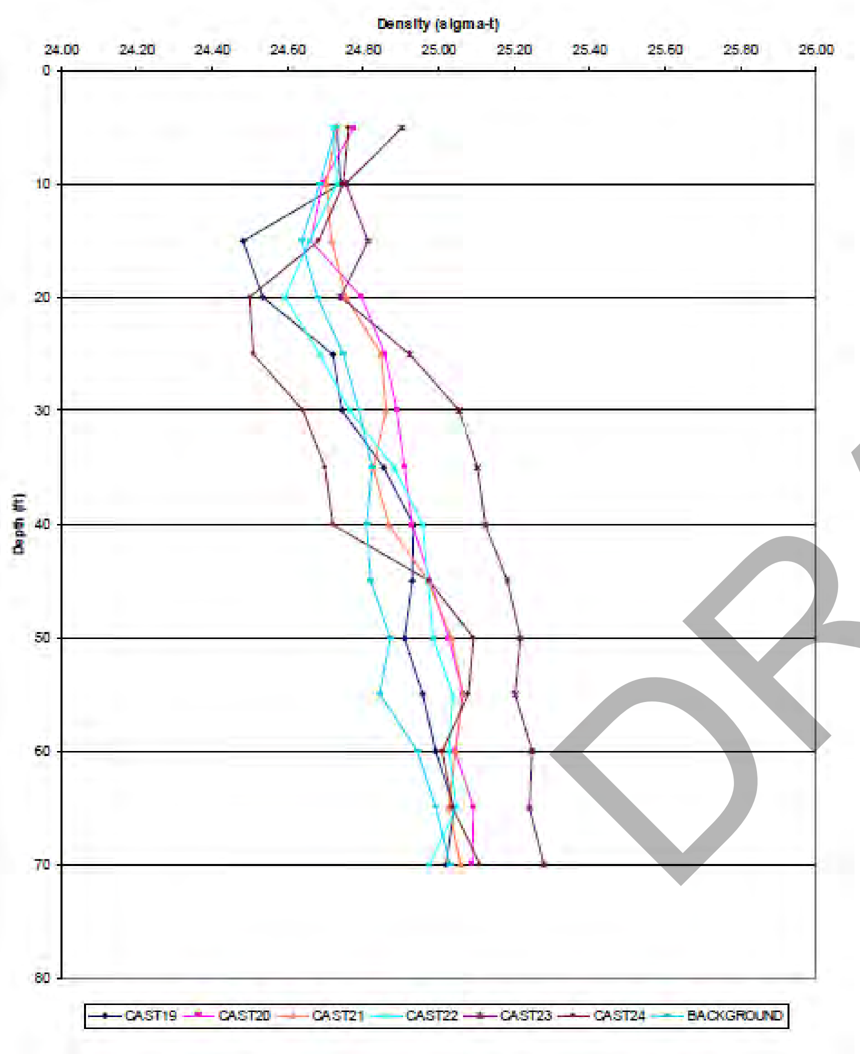

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Figure 3. Plots of Temperature Profile Data Collected June 6, 2007 from Around the Samoa Peninsula Outfall.

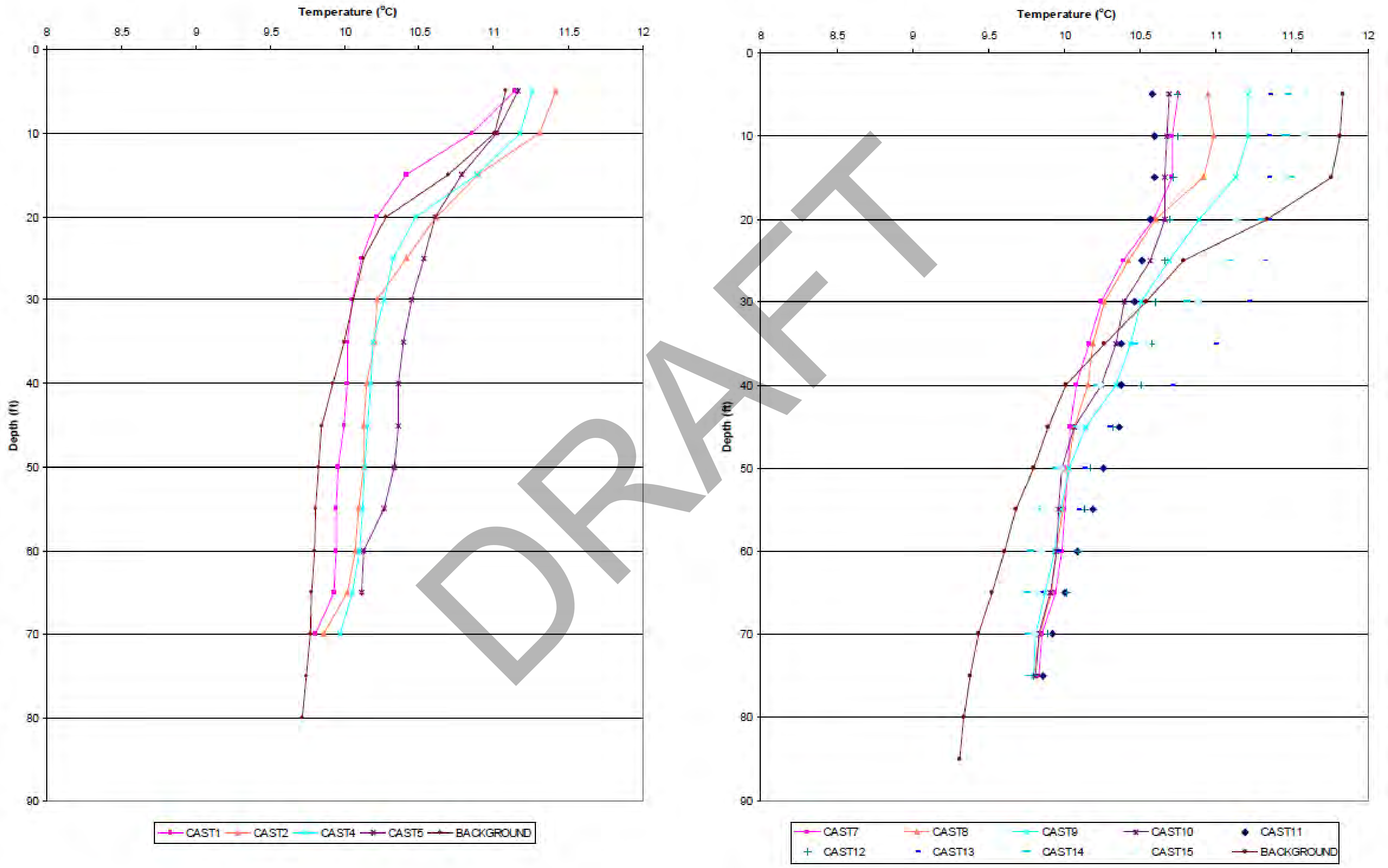

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Figure 4. Plots of Temperature Profile Data Collected October 8, 2007 from Around the Samoa Peninsula Outfall.

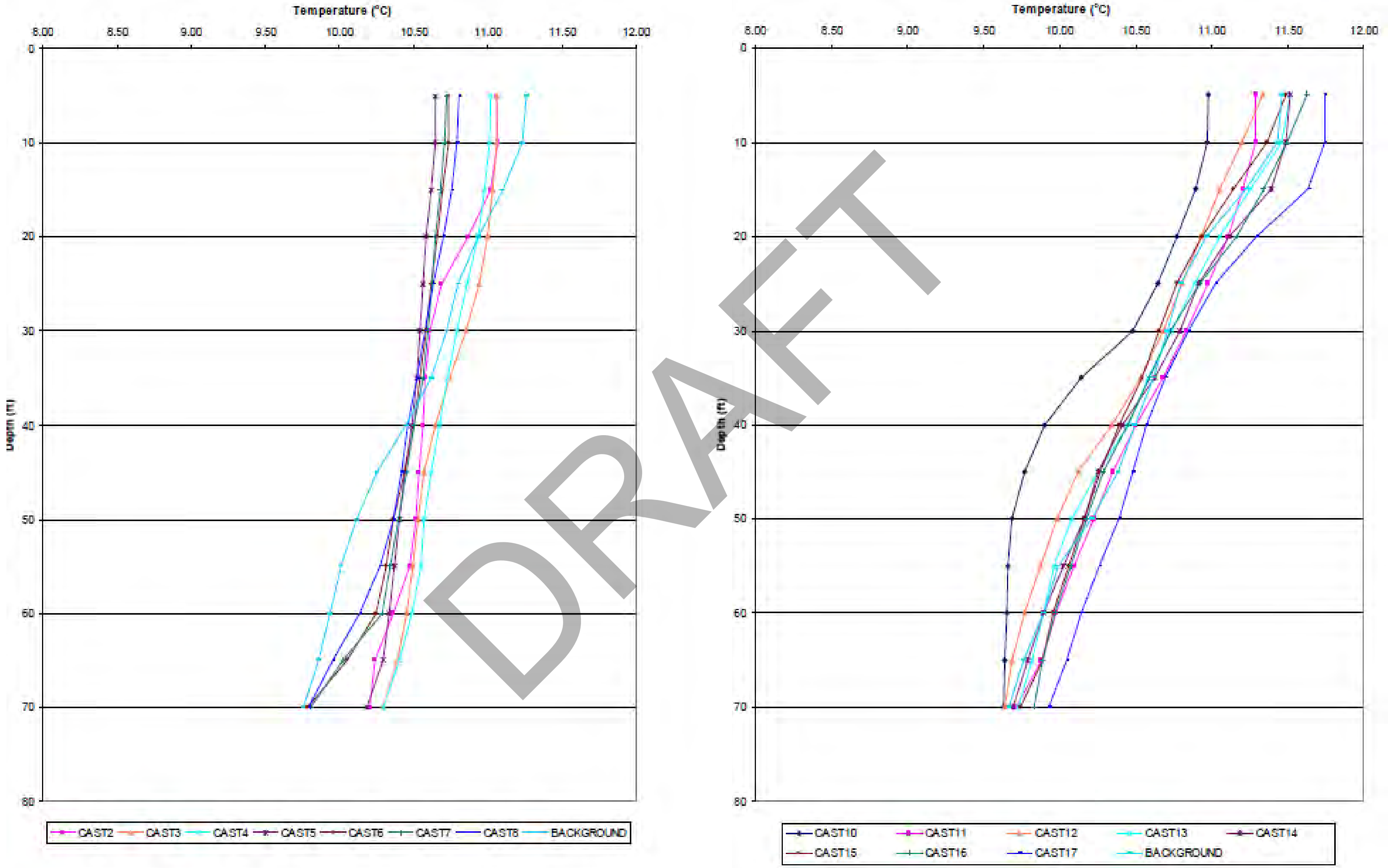

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Figure 4 continued. Plots of Temperature Profile Data Collected October 8, 2007 from Around the Samoa Peninsula Outfall

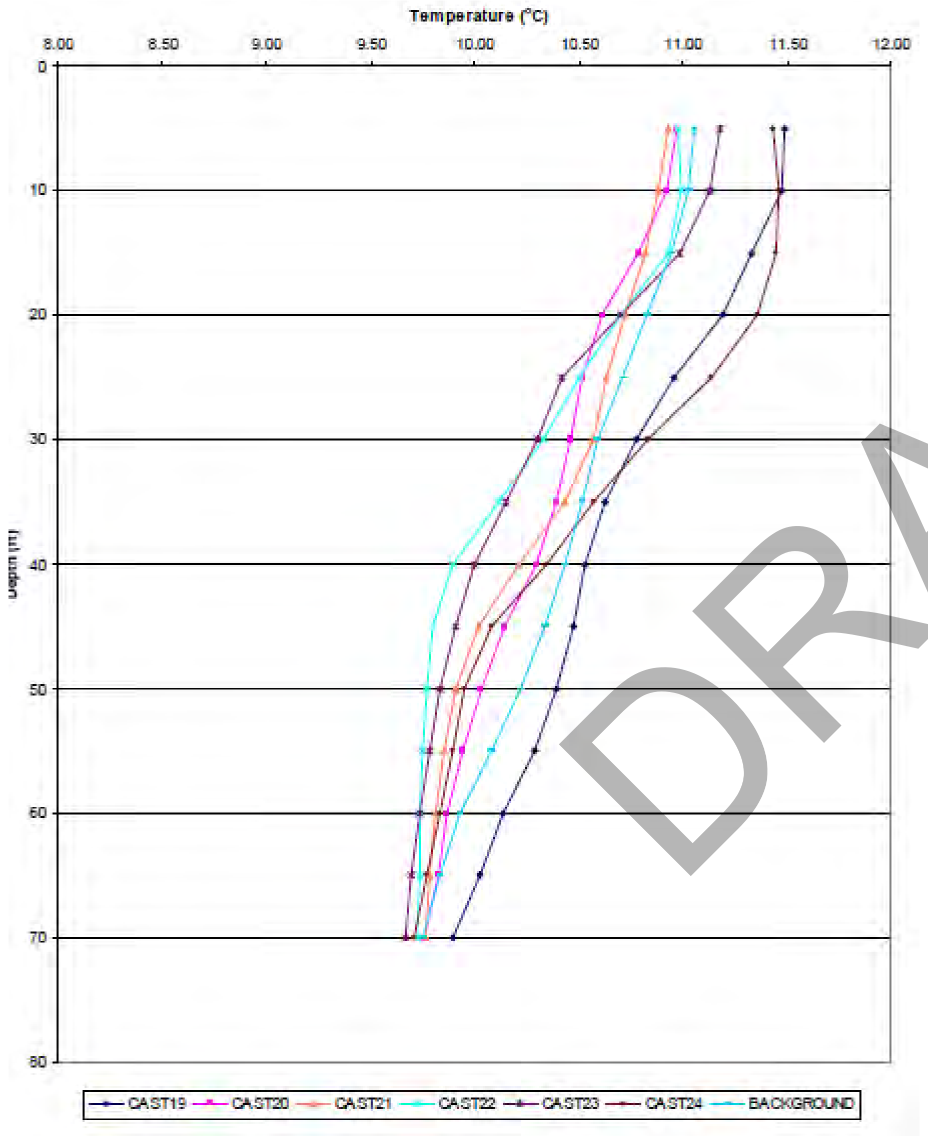

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Figure 5. Plots of Salinity Profile Data Collected June 6, 2007 from Around the Samoa Peninsula Outfall

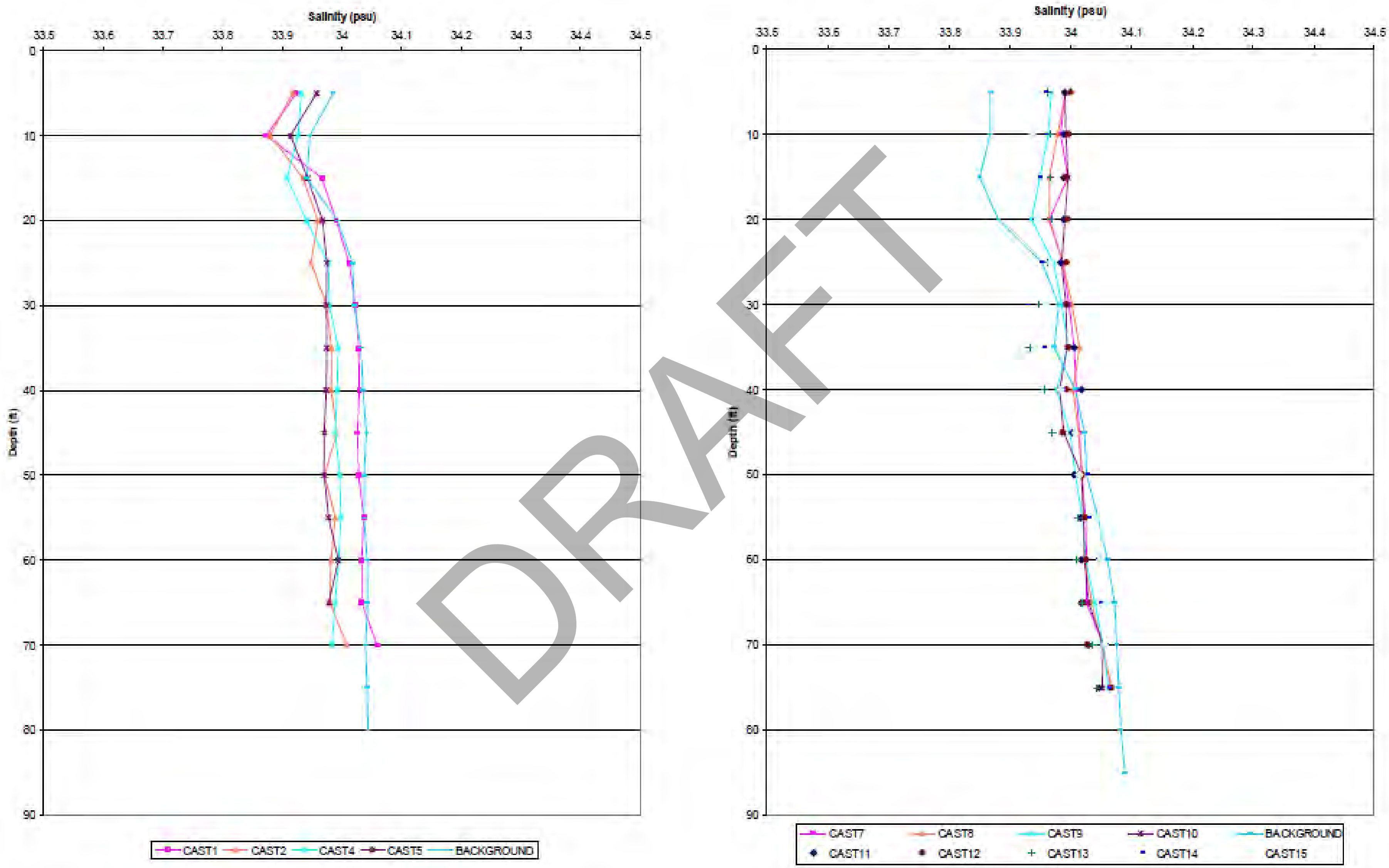

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Figure 6. Plots of Salinity Profile Data Collected October 8, 2007 from Around the Samoa Peninsula Outfall.

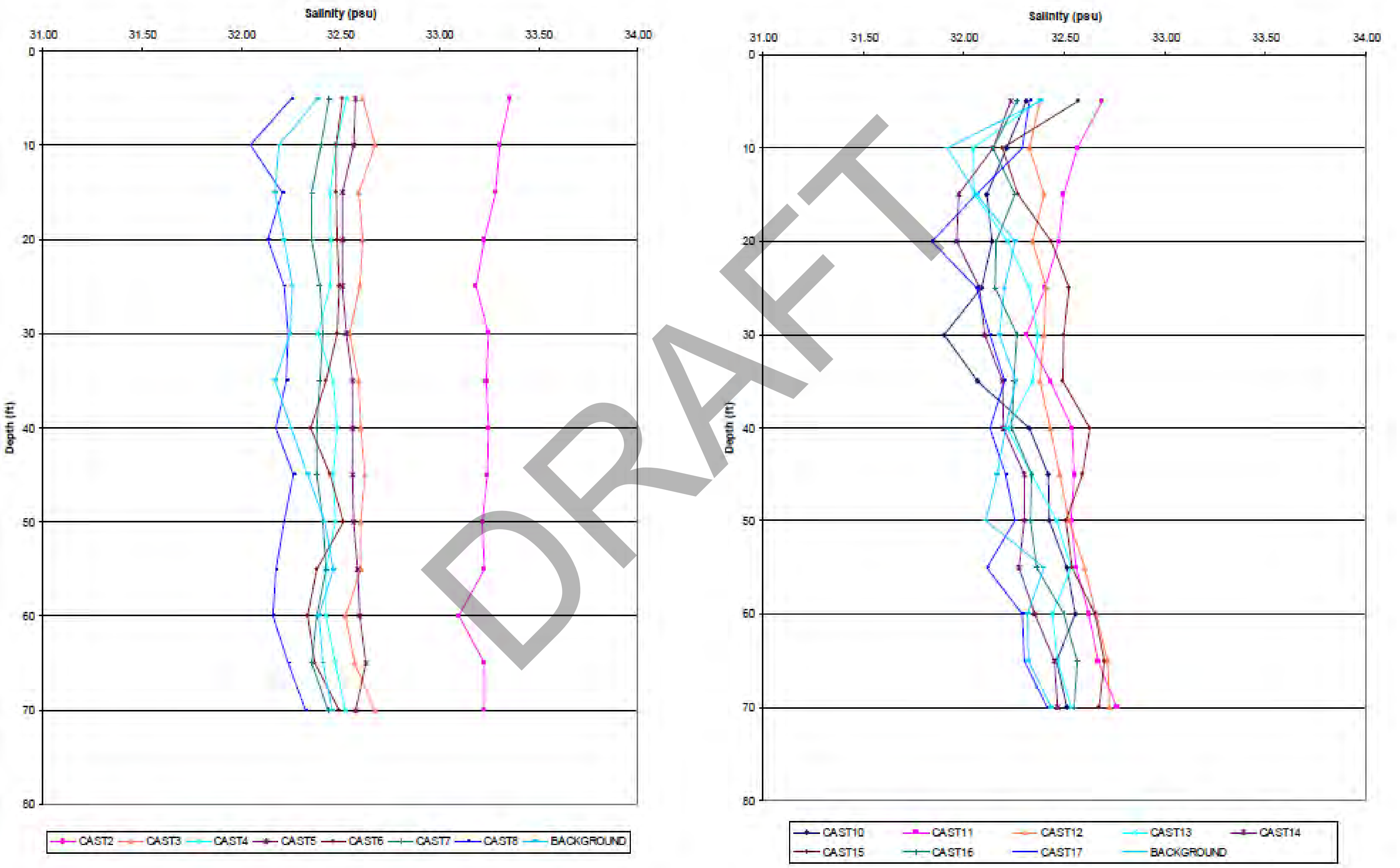

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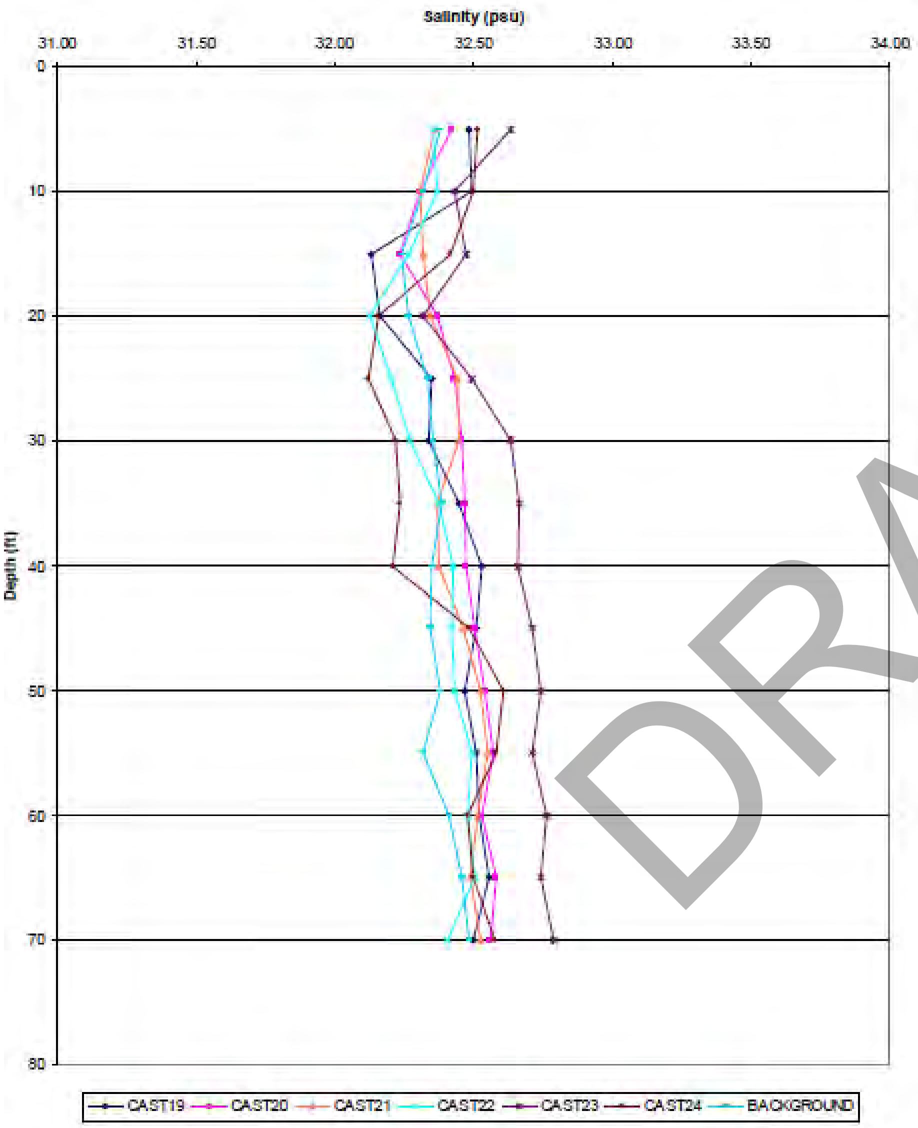
Figure 6 continued. Plots of Salinity Profile Data Collected October 8, 2007 from Around the Samoa Peninsula Outfall.



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Attachment 2
Current Speed and Direction Data

Table 1. Current Speeds collect near the Evergreen Ocean Outfall 6 June 2007

Path (Cast No. to Cast No.)	Start	End	Duration	Duration (min)	Distance (ft)	Speed (ft/min)	Speed (m/s)
7 to 8	14:05	14:19	0:14	14	136	9.7	0.049
8 to 9	14:19	14:32	0:13	13	175	13.5	0.068
9 to 10	14:32	15:00	0:28	28	454	16.2	0.082
10 to 11	15:00	15:14	0:14	14	87	6.2	0.032
11 to 12	15:14	15:19	0:05	5	152	30.4	0.154
12 to 13	15:19	15:43	0:24	24	304	12.7	0.064
13 to 14	15:43	15:55	0:12	12	103	8.6	0.044
14 to 15	15:55	16:11	0:16	16	466	29.1	0.148
15 to Recovery	16:11	16:23	0:12	12	158	13.2	0.067
Average						15.5	
Total Path	14:05	16:23	2:18	138	2035	14.7	0.075
7 to recovery (direct)	14:05	16:23	2:18	138	1720	12.5	0.063
Average (15.5, 14.7, 12.5)						**14.2**	**0.072**

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Attachment 3

Port Velocities Calculated for the Samoa Peninsula Outfall

Port Velocity vs. Flow and Number of Ports in Ft/Sec
for the RMT II Ocean Outfall

Number of Ports	Total Port Area (sq.ft)	Flow (mgd)									
		1	5	10	15	20	25	30	35	40	45
		Flow (cfs)									
		1.5473	7.7363	15.4727	23.2090	30.9454	38.6817	46.4181	54.1544	61.8908	69.6271
		Port Velocity (ft/sec)									
1	0.031	49.3	246.3	492.5	738.8	985.0	1231.3	1477.5	1723.8	1970.0	2216.3
2	0.063	24.6	123.1	246.3	369.4	492.5	615.6	738.8	861.9	985.0	1108.1
3	0.094	16.4	82.1	164.2	246.3	328.3	410.4	492.5	574.6	656.7	738.8
4	0.126	**12.3**	61.6	123.1	184.7	246.3	307.8	369.4	430.9	492.5	554.1
5	0.157	**9.9**	49.3	98.5	147.8	197.0	246.3	295.5	344.8	394.0	443.3
6	0.188	8.2	41.0	82.1	123.1	164.2	205.2	246.3	287.3	328.3	369.4
7	0.220	7.0	35.2	70.4	105.5	140.7	175.9	211.1	246.3	281.4	316.6
8	0.251	6.2	30.8	61.6	92.3	123.1	153.9	184.7	215.5	246.3	277.0
9	0.283	5.5	27.4	54.7	82.1	109.4	136.8	164.2	191.5	218.9	246.3
10	0.314	4.9	24.6	49.3	73.9	98.5	123.1	147.8	172.4	197.0	221.6
11	0.346	4.5	22.4	44.8	67.2	89.5	111.9	134.3	156.7	179.1	201.5
12	0.377	4.1	20.5	41.0	61.6	82.1	102.6	123.1	143.6	164.2	184.7
13	0.408	3.8	18.9	37.9	56.8	75.8	94.7	113.7	132.6	151.5	170.5
14	0.440	3.5	17.6	35.2	52.8	70.4	87.9	105.5	123.1	140.7	158.3
15	0.471	3.3	16.4	32.8	49.3	65.7	82.1	98.5	114.9	131.3	147.8
16	0.503	3.1	**15.4**	30.8	46.2	61.6	77.0	92.3	107.7	123.1	138.5
17	0.534	2.9	**14.5**	29.0	43.5	57.9	72.4	86.9	101.4	115.9	130.4
18	0.565	2.7	**13.7**	27.4	41.0	54.7	68.4	82.1	95.8	109.4	123.1
19	0.597	2.6	**13.0**	25.9	38.9	51.8	64.8	77.8	90.7	103.7	116.6
20	0.628	2.5	**12.3**	24.6	36.9	49.3	61.6	73.9	86.2	98.5	110.8
21	0.660	2.3	**11.7**	23.5	35.2	46.9	58.6	70.4	82.1	93.8	105.5
22	0.691	2.2	**11.2**	22.4	33.6	44.8	56.0	67.2	78.4	89.5	100.7
23	0.723	2.1	**10.7**	21.4	32.1	42.8	53.5	64.2	74.9	85.7	96.4
24	0.754	2.1	**10.3**	20.5	30.8	41.0	51.3	61.6	71.8	82.1	92.3
25	0.785	2.0	9.9	19.7	29.6	39.4	49.3	59.1	69.0	78.8	88.7
26	0.817	1.9	9.5	18.9	28.4	37.9	47.4	56.8	66.3	75.8	85.2
27	0.848	1.8	9.1	18.2	27.4	36.5	45.6	54.7	63.8	73.0	82.1
28	0.880	1.8	8.8	17.6	26.4	35.2	44.0	52.8	61.6	70.4	79.2
29	0.911	1.7	8.5	17.0	25.5	34.0	42.5	50.9	59.4	67.9	76.4
30	0.942	1.6	8.2	16.4	24.6	32.8	41.0	49.3	57.5	65.7	73.9
31	0.974	1.6	7.9	15.9	23.8	31.8	39.7	47.7	55.6	63.5	71.5
32	1.005	1.5	7.7	15.4	23.1	30.8	38.5	46.2	53.9	61.6	69.3
33	1.037	1.5	7.5	**14.9**	22.4	29.8	37.3	44.8	52.2	59.7	67.2
34	1.068	1.4	7.2	**14.5**	21.7	29.0	36.2	43.5	50.7	57.9	65.2
35	1.100	1.4	7.0	**14.1**	21.1	28.1	35.2	42.2	49.3	56.3	63.3
36	1.131	1.4	6.8	**13.7**	20.5	27.4	34.2	41.0	47.9	54.7	61.6
37	1.162	1.3	6.7	**13.3**	20.0	26.6	33.3	39.9	46.6	53.2	59.9
38	1.194	1.3	6.5	**13.0**	19.4	25.9	32.4	38.9	45.4	51.8	58.3
39	1.225	1.3	6.3	**12.6**	18.9	25.3	31.6	37.9	44.2	50.5	56.8
40	1.257	1.2	6.2	**12.3**	18.5	24.6	30.8	36.9	43.1	49.3	55.4
41	1.288	1.2	6.0	**12.0**	18.0	24.0	30.0	36.0	42.0	48.0	54.1
42	1.319	1.2	5.9	**11.7**	17.6	23.5	29.3	35.2	41.0	46.9	52.8
43	1.351	1.1	5.7	**11.5**	17.2	22.9	28.6	34.4	40.1	45.8	51.5
44	1.382	1.1	5.6	**11.2**	16.8	22.4	28.0	33.6	39.2	44.8	50.4
45	1.414	1.1	5.5	**10.9**	16.4	21.9	27.4	32.8	38.3	43.8	49.3
46	1.445	1.1	5.4	**10.7**	16.1	21.4	26.8	32.1	37.5	42.8	48.2
47	1.477	1.0	5.2	**10.5**	15.7	21.0	26.2	31.4	36.7	41.9	47.2
48	1.508	1.0	5.1	**10.3**	15.4	20.5	25.7	30.8	35.9	41.0	46.2
49	1.539	1.0	5.0	**10.1**	**15.1**	20.1	25.1	30.2	35.2	40.2	45.2
50	1.571	1.0	4.9	9.9	**14.8**	19.7	24.6	29.6	34.5	39.4	44.3
51	1.602	1.0	4.8	9.7	**14.5**	19.3	24.1	29.0	33.8	38.6	43.5
52	1.634	0.9	4.7	9.5	**14.2**	18.9	23.7	28.4	33.1	37.9	42.6
53	1.665	0.9	4.6	9.3	**13.9**	18.6	23.2	27.9	32.5	37.2	41.8
54	1.696	0.9	4.6	9.1	**13.7**	18.2	22.8	27.4	31.9	36.5	41.0
55	1.728	0.9	4.5	9.0	**13.4**	17.9	22.4	26.9	31.3	35.8	40.3
56	1.759	0.9	4.4	8.8	**13.2**	17.6	22.0	26.4	30.8	35.2	39.6
57	1.791	0.9	4.3	8.6	**13.0**	17.3	21.6	25.9	30.2	34.6	38.9
58	1.822	0.8	4.2	8.5	**12.7**	17.0	21.2	25.5	29.7	34.0	38.2
59	1.854	0.8	4.2	8.3	**12.5**	16.7	20.9	25.0	29.2	33.4	37.6

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60	1.885	0.8	4.1	8.2	**12.3**	16.4	20.5	24.6	28.7	32.8	36.9
61	1.916	0.8	4.0	8.1	**12.1**	16.1	20.2	24.2	28.3	32.3	36.3
62	1.948	0.8	4.0	7.9	**11.9**	15.9	19.9	23.8	27.8	31.8	35.7
63	1.979	0.8	3.9	7.8	**11.7**	15.6	19.5	23.5	27.4	31.3	35.2
64	2.011	0.8	3.8	7.7	**11.5**	15.4	19.2	23.1	26.9	30.8	34.6
65	2.042	0.8	3.8	7.6	**11.4**	15.2	18.9	22.7	26.5	30.3	34.1
66	2.073	0.7	3.7	7.5	**11.2**	**14.9**	18.7	22.4	26.1	29.8	33.6
67	2.105	0.7	3.7	7.4	**11.0**	**14.7**	18.4	22.1	25.7	29.4	33.1
68	2.136	0.7	3.6	7.2	**10.9**	**14.5**	18.1	21.7	25.3	29.0	32.6
69	2.168	0.7	3.6	7.1	**10.7**	**14.3**	17.8	21.4	25.0	28.6	32.1
70	2.199	0.7	3.5	7.0	**10.6**	**14.1**	17.6	21.1	24.6	28.1	31.7
71	2.231	0.7	3.5	6.9	**10.4**	**13.9**	17.3	20.8	24.3	27.7	31.2
72	2.262	0.7	3.4	6.8	**10.3**	**13.7**	17.1	20.5	23.9	27.4	30.8
74	2.325	0.7	3.3	6.7	**10.0**	**13.3**	16.6	20.0	23.3	26.6	29.9
76	2.388	0.6	3.2	6.5	9.7	**13.0**	16.2	19.4	22.7	25.9	29.2
78	2.450	0.6	3.2	6.3	9.5	**12.6**	15.8	18.9	22.1	25.3	28.4
80	2.513	0.6	3.1	6.2	9.2	**12.3**	15.4	18.5	21.5	24.6	27.7
82	2.576	0.6	3.0	6.0	9.0	**12.0**	**15.0**	18.0	21.0	24.0	27.0
84	2.639	0.6	2.9	5.9	8.8	**11.7**	**14.7**	17.6	20.5	23.5	26.4
86	2.702	0.6	2.9	5.7	8.6	**11.5**	**14.3**	17.2	20.0	22.9	25.8
88	2.765	0.6	2.8	5.6	8.4	**11.2**	**14.0**	16.8	19.6	22.4	25.2
90	2.827	0.5	2.7	5.5	8.2	**10.9**	**13.7**	16.4	19.2	21.9	24.6
92	2.890	0.5	2.7	5.4	8.0	**10.7**	**13.4**	16.1	18.7	21.4	24.1
94	2.953	0.5	2.6	5.2	7.9	**10.5**	**13.1**	15.7	18.3	21.0	23.6
96	3.016	0.5	2.6	5.1	7.7	**10.3**	**12.8**	15.4	18.0	20.5	23.1
98	3.079	0.5	2.5	5.0	7.5	**10.1**	**12.6**	**15.1**	17.6	20.1	22.6
100	3.142	0.5	2.5	4.9	7.4	9.9	**12.3**	**14.8**	17.2	19.7	22.2
102	3.204	0.5	2.4	4.8	7.2	9.7	**12.1**	**14.5**	16.9	19.3	21.7
104	3.267	0.5	2.4	4.7	7.1	9.5	**11.8**	**14.2**	16.6	18.9	21.3
106	3.330	0.5	2.3	4.6	7.0	9.3	**11.6**	**13.9**	16.3	18.6	20.9
108	3.393	0.5	2.3	4.6	6.8	9.1	**11.4**	**13.7**	16.0	18.2	20.5
110	3.456	0.4	2.2	4.5	6.7	9.0	**11.2**	**13.4**	15.7	17.9	20.1
112	3.519	0.4	2.2	4.4	6.6	8.8	**11.0**	**13.2**	15.4	17.6	19.8
114	3.581	0.4	2.2	4.3	6.5	8.6	**10.8**	**13.0**	**15.1**	17.3	19.4
116	3.644	0.4	2.1	4.2	6.4	8.5	**10.6**	**12.7**	**14.9**	17.0	19.1
118	3.707	0.4	2.1	4.2	6.3	8.3	**10.4**	**12.5**	**14.6**	16.7	18.8
120	3.770	0.4	2.1	4.1	6.2	8.2	**10.3**	**12.3**	**14.4**	16.4	18.5
122	3.833	0.4	2.0	4.0	6.1	8.1	**10.1**	**12.1**	**14.1**	16.1	18.2
124	3.896	0.4	2.0	4.0	6.0	7.9	9.9	**11.9**	**13.9**	15.9	17.9
126	3.958	0.4	2.0	3.9	5.9	7.8	9.8	**11.7**	**13.7**	15.6	17.6
128	4.021	0.4	1.9	3.8	5.8	7.7	9.6	**11.5**	**13.5**	15.4	17.3
130	4.084	0.4	1.9	3.8	5.7	7.6	9.5	**11.4**	**13.3**	**15.2**	17.0
132	4.147	0.4	1.9	3.7	5.6	7.5	9.3	**11.2**	**13.1**	**14.9**	16.8
134	4.210	0.4	1.8	3.7	5.5	7.4	9.2	**11.0**	**12.9**	**14.7**	16.5
136	4.273	0.4	1.8	3.6	5.4	7.2	9.1	**10.9**	**12.7**	**14.5**	16.3
138	4.335	0.4	1.8	3.6	5.4	7.1	8.9	**10.7**	**12.5**	**14.3**	16.1
140	4.398	0.4	1.8	3.5	5.3	7.0	8.8	**10.6**	**12.3**	**14.1**	15.8
142	4.461	0.3	1.7	3.5	5.2	6.9	8.7	**10.4**	**12.1**	**13.9**	15.6
144	4.524	0.3	1.7	3.4	5.1	6.8	8.6	**10.3**	**12.0**	**13.7**	15.4

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Attachment 4

HYDRO Model Results for Head Loss and Port Velocity

	1 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	3	3	3	3	4	4	4	4	5	5	5	5
Port Spacing (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Avg Port Vel (ft/sec)	16.42	16.42	16.42	16.42	12.31	12.31	12.31	12.31	9.85	9.85	9.85	9.85
Min Port Vel (ft/sec)	16.42	16.42	16.42	16.41	12.31	12.31	12.31	12.31	9.85	9.85	9.85	9.85
Max Port Vel (ft/sec)	16.42	16.42	16.42	16.42	12.31	12.31	12.31	12.31	9.85	9.85	9.85	9.85
Head loss	10.55	10.55	10.54	10.54	5.93	5.93	5.93	5.93	3.80	3.80	3.80	3.80
	5 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	16	16	16	16	20	20	20	20	24	24	24	24
Port Spacing (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Avg Port Vel (ft/sec)	15.39	15.39	15.39	15.39	12.31	12.31	12.31	12.31	10.26	10.26	10.26	10.26
Min Port Vel (ft/sec)	15.39	15.39	15.39	15.38	12.31	12.31	12.3	12.3	10.26	10.25	10.25	10.25
Max Port Vel (ft/sec)	15.39	15.39	15.4	15.4	12.31	12.31	12.32	12.32	10.27	10.27	10.27	10.26
Head loss	9.30	9.30	9.30	9.30	5.97	5.97	5.97	5.96	4.16	4.16	4.15	4.15
	10											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	33	33	33	33	41	41	41	41	49	49	49	49
Port Spacing (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Avg Port Vel (ft/sec)	14.92	14.92	14.92	14.93	12.01	12.01	12.01	12.01	10.05	10.05	10.05	10.05
Min Port Vel (ft/sec)	14.91	14.91	14.9	14.9	12.01	12.01	12	12	10.04	10.04	10.04	10.04
Max Port Vel (ft/sec)	14.93	14.94	14.94	14.93	12.05	12.05	12.03	12.03	10.11	10.12	10.09	10.1
Head loss	8.87	8.87	8.85	8.86	5.81	5.82	5.80	5.80	4.14	4.14	4.12	4.13
	15 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	49	49	49	49	61	61	61	61	74	74	74	74
Port Spacing (ft)	12	12	12	12	12	12	12	12	6	6	6	6
Avg Port Vel (ft/sec)	15.08	15.08	15.08	15.08	12.11	12.11	12.11	12.11	9.98	9.98	9.98	9.98
Min Port Vel (ft/sec)	15.06	15.06	15.05	15.05	12.1	12.1	12.09	12.09	9.92	9.92	9.9	9.91
Max Port Vel (ft/sec)	15.14	15.14	15.12	15.13	12.24	12.24	12.22	12.22	10.03	10.03	10.05	10.04
Head loss	9.27	9.27	9.26	9.26	6.17	6.17	6.15	6.15	4.23	4.23	4.22	4.22
	20 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	66	66	66	66	80	80	80	80	98	98	98	98
Port Spacing (ft)	12	12	12	12	6	6	6	6	6	6	6	6
Avg Port Vel (ft/sec)	14.92	14.92	14.92	14.92	12.31	12.31	12.31	12.31	10.05	10.05	10.05	10.05
Min Port Vel (ft/sec)	14.9	14.9	14.9	14.9	12.21	12.23	12.2	12.2	10	10	9.98	9.98
Max Port Vel (ft/sec)	15.1	15.1	15.08	15.08	12.39	12.39	12.35	12.35	10.11	10.19	10.17	10.17
Head loss	9.47	9.47	9.44	9.45	6.51	6.52	6.50	6.50	4.59	4.60	4.58	4.58
	25 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	82	82	82	82	102	102	102	102	122	122	122	122
Port Spacing (ft)	6	6	6	6	6	6	6	6	6	6	6	6
Avg Port Vel (ft/sec)	15.02	15.02	15.02	15.02	12.07	12.07	12.07	12.07	10.09	10.09	10.09	10.09
Min Port Vel (ft/sec)	14.9	4.88	14.86	14.87	11.99	11.99	11.98	11.98	10.04	10.04	10.03	10.03
Max Port Vel (ft/sec)	15.12	15.07	15.13	15.07	12.24	12.24	12.22	12.22	10.41	10.41	10.39	10.39
Head loss	9.72	9.72	9.70	9.70	6.69	6.69	6.67	6.67	5.07	5.07	5.04	5.05
	30 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	98	98	98	98	122	122	122	122	144	144	144	144
Port Spacing (ft)	6	6	6	6	6	6	6	6	6	6	6	6
Avg Port Vel (ft/sec)	15.08	15.08	15.08	15.08	12.11	12.11	12.11	12.11	10.26	10.26	10.26	10.26
Min Port Vel (ft/sec)	14.94	14.94	14.93	14.93	12.03	12.03	12.02	12.02	10.19	10.19	10.18	10.18
Max Port Vel (ft/sec)	15.22	15.22	15.22	15.22	12.21	12.46	12.44	12.44	10.84	10.84	10.81	10.81
Head loss	10.26	10.26	10.24	10.24	7.25	7.26	7.23	7.24	5.77	5.77	5.75	5.75

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	35 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	114	114	114	114	130	130	130	130	144	144	144	144
Port Spacing (ft)	6	6	6	6	6	6	6	6	6	6	6	6
Avg Port Vel (ft/sec)	15.12	15.12	15.12	15.12	13.26	13.26	13.26	13.26	11.97	11.97	11.97	11.97
Min Port Vel (ft/sec)	15	15	14.99	14.99	13.17	13.17	13.16	13.16	11.88	11.88	11.87	11.87
Max Port Vel (ft/sec)	15.41	15.41	15.39	15.39	13.72	13.72	13.7	13.7	12.6	12.6	12.57	12.58
Head loss	10.90	10.91	10.88	10.89	8.97	8.97	8.95	8.95	7.81	7.81	7.78	7.79

	40 mgd											
Effluent Sal. (psu)	0.1	0.1	30	30	0.1	0.1	30	30	0.1	0.1	30	30
Effluent Temp. (°C)	10	25	10	25	10	25	10	25	10	25	10	25
Open Ports	132	132	132	132	138	138	138	138	144	144	144	144
Port Spacing (ft)	6	6	6	6	6	6	6	6	6	6	6	6
Avg Port Vel (ft/sec)	14.92	14.92	14.92	14.92	14.28	14.28	14.28	14.28	13.68	13.68	13.68	13.68
Min Port Vel (ft/sec)	14.81	14.81	14.8	14.8	14.17	14.17	14.16	14.16	13.57	13.57	13.57	13.57
Max Port Vel (ft/sec)	15.44	15.44	15.42	15.42	14.87	14.87	14.85	14.85	14.36	14.36	14.34	14.34
Head loss	11.42	11.42	11.40	11.40	10.74	10.74	10.72	10.72	10.15	10.15	10.15	10.13

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Attachment 5

UDKHDEN Model Results Summary

Model Run	Flow mgd	Open Ports	Sal. psu	Temp. °C	Spacing m	Froude No.	Trapping Level	Dilution
1	1	3	0.1	10	3.66	41.38	7.54	589.71
2	1	3	1	10	3.66	41.96	7.57	588.40
3	1	3	10	10	3.66	49.36	9.13	529.80
4	1	3	20	10	3.66	64.71	13.79	363.02
5	1	3	30	10	3.66	119.74	21.04	88.63
6	1	3	0.1	15	3.66	40.91	7.46	593.18
7	1	3	1	15	3.66	41.46	7.56	589.08
8	1	3	10	15	3.66	48.43	8.93	537.17
9	1	3	20	15	3.66	62.39	13.60	369.36
10	1	3	30	15	3.66	105.49	20.69	104.09
11	1	3	0.1	20	3.66	40.23	7.39	596.07
12	1	3	1	20	3.66	40.74	7.47	592.70
13	1	3	10	20	3.66	47.22	8.49	553.02
14	1	3	20	20	3.66	59.69	13.43	374.72
15	1	3	30	20	3.66	93.18	20.37	117.27
16	1	3	0.1	25	3.66	39.40	7.27	600.54
17	1	3	1	25	3.66	39.88	7.36	597.14
18	1	3	10	25	3.66	45.82	8.39	556.99
19	1	3	20	25	3.66	56.82	13.22	382.03
20	1	3	30	25	3.66	82.96	20.05	130.35
21	1	4	0.1	10	3.66	31.04	8.43	719.04
22	1	4	1	10	3.66	31.47	8.64	708.66
23	1	4	10	10	3.66	37.02	9.63	658.53
24	1	4	20	10	3.66	48.53	15.11	399.90
25	1	4	30	10	3.66	89.81	21.15	101.80
26	1	4	0.1	15	3.66	30.68	8.15	732.98
27	1	4	1	15	3.66	31.09	8.31	724.94
28	1	4	10	15	3.66	36.32	9.54	663.18
29	1	4	20	15	3.66	46.79	14.62	422.47
30	1	4	30	15	3.66	79.12	21.00	109.56
31	1	4	0.1	20	3.66	30.17	7.99	741.36
32	1	4	1	20	3.66	30.56	8.17	732.35
33	1	4	10	20	3.66	35.41	9.43	668.44
34	1	4	20	20	3.66	44.76	13.94	454.32
35	1	4	30	20	3.66	69.88	20.68	127.21
36	1	4	0.1	25	3.66	29.55	7.89	746.56
37	1	4	1	25	3.66	29.91	7.99	741.52
38	1	4	10	25	3.66	34.36	9.34	673.25
39	1	4	20	25	3.66	42.62	13.76	462.22
40	1	4	30	25	3.66	62.22	20.39	142.16
41	1	5	0.1	10	3.66	24.83	9.21	834.61
42	1	5	1	10	3.66	25.18	9.28	829.61
43	1	5	10	10	3.66	29.61	13.36	585.20

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44	1	5	20	10	3.66	38.83	19.09	245.68
45	1	5	30	10	3.66	71.84	21.26	112.23
46	1	5	0.1	15	3.66	24.54	9.17	837.36
47	1	5	1	15	3.66	24.87	9.24	833.20
48	1	5	10	15	3.66	29.06	13.24	592.12
49	1	5	20	15	3.66	37.43	15.36	470.50
50	1	5	30	15	3.66	63.29	21.10	122.34
51	1	5	0.1	20	3.66	24.14	9.12	840.83
52	1	5	1	20	3.66	24.45	9.11	840.85
53	1	5	10	20	3.66	28.33	13.16	597.20
54	1	5	20	20	3.66	35.81	15.18	479.40
55	1	5	30	20	3.66	55.91	20.96	130.99
56	1	5	0.1	25	3.66	23.64	8.86	856.94
57	1	5	1	25	3.66	23.93	9.02	846.95
58	1	5	10	25	3.66	27.49	13.07	602.65
59	1	5	20	25	3.66	34.09	14.86	497.23
60	1	5	30	25	3.66	49.78	20.67	150.01

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CH2M Aquaculture Waste Load Estimation

TECHNICAL MEMORANDUM

Aquaculture Waste Load Estimation Redwood Marine Terminal II

PREPARED FOR: County of Humboldt and
Humboldt Bay Harbor, Recreation and Conservation District

PREPARED BY: CH2M

DATE: February 2016

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1.0 Introduction

Aquaculture has been identified as a key industry with opportunities for growth in Humboldt County, and is one of several proposed uses of the Redwood Marine Terminal II (RMT II) site. The existing infrastructure and facilities at the RMT II site offer opportunities to develop, expand and diversify aquaculture in the region. Among these opportunities are the availability and access to both seawater and freshwater for aquaculture operations, marine dock access, a wastewater treatment facility that could potentially receive and treat waste from aquaculture operations, and an ocean outfall for discharge of the treated waste from aquaculture facilities.

Management of the wastewater generated by proposed aquaculture facilities is a key issue to consider early in the planning process for reuse of the RMT II site. Aquaculture wastewater is typically high in nutrients and turbidity from particulate and dissolved waste matter, and could potentially carry pathogens such as enteric bacteria and other disease causing agents. This wastewater may need treatment before discharge into Humboldt Bay to comply with permit requirements. The production capacity (kilograms of fish produced per year) of the aquaculture facility will also need to be scaled to that of the wastewater treatment facility and the ocean outfall so as not to overwhelm the wastewater treatment and disposal capacity of these systems. It is therefore necessary to understand the aquaculture waste loads that would be generated by this proposed reuse of the RMT II site.

This technical memorandum (TM) focuses on a preliminary conceptual level estimation of potential waste loads that an aquaculture facility could generate at the RMT II site.

2.0 Methods

2.1 Selection of Aquaculture Species and Operation

For an understanding of waste loads from an aquaculture facility, it is first necessary to select a target species. Waste loads are species dependent, particularly when different taxa such as finfish and bivalves are considered. Previous studies also indicate that the use of freshwater will be prohibitively expensive at the RMT II site (Vinci 2013). Selection of a species that could be cultured predominantly in saltwater would thus be advantageous.

Based on additional information received from discussions with Randy Lovell (California Department of Fish & Wildlife), Greg Dale (Coast Seafoods), and John Finger (Hog Island Oyster Company), steelhead (*Onchorhynchus mykiss*) culture with once-through seawater was selected as the target species and mode of operation, respectively, for the purpose of this analysis. Steelhead are essentially anadromous rainbow trout that yield medium-to-high market value and would minimize the use of freshwater at the RMT II site.

Discussions with the oyster producers also confirmed that oyster operations would not involve significant waste loads, relative to those generated from finfish operations. A bivalve hatchery mariculture operation at RMT II would generate only a minimal amount of waste and would in all likelihood qualify for an exemption to NPDES permitting requirements under the Environmental Protection Agency's (EPA) regulation of the Clean Water Act. The EPA requires NPDES permitting only for cold-water operations that produce more than 20,000 pounds of organisms per year and use 5,000 pounds of feed per month. Because algae feed for oyster hatcheries are most often grown onsite by culturing algae cells already present in the sourcewater, trace nutrients, and solar energy, hatcheries are normally exempt from these requirements. For example, the private oyster mariculture hatchery operation currently being developed in Humboldt Bay by Coast Seafood will be exempt from NPDES reporting requirements under this criteria. Therefore, selection of a finfish such as steelhead would allow estimation of maximum waste loads in order to appropriately size future potential waste treatment and discharge facilities at the RMT II site.

2.2 Nutritional Approach for Estimating Waste Loads from Steelhead Aquaculture

A nutritional approach is used to estimate waste loads from steelhead aquaculture operations (Bureau and Hua 2010). The key processes involved in waste generation are outlined in Figure 1. In this nutritional approach, feed is distributed to fish on a daily basis. The amount of feed distributed is dependent on the average size of the fish and water temperature at that time. Most of this feed is consumed by the fish, while some of it is wasted. This uneaten feed becomes a component of the total solid wastes. Most of the consumed feed is assimilated (digested) by the fish, while the undigested feed is eliminated as fecal waste. This fecal waste also contributes to the total solid wastes.

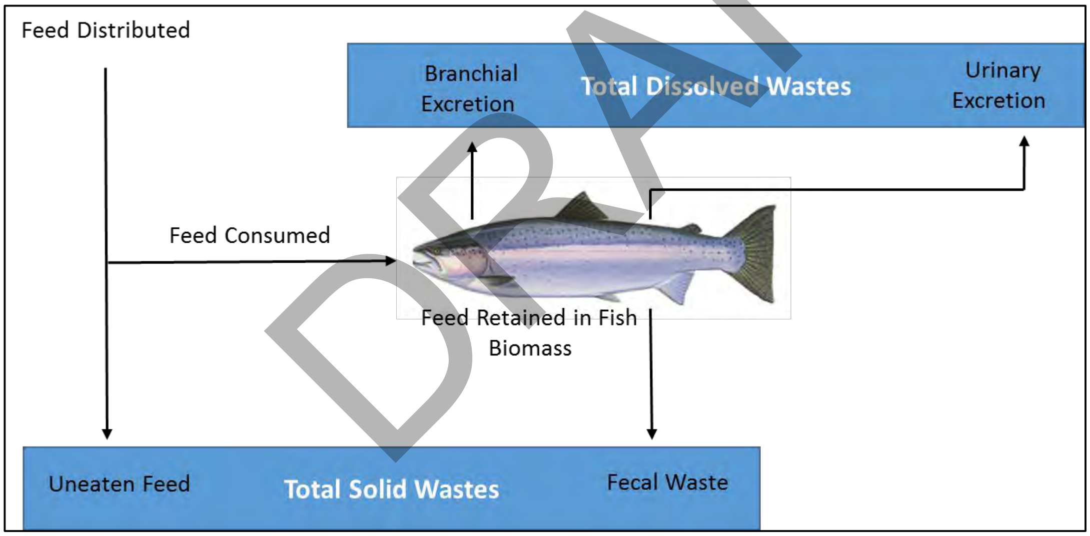

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Figure 1. Schematic depicting the nutritional approach for estimating waste loads from finfish aquaculture

Total dissolved wastes are a direct function of the consumption, metabolism and retention of nutrients by the fish (Bureau and Hua, 2010). Nutrients assimilated from the consumed feed are absorbed and can potentially be metabolized by the fish to support various life processes and functions. A significant proportion of the assimilated nutrients is retained in fish biomass. The absorbed nutrients that are not retained are metabolized, and end-products of nutrient breakdown (catabolism) are eliminated by the fish through branchial or urinary excretion (Figure 1). For example, in saltwater fish, amino acid catabolism results in the production of NH_3-N/NH_4-N (henceforth called NH_4-N), which is excreted through the gills (branchial excretion), and accounts for 80-90% of nitrogenous metabolic wastes. The breakdown of nucleic acids present in the feed results in the production of urea, which is mainly excreted in the urine. Urea generally only represents about 10% of the dissolved nitrogenous waste. In addition, orthophosphates are the major form of dissolved P waste excreted by the fish.

2.3 Methods for Estimation of Waste Load Components

Wastes loads are estimated using the nutritional approach (Figure 1) that compartmentalizes the total wastes into solid and dissolved wastes. The solid and dissolved wastes components are further divided into nitrogenous and phosphorus wastes according to methods described by Bureau et al. (2003), Papatryphon et al. (2005), Roque d'Orbcastel et al. (2008), and Bureau and Hua (2010). The following sub-sections on solid waste and dissolved waste estimation describe the methods used in this analysis.

2.3.1 Solid Waste Estimation

Total Solid Wastes

The following equation describes the total solid wastes (SW) generated by fish.

$$SW = FE_w + UE_F$$

FE_W = Fecal Wastes = $F_C * (1 - ADC_{DM})$

UE_F = Uneaten Feed = $(F_D * F_W)$

Where;

ADC_{DM} = Apparent Digestibility Coefficient of Feed Dry Matter

F_W = Percent of Feed Wasted

F_C = Feed Consumed = $(F_D – UE_F)$

F_D = Feed Distributed = $(FBM * F_R)$

Where;

FBM = Fish Body Mass

F_R = Feeding Rate (as % of fish body mass per day)

Solid Nitrogenous (N) Wastes

The following equation describes the solid N waste (SW_N) generated by fish, which is a part of the total solid waste.

$$SW_N = FE_N + UE_N$$

FE_N = Fecal N Waste = $F_C * F_N * (1 – ADC_{Pr})$

UE_N = N in Uneaten Feed = $(UE_F * F_N)$

Where;

ADC_{Pr} = Apparent Digestibility Coefficient of Crude Protein in Feed

F_N = Percent N Content of Feed

F_C = Feed Consumed

UE_F = Uneaten Feed

Solid Phosphorus (P) Wastes

The following equation describes the solid P waste (SW_P) generated by fish, which is a part of the total solid waste.

$$SW_P = FE_P + UE_P$$

FE_P = Fecal P Waste = $F_C * F_P * (1 – ADC_P)$

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UE_P = P in Uneaten Feed = (UE_F * F_P)

Where;

ADC_P = Apparent Digestibility Coefficient of P in Feed

F_P = Percent P Content of Feed

F_C = Feed Consumed

UE_F = Uneaten Feed

2.3.2 Dissolved Waste Estimation

Dissolved N Waste

The following equation describes the dissolved N waste (DW_N) generated by fish.

$$DW_N = C_N – FE_N - R_N$$

Where,

C_N = Consumed N = F_C * F_N

F_C = Feed Consumed

F_N = Percent N Content of Feed

FE_N = Fecal N Waste

R_N = N Retained by Fish = (F_C * B_N)/FCR

B_N = N Content of Whole Fish Body (as % of fish body mass)

FCR = Feed Conversion Ratio

Ammonia-N Waste

Ammonia-N waste is assumed to be 80% of DW_N (Papatryphon et al. 2005).

Dissolved P Waste

The following equation describes the dissolved P waste (DW_P) generated by fish.

$$DW_P = C_P – FE_P – R_P$$

Where,

C_P = Consumed P = F_C * F_P

F_C = Feed Consumed

F_P = Percent P Content of Feed

FE_P = Fecal P Waste

R_P = P Retained by Fish = (F_C * B_P)/FCR

B_P = P Content of Whole Fish Body (as % of fish body mass)

FCR = Feed Conversion Ratio

2.3.3 Total Waste Estimation

Total waste components for the purpose of this analysis include total solid waste, total N waste, and total P waste. Total solid waste is estimated as described in section 2.3.1. This section describes estimation methods for total N waste and total P waste.

Total N Waste

Total N waste (TW_N) is estimated with the equation,

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$$TW_N = SW_N + DW_N$$

Where,

SW_N = Solid N Waste

DW_N = Dissolved N Waste

Total P Waste

Total P waste (TW_P) is estimated with the equation,

$$TW_P = SW_P + DW_P$$

Where,

SW_P = Solid P Waste

DW_P = Dissolved P Waste

2.4 Assumptions for Analysis of Waste Loads from Steelhead Aquaculture

The amount of waste loads generated from finfish aquaculture operations will depend on general factors such as water temperatures and fish growth (sizes achieved) during the production cycle, and the total annual production capacity. Specific feed-related factors are also important such as feed rations distributed, feed wastage (uneaten feed), feed composition, feed digestibility and feed conversion ratios, among other factors. Waste load estimation for steelhead aquaculture operations in this analysis uses the following assumptions and coefficients based on a literature review of these various factors (Tables 1, 2 and 3).

Table 1. General Factors Considered for Estimating Waste Loads From Steelhead Aquaculture Operations

General Factors	Assumptions and Rationale	Reference
Water Temperature	Assumption: Estimate waste loads for three water temperature scenarios: 10 ^{0}C, 15 ^{0}C, and 20 ^{0}C. Rationale: Steelhead can withstand a vast range of temperatures but spawning and growth occurs in a narrower range (9 ^{0}C - 14 ^{0}C) and the optimum temperature for culture is below 21 ^{0}C.	*FAO. Online article*
Fish Growth and Fish Sizes	Assumption: Estimate waste loads for four sizes of fish during this growth period, 5 g, 50 g, 250 g, and 500 g. Rationale: During the annual production cycle, steelhead grow from a startup size of 5 g fish to a 500 g (1.1 lb) fish at harvest (market size).	*1) FAO.* *2) Klontz (1991)*
Total Annual Fish Production Capacity	Assumption: Estimate waste loads for four fish production capacity scenarios, 5,000 kg; 50,000 kg; 250,000 kg; and 500,000 kg. Rationale: The RMT II site can be configured to house fish production systems that might produce as much as 500,000 kg of fish per year.	*Vinci (2013)*

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Table 2. Aquaculture Feed and Fish Body Composition Factors Considered for Estimating Waste Loads From Steelhead Aquaculture Operations

Parameters	Symbol	Value	Reference
Feed Composition (%)			
Nitrogen	F_N	7.0	*Bureau and Hua (2010)*
Phosphorus	F_P	1.1	*Bureau and Hua (2010)*
Feed Wasted (%)			
Feed Wasted	F_W	5.0	*Bureau et al. (2003)*
Apparent Digestibility Coefficient (%)			
Feed Dry Matter	ADC_{DM}	78.0	*Bureau and Hua (2010)*
Crude Protein in Feed	ADC_{Pr}	88.0	*Bureau and Hua (2010)*
Phosphorus in Feed	ADC_P	60.0	*Bureau and Hua (2010)*
Feed Conversion Ratio (feed:gain)	FCR	1.1	*Bureau and Hua (2010)*
Whole Fish Body Composition (% of body weight)			
N Content of Whole Fish Body	B_N	2.65	*Roque d'Orbcastel et al. (2008)*
P Content of Whole Fish Body	B_P	0.4	*Papatryphon et al. (2005)*

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In aquaculture operations, feed is distributed to steelhead on a daily basis to achieve growth of the fish to market size over a specific period of time. Daily feeding rates (daily rations) will depend on fish size and water temperatures on any particular day, which in turn will affect the amount of waste loads produced. Feeding rates are estimated as a percentage of fish body weight (% body mass/d) and are shown for the three water temperature and fish body size scenarios used to estimate waste loads (Table 3).

Table 3. Feeding Rates (Food Rations) Distributed to Steelhead as a Function of Fish Body Mass and Water Temperature.
Source for Feeding Rates: Hinshaw (1999

Individual Fish Mass (g)	Feeding Rates (F_R) (% of body weight)		
	10 ^{0}C	**15 ^{0}C**	**20 ^{0}C**
5.0	4.15	4.9	5.3
50.0	1.8	2.3	2.4
250.0	1.1	1.55	1.55
500.0	0.9	1.2	1.25

Notes: *Hinshaw (1999) provides fish size- and water temperature-specific feeding rates for rainbow trout where fish size is expressed as numbers of fish per pound. The number of fish/pound data in Hinshaw (1999) is converted to grams/individual fish (individual fish mass) based on 1 pound = 453.6 grams. For example, 100 fish/pound will have individual fish weighing 4.536 g each.*

2.5 Estimation of Aquaculture Waste Production

All solid and dissolved wastes are first estimated on a g/fish/d basis for fish of four different sizes under three different water temperature scenarios (Table 1). System-wide daily waste loads are estimated using individual fish waste production rates and scaling up to four aquaculture production capacity scenarios of 5,000, 50,000, 250,000 and 500,000 kg of fish (Table 1). At a market weight of 500 g (0.5 kg) per fish, these translate to fish production numbers of 10,000, 100,000, 500,000, and 1,000,0000 steelhead. Finally, annual waste loads generated by steelhead aquaculture are estimated and presented on a kilogram per metric ton of fish produced, and kilogram per annum basis.

3.0 Results and Discussion

This section describes the waste loads estimated for a steelhead aquaculture facility at the RMT II site. Waste load estimates presented in this section are based on feeding rates that are dependent on four sizes of steelhead that reflect various stages of growth, and at three water temperatures. The resulting amounts of feed distributed, feed consumed by the fish and feed left uneaten are presented in the Appendix (Table A-1).

Results of the solid and dissolved wastes loads are first described on an individual fish basis in sections 3.1-3.2. These individual fish waste load estimates are then projected to estimate system-wide daily waste loads based on total steelhead production capacity and described in section 3.3. Finally, annual waste loads expected from the steelhead aquaculture facility are presented in section 3.4.

3.1 Solid Wastes Generated by Individual Fish

Solid wastes include total solid wastes and its components, solid N wastes and solid P wastes, all of which increased by one to two orders of magnitude with increases in fish body mass and water temperatures (Appendix, Table A-2, Figures 2 and 3). At startup of system operations for example, a fish of 5 g at 10 ^{0}C produces 0.0537 g/d of solid waste, of which 0.0024 g is N waste and 0.001 g is P waste. At the end of one growth cycle of annual operations, a harvestable fish of 500 g (market size) at 20 ^{0}C produces approximately 1.6188 g/d of solid waste, of which 0.0718 g is N waste and 0.0296 g is P waste (Appendix Table A-2, Figures 2 and 3).

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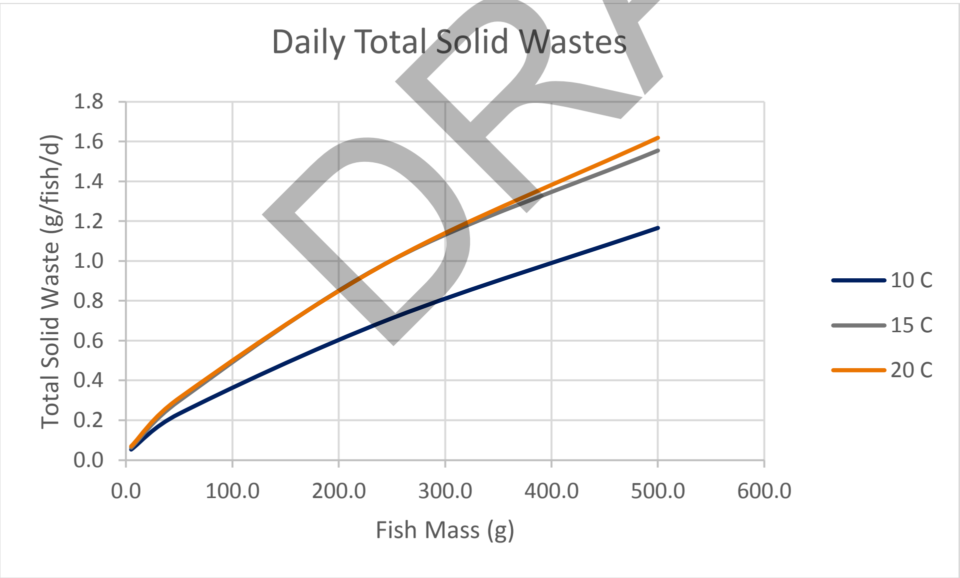

Figure 2. Estimated daily production of total solid wastes by individual steelhead trout

Figure 3. Estimated daily production of solid N and P wastes by individual steelhead trout

3.2 Dissolved Wastes Generated by Individual Fish

Dissolved wastes include dissolved N, of which 80% is NH_4-N waste, and dissolved P wastes. Fish body mass and water temperatures strongly affect production of each of these dissolved waste components (Appendix, Table A-3, Figures 4 and 5). At startup of system operations for example, a fish of 5 g at 10 ^{0}C produces 0.0074 g/d of dissolved N waste, of which 0.0059 g is as NH_4-N, and 0.0006 g is P waste. At the end of one growth cycle of annual operations, a harvestable fish of 500 g (market size) at 20 ^{0}C produces approximately 0.2227 g/d of dissolved N waste, of which 0.1782 g is as NH_4-N, and 0.0176 g of P waste (Appendix, Table A-3, Figures 4 and 5).

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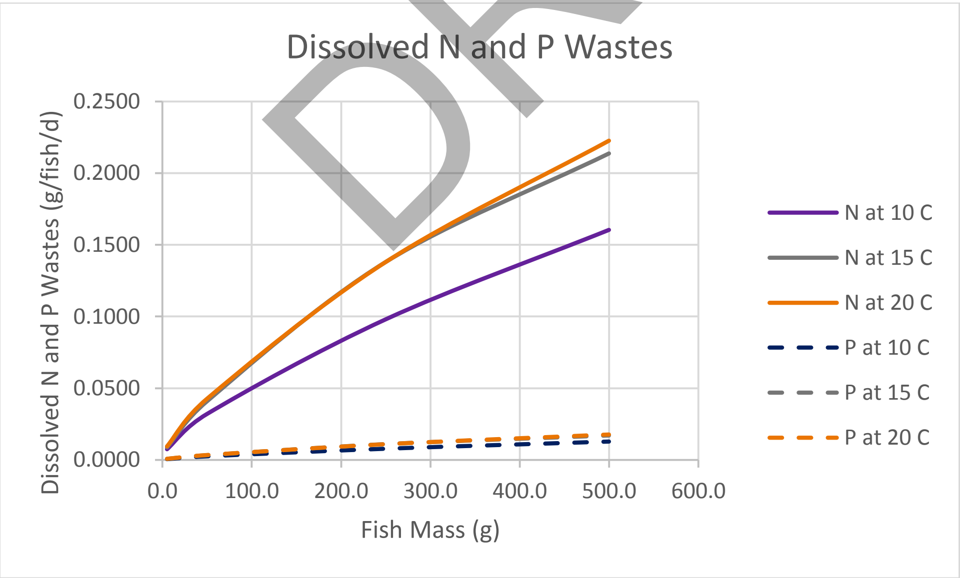

Figure 4. Estimated daily production of dissolved N and P wastes by individual steelhead trout

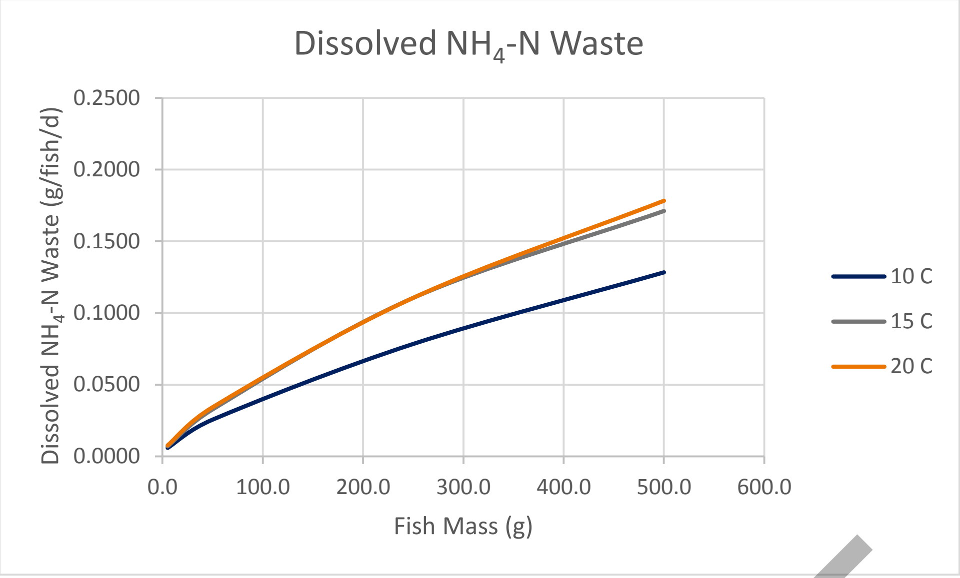

Figure 5. Estimated daily production of solid N and P wastes by individual steelhead trout

3.3 System-wide Daily Waste Loads Related to Total Steelhead Production Capacity

Daily wastes generated by steelhead aquaculture operating at various annual production capacities are evaluated at startup and harvest under three different water temperature regimes. Waste loads scaled to fish production capacities include total solid waste, total N and P waste (solid + dissolved N and P), NH_4-N waste, and dissolved P waste.

The ranges of daily total solid wastes, NH_4-N production, dissolved P waste production, and daily total N and P waste production all increase significantly with increasing fish production capacity (Appendix, Tables A-4 to A-8, Figures 6 to 10).

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3.3.1 Daily Total Solid Wastes and Fish Production Capacity

The relationship between production of total solid wastes and fish production capacity is shown in Figure 6. For example, at a production capacity of 5,000 kg of steelhead (10,000 fish), total solid waste production is 0.5 kg/d at 10 ^{0}C at startup and increases to 16.2 kg/d at 20 ^{0}C at harvest, as fish grow through the production cycle. At 500,000 kg of steelhead produced (1,000,000 fish), total solid waste production ranges from 53.7 kg/d at 10 ^{0}C at startup, to 1,618.8 kg/d at 20 ^{0}C at harvest size, which is also the maximum daily load under the scenarios examined (Appendix, Table A-4, Figure 6).

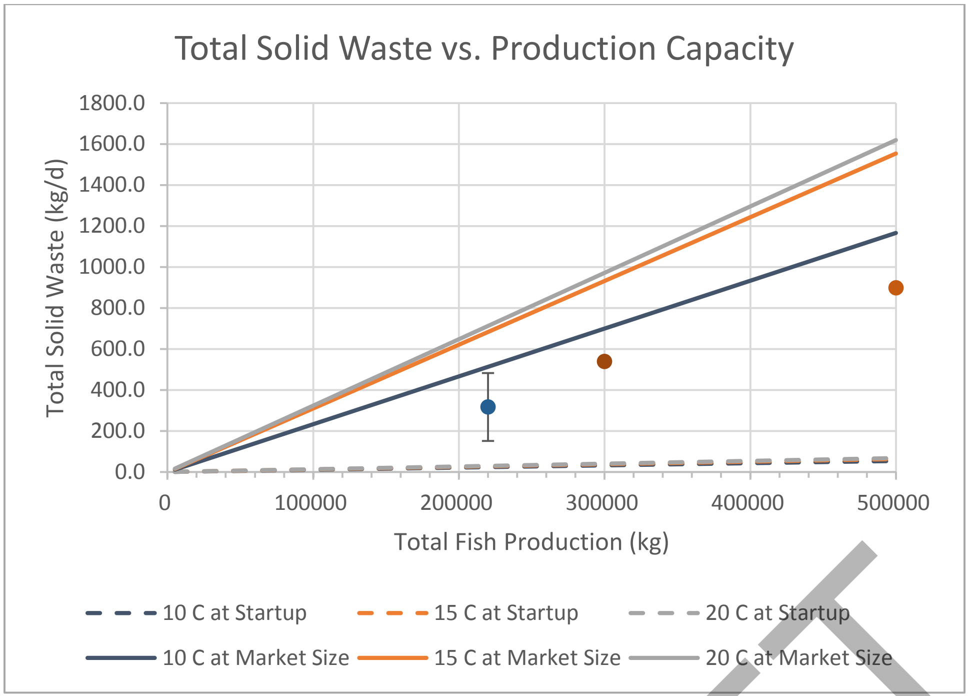

Figure 6. Daily total solid wastes produced by steelhead at various production capacities at startup of operations and at harvest, under three water temperature regimes

Note: It is assumed that none to negligible fish mortality occurs through the production cycle. Symbols represent data from other studies; blue symbol is data from Roque D'Orbcastel et al. (2008), and the other two symbols are estimates derived from Azevedo et al. (1998), corroborating that waste production estimated in this study falls within the ranges presented in other studies.

3.3.2 Daily NH_4-N Wastes and Fish Production Capacity

The relationship between production of NH_4-N wastes and fish production capacity is shown in Figure 7. At a production capacity of 5,000 kg of steelhead (10,000 fish), NH_4-N waste production is 0.06 kg/d at 10 ^{0}C at startup and increases to 1.8 kg/d at 20 ^{0}C at harvest, reflecting an increase in waste produced as fish grow through the production cycle. At 500,000 kg of steelhead produced (1,000,000 fish), total NH_4-N waste production ranges from 5.9 kg/d at 10 ^{0}C at startup, to 178.2 kg/d at 20 ^{0}C at harvest size, and represents a significant increase in waste production as fish production capacity increases. The waste load of 178.2 kg/d also reflects the maximum daily load of NH_4-N waste under the scenarios examined (Appendix, Table A-5, Figure 7).

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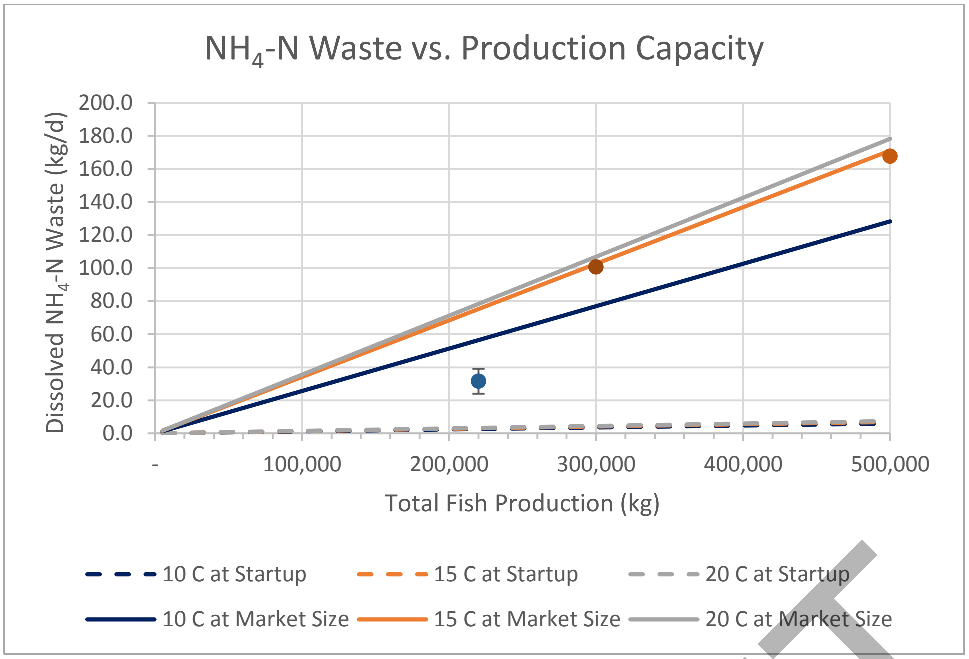

Figure 7. Daily NH4-N wastes produced by steelhead at various production capacities at startup of operations and at harvest, under three water temperature regimes

Note: It is assumed that none to negligible fish mortality occurs through the production cycle. Symbols represent data from other studies; blue symbol is data from Roque D'Orbcastel et al. (2008), and the other two symbols are estimates derived from Azevedo et al. (1998), corroborating that waste production estimated in this study falls within the ranges presented in other studies.

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3.3.3 Daily Dissolved P Waste and Fish Production Capacity

The relationship between production of dissolved P wastes and fish production capacity is shown in Figure 8. At a production capacity of 5,000 kg of steelhead (10,000 fish), dissolved P waste production is 0.006 kg/d at 10 ^{0}C at startup and increases to 0.18 kg/d at 20 ^{0}C at harvest, reflecting an increase in dissolved P waste generated as fish grow through the production cycle. At 500,000 kg of steelhead produced (1,000,000 fish), dissolved P waste production ranges from 0.58 kg/d at 10 ^{0}C at startup, to 17.6 kg/d at 20 ^{0}C at harvest size. The latter also reflects the maximum daily load of dissolved P waste, most of it as orthophosphate, under the scenarios examined (Appendix, Table A-6, Figure 8).

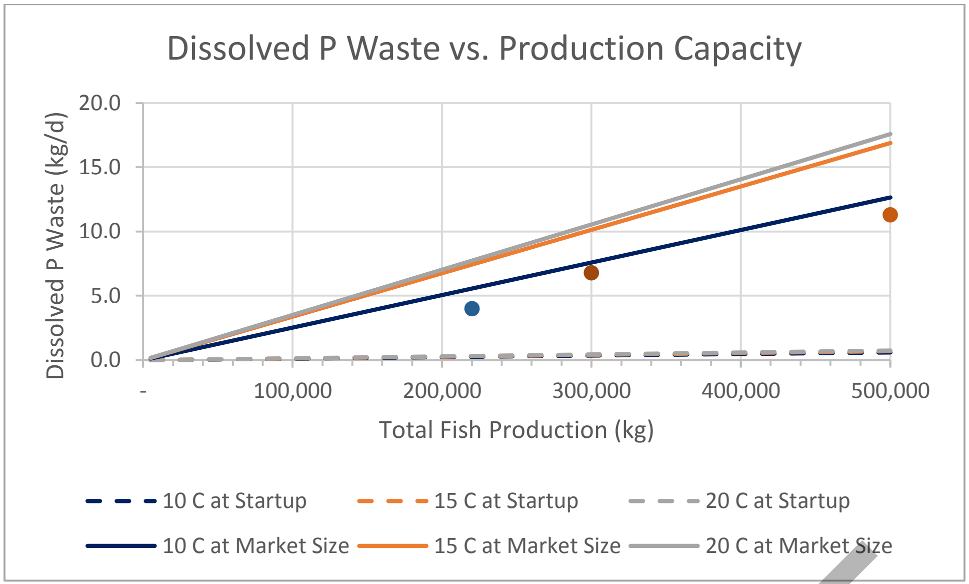

Figure 8. Daily dissolved P wastes produced by steelhead at various production capacities at startup of operations and at harvest, under three water temperature regimes

Note: It is assumed that none to negligible fish mortality occurs through the production cycle. Symbols represent data from other studies; blue symbol is data from Roque D'Orbcastel et al. (2008), and the other two symbols are estimates derived from Azevedo et al. (1998), corroborating that waste production estimated in this study falls within the ranges presented in other studies.

3.3.4 Daily Total N Waste and Fish Production Capacity

The relationship between daily total N wastes (dissolved N + solid N) is shown in Figure 9. At a production capacity of 5,000 kg of steelhead (10,000 fish), total N waste production is 0.1 kg/d at 10 ^{0}C at startup and increases to 2.9 kg/d at 20 ^{0}C at harvest. This reflects an increase in total N waste generated as fish grow through the production cycle. At 500,000 kg of steelhead produced (1,000,000 fish), total N waste production ranges from 9.8 kg/d at 10 ^{0}C at startup, to a maximum of 294.5 kg/d at 20 ^{0}C at harvest size under the scenarios examined (Appendix, Table A-7, Figure 9).

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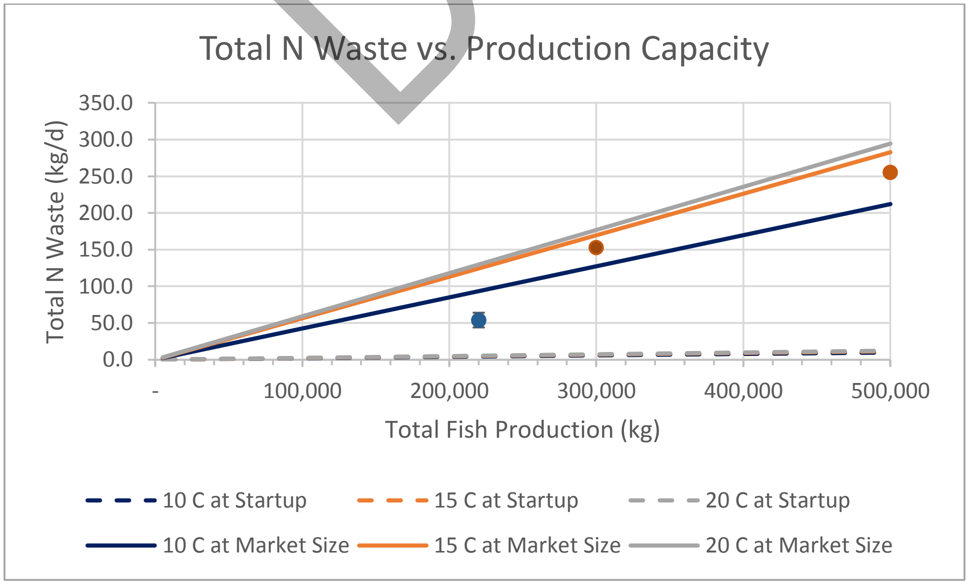

Figure 9. Daily total N wastes produced by steelhead at various production capacities at startup of operations and at harvest, under three water temperature regimes

Note: It is assumed that none to negligible fish mortality occurs through the production cycle. Symbols represent data from other studies; blue symbol is data from Roque D'Orbcastel et al. (2008), and the other two symbols are estimates derived from Azevedo et al. (1998), corroborating that waste production estimated in this study falls within the ranges presented in other studies.

3.3.5 Daily Total P Waste and Fish Production Capacity

The relationship between daily total P wastes (dissolved P + solid P) is shown in Figure 10. At a production capacity of 5,000 kg of steelhead (10,000 fish), total P waste production is 0.02 kg/d at 10 ^{0}C at startup and increases to 0.47 kg/d at 20 ^{0}C at harvest. This reflects an increase in total P waste generated as fish grow through the production cycle. At 500,000 kg of steelhead produced (1,000,000 fish), total P waste production ranges from 1.57 kg/d at 10 ^{0}C at startup, to a maximum of 47.16 kg/d at 20 ^{0}C at harvest size, under the scenarios examined (Appendix, Table A-8, Figure 10).

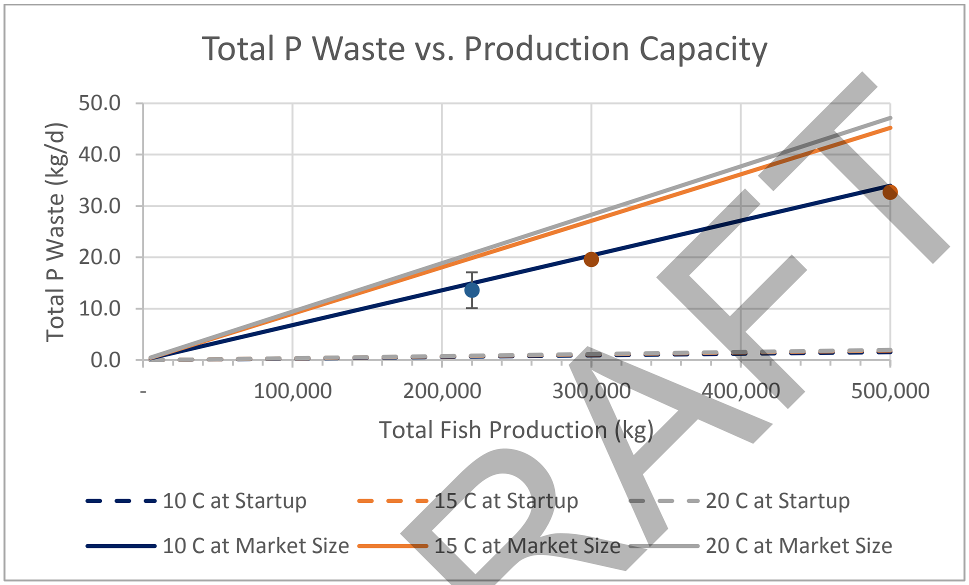

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Figure 10. Daily total P wastes produced by steelhead at various production capacities at startup of operations and at harvest, under three water temperature regimes

Note: It is assumed that none to negligible fish mortality occurs through the production cycle. Symbols represent data from other studies; blue symbol is data from Roque D'Orbcastel et al. (2008), and the other two symbols are estimates derived from Azevedo et al. (1998), corroborating that waste production estimated in this study falls within the ranges presented in other studies.

3.4 Annual Waste Loads Generated by Steelhead Aquaculture

Annual waste loads generated per metric ton of fish produced are estimated for a single cycle of steelhead aquaculture that grows fish from 5 g at startup to 500 g market size over a 30 week (210 day) period. The average water temperature is assumed to be 15 ^{0}C during this production cycle, which is within the optimal water temperature range for growth of *O. mykiss* in aquaculture operations (Hinshaw 1999).

Total solid wastes formed the bulk of the total wastes generated at 306.5 kg per metric ton of fish produced, followed by N and P wastes (Figure 11).

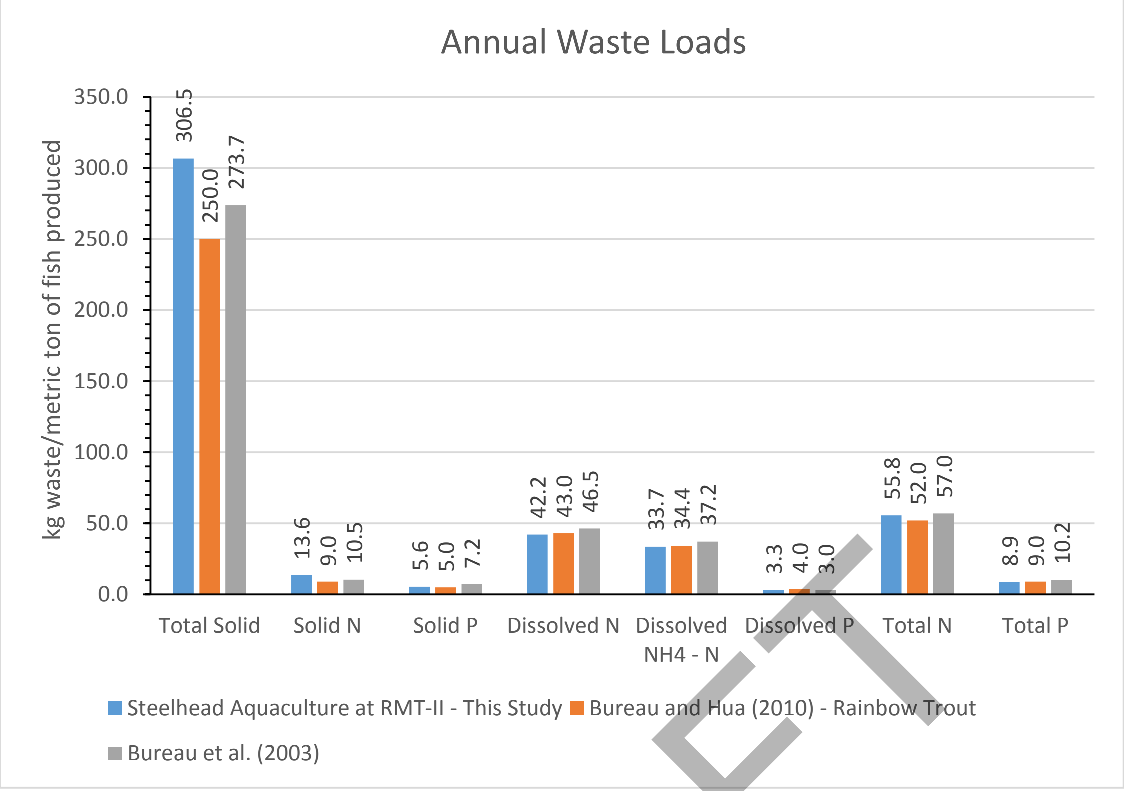

Figure 11. Total waste loads generated per metric ton of steelhead produced over a 30 week production period, compared to waste production estimates from other studies.

Table 4 further provides a breakdown of these waste loads based on various total fish production capacities of the steelhead aquaculture operations.

Table 4. Total waste loads generated by steelhead aquaculture over a 30 week production period at various fish production capacities.

	Total Fish Production (kg)			
Waste Load (kg)	**5,000**	**50,000**	**250,000**	**500,000**
Total Solid Waste (SW)	1,532	15,324	76,622	153,244
Solid N Waste (SW_N)	68	679	3,396	6,792
Solid P Waste (SW_P)	28	280	1,399	2,799
Dissolved N Waste (DW_N)	211	2,108	10,542	21,084
NH4 - N Waste (DW_{NH4-N})	169	1,687	8,433	16,867
Dissolved P Waste (DW_P)	17	167	833	1,666
Total N Waste (TW_N)	279	2,788	13,938	27,876
Total P Waste (TW_P)	45	446	2,232	4,464

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4.0 References

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Appendix (Tables A-1 to A-8)

Table A-1. Fish body mass, rations fed, and related food consumption.

	Feeding Rates (F_R) (% of body weight)			Feed Distributed (F_D) (g/fish/d)			Uneaten Feed (UE_F) (g/fish/d)			Feed Consumed (F_C) (g/fish/d)		
Individual Fish Mass (g)	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5	4.15	4.9	5.3	0.2075	0.2450	0.2650	0.0104	0.0123	0.0133	0.1971	0.2328	0.2518
50	1.8	2.3	2.4	0.9000	1.1500	1.2000	0.0450	0.0575	0.0600	0.8550	1.0925	1.1400
250	1.1	1.55	1.55	2.7500	3.8750	3.8750	0.1375	0.1938	0.1938	2.6125	3.6813	3.6813
500	0.9	1.2	1.25	4.5000	6.0000	6.2500	0.2250	0.3000	0.3125	4.2750	5.7000	5.9375

Table A-2. Solid wastes for individual fish in relation to fish body mass and water temperature.

	Total Solid Waste (SW) (g/fish/d)			Solid N Waste (SW_N) (g/fish/d)			Solid P Waste (SW_P) (g/fish/d)		
Individual Fish Mass (g)	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5	0.0537	0.0635	0.0686	0.0024	0.0028	0.0030	0.0010	0.0012	0.0013
50	0.2331	0.2979	0.3108	0.0103	0.0132	0.0138	0.0043	0.0054	0.0057
250	0.7123	1.0036	1.0036	0.0316	0.0445	0.0445	0.0130	0.0183	0.0183
500	1.1655	1.5540	1.6188	0.0517	0.0689	0.0718	0.0213	0.0284	0.0296

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Table A-3. Dissolved wastes for individual fish in relation to fish body mass and water temperature

	Dissolved N Waste (DW_N) (g/fish/d)			**Dissolved NH_4-N Waste (DW_{NH4-N}) (g/fish/d)**			**Dissolved P Waste (DW_P) (g/fish/d)**		
Individual Fish Mass (g)	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5	0.0074	0.0087	0.0094	0.0059	0.0070	0.0076	0.0006	0.0007	0.0007
50	0.0321	0.0410	0.0428	0.0257	0.0328	0.0342	0.0025	0.0032	0.0034
250	0.0980	0.1381	0.1381	0.0784	0.1105	0.1105	0.0077	0.0109	0.0109
500	0.1604	0.2138	0.2227	0.1283	0.1710	0.1782	0.0127	0.0169	0.0176

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Table A-4. Annual production capacity of aquaculture operations and daily solid wastes at startup and at harvest.

		Total Solid Waste (SW) (kg/d) at startup			**Total Solid Waste (SW) (kg/d) at harvest**		
Total Fish Production (kg)	**Total Number Fish Produced**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5,000	10,000	0.5	0.6	0.7	11.7	15.5	16.2
50,000	100,000	5.4	6.3	6.9	116.6	155.4	161.9
250,000	500,000	26.9	31.7	34.3	582.8	777.0	809.4
500,000	1,000,000	53.7	63.5	68.6	1165.5	1554.0	1618.8

Note: Fish size at startup is 5 g and at harvest is 500 g (market size).

Table A-5. Annual production capacity of aquaculture operations and daily NH_4-N wastes at startup and at harvest.

		NH_4-N Waste ($DW_{NH4\text{-}N}$) (kg/d) at Startup			NH4-N Waste ($DW_{NH4\text{-}N}$) (kg/d) at Harvest		
Total Fish Production (kg)	**Total Number Fish Produced**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5,000	10,000	0.06	0.07	0.08	1.3	1.7	1.8
50,000	100,000	0.6	0.7	0.8	12.8	17.1	17.8
250,000	500,000	3.0	3.5	3.8	64.1	85.5	89.1
500,000	1,000,000	5.9	7.0	7.6	128.3	171.0	178.2

Note: Fish size at startup is 5 g and at harvest is 500 g (market size).

Table A-6. Annual production capacity of aquaculture operations and daily dissolved P wastes at startup and at harvest.

		Dissolved P Waste (DW_P) (kg/d) at Startup			Dissolved P Waste (DW_P) (kg/d) at Harvest		
Total Fish Production (kg)	**Total Number Fish Produced**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5,000	10,000	0.006	0.007	0.007	0.13	0.17	0.18
50,000	100,000	0.058	0.069	0.075	1.27	1.69	1.76
250,000	500,000	0.29	0.34	0.37	6.33	8.45	8.80
500,000	1,000,000	0.58	0.69	0.75	12.67	16.89	17.60

Note: Fish size at startup is 5 g and at harvest is 500 g (market size).

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Table A-7. Annual production capacity of aquaculture operations and daily total N wastes at startup and at harvest.

		Total N Waste (TW_N) (kg/d) at Startup			**Total N Waste (TW_N) (kg/d) at Harvest**		
Total Fish Production (kg)	**Total Number Fish Produced**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5,000	10,000	0.10	0.12	0.12	2.1	2.8	2.9
50,000	100,000	1.0	1.2	1.2	21.2	28.3	29.4
250,000	500,000	4.9	5.8	6.2	106.0	141.3	147.2
500,000	1,000,000	9.8	11.5	12.5	212.0	282.7	294.5

Note: Total N = Solid N + Dissolved N.

Fish size at startup is 5 g and at harvest is 500 g (market size).

Table A-8. Annual production capacity of aquaculture operations and daily total P wastes at startup and at harvest.

		Total P Waste (TW_P) (kg/d) at Startup			**Total P Waste (TW_P) (kg/d) at Harvest**		
Total Fish Production (kg)	**Total Number Fish Produced**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**	**10 ^{0}C**	**15 ^{0}C**	**20 ^{0}C**
5,000	10,000	0.02	0.02	0.02	0.34	0.45	0.47
50,000	100,000	0.16	0.18	0.20	3.40	4.53	4.72
250,000	500,000	0.78	0.92	1.00	16.98	22.64	23.58
500,000	1,000,000	1.57	1.85	2.00	33.95	45.27	47.16

Note: Total P = Solid P + Dissolved P.

Fish size at startup is 5 g and at harvest is 500 g (market size).

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E

HWE Preliminary Analysis Dredge Spoils Processing

Memorandum

To:	Mike Foget, PE / SHN Consulting Engineers and Geologists, Inc.		
From:	Brian Hemphill	Project:	Redwood Marine Terminal II
CC:			
Date:	January 15, 2016	Job No:	
Re:	Preliminary Analysis Dredge Spoils Processing in Microfloc System		

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INTRODUCTION

This memorandum presents a concept for managing dredge spoils in the existing Microfloc water processing facilities at the Samoa site. Details on existing treatment facilities are presented in a separate memorandum.

SYSTEM DESIGN CONCEPT

A preliminary operating scheme was developed for management of the dredge spoils. A summary of the basic system operating parameters is presented in Table 1.

Under this concept the dredge will pump directly to the treatment system site, and the slurry will be directed to one of the two clarifiers. The clarifier basins will be modified by installing a porous base/underdrain system that covers the existing floor, preventing dredged soil from entering the solids hoppers in the floor while allowing drainage of water. The drained water will be pumped away using the existing waste pumps, supplemented with new vertical can pumps equipped with telescoping valves, installed in clarifier. These will allow pumping of supernatant over soils in the event of slow drainage to the floor.

The operating clarifier will be alternated each week. While one is in service processing the pumped spoils, the other will be allowed to drain free water and then excavated using conventional mobile machinery. Spoils will be trucked to the final destination.

Free water will also be allowed to overflow the tank via the existing weirs. The overflowed water will be combined with the pumped drain water in the clarifier effluent sump in the filter building.

There appears to be sufficient storage in each clarifier basin to hold a week’s production with adequate freeboard. The total depth of accumulation is estimated at just under nine feet measured at the tank center, and about 2.7 feet above the floor at the tank wall, well within the available space. Even with consideration of an 18 inch underdrain, this leaves about four feet from the top of the sediment surface to the top of the effluent launder, as depicted in Figure 3.

TABLE 1. DREDGE SPOILS PROCESSING DESIGN CONCEPT	
DREDGE SPOILS	
Solids pumping rate	150 CY/hour
Solids content of pumped slurry	10%
Total slurry pumping rate	5,000 gpm
Water flow	4,500 gpm
Hours/day of pumping	5
Days/week of operation	5
Weekly solids processed	3,750 CY
SLURRY PROCESSING	
Overflow rate in one clarifier (150')	365 gpd/sf
Depth of soil in one clarifier/week	5.7 ft
Filter rate in three filters (if needed)	4.1 gpm/sf

The water quality standards for the outfall call for a maximum discharge turbidity of 75 NTU (nephelometric turbidity units). For most types of water this is roughly equivalent to 75 mg/l TSS. It's not possible to speculate whether or not the discharge from the dredge spoils tank will meet that standard without additional treatment. It is highly likely that it will if it is filtered, possibly with the aid of a low dose of coagulant. To be safe, it is prudent to plan to use three of the existing filters for this purpose.

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SYSTEM MODIFICATIONS

Besides renovations needed to get the filters operable, it will be necessary to also install a new system to provide backwash water. The existing filtration system was designed to use what is known as "internal backwash", in which treated effluent is routed directly from other operating filters into the effluent/backwash supply line to the filter being backwashed. To ensure sufficient flow for backwash, this method relies on at least four filters being in operation while another is being backwashed. That will not be the case for the proposed system. The backwash requirement for each filter will be a flow rate of about 5,700 gpm and a total volume of about 56,000 gallons.

The proposed scheme for accomplishing this is to use the existing seawater filtration storage tank, which has a capacity of 100,000 gallons. New pumps would be installed to supply the required backwash flow. These will be in the range of 75-100 hp. A new line will be installed to the storage tank from the filter effluent line with an automatic valve to keep the backwash storage tank filled,

This scheme will also require modifications to the piping manifold serving the filters. An 18" backwash supply line will be installed, with automatic valves serving each filter.

Other minor modifications will be made to the treatment complex:

- A new line will be installed to direct collected underdrain water from the clarifier waste sump to the clarifier effluent sump.
- The filter backwash waste line will connected to the existing flash mix basin, which feeds both clarifiers by gravity. In this way filter backwash will be recycled to the clarifiers, where the solids will settle and be removed with the dredge material.

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FIGURE 1. DREDGE SPOILS LIQUIDS PROCESSING SCHEMATIC

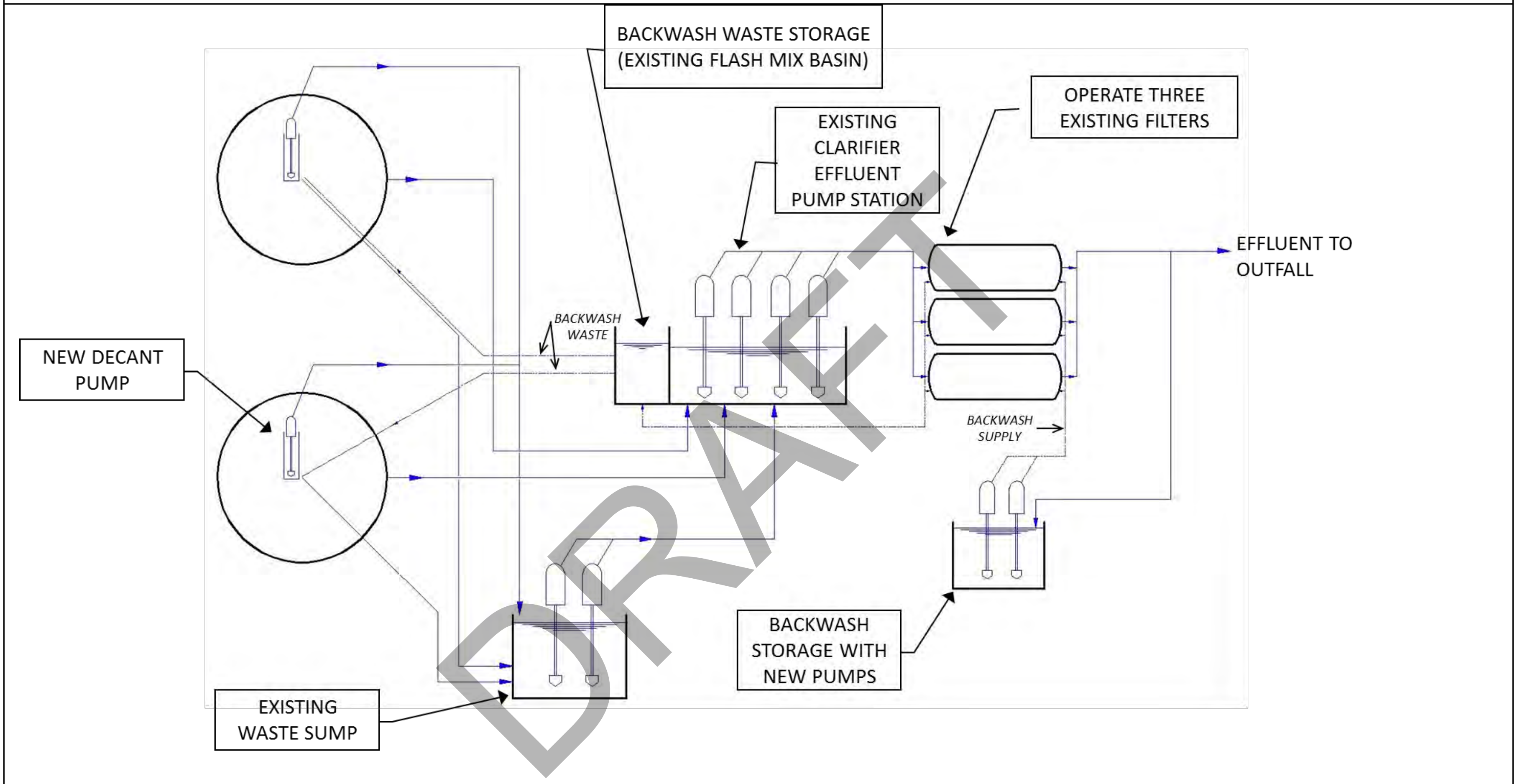

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FIGURE 2. PLAN OF CONVERTED CLARIFIERS

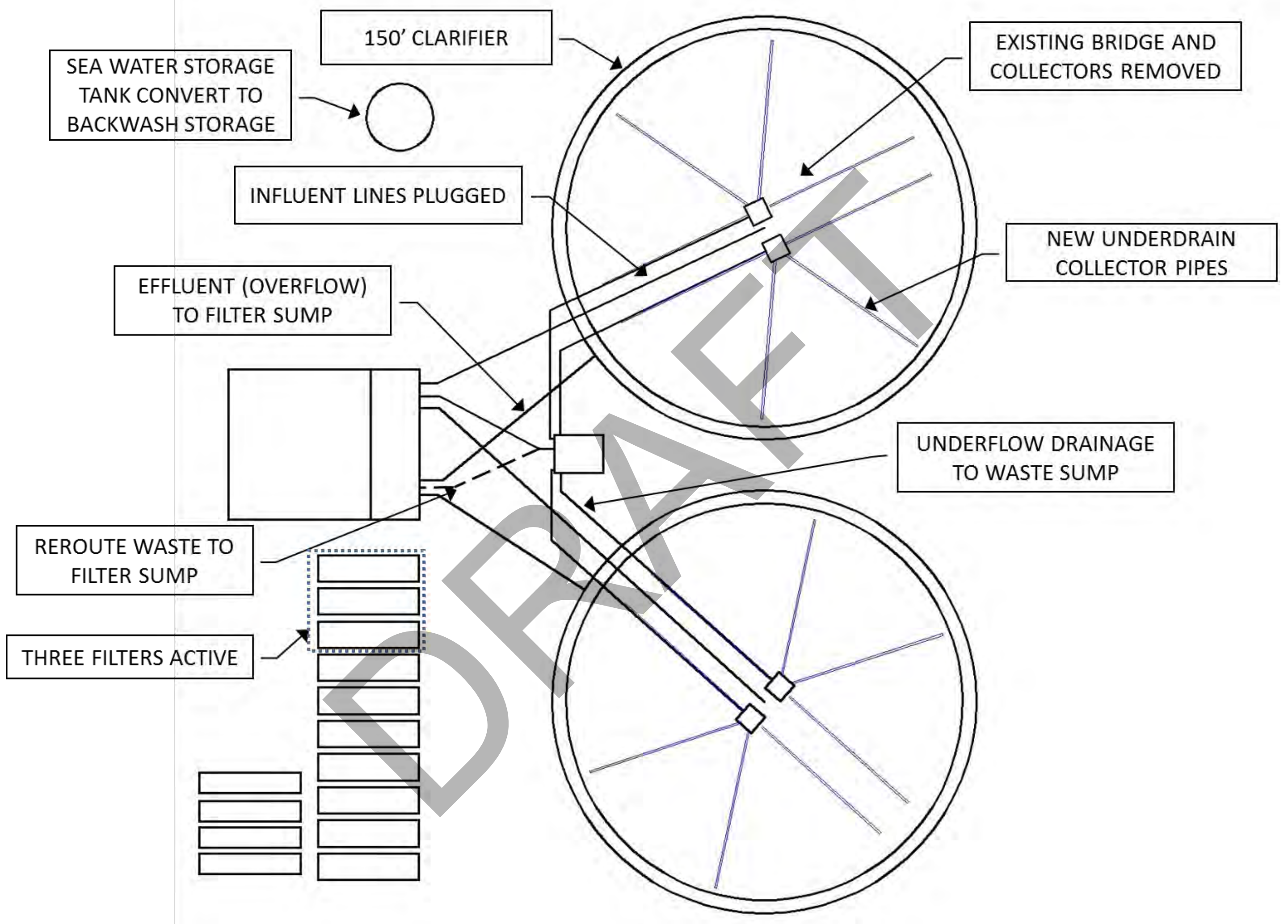

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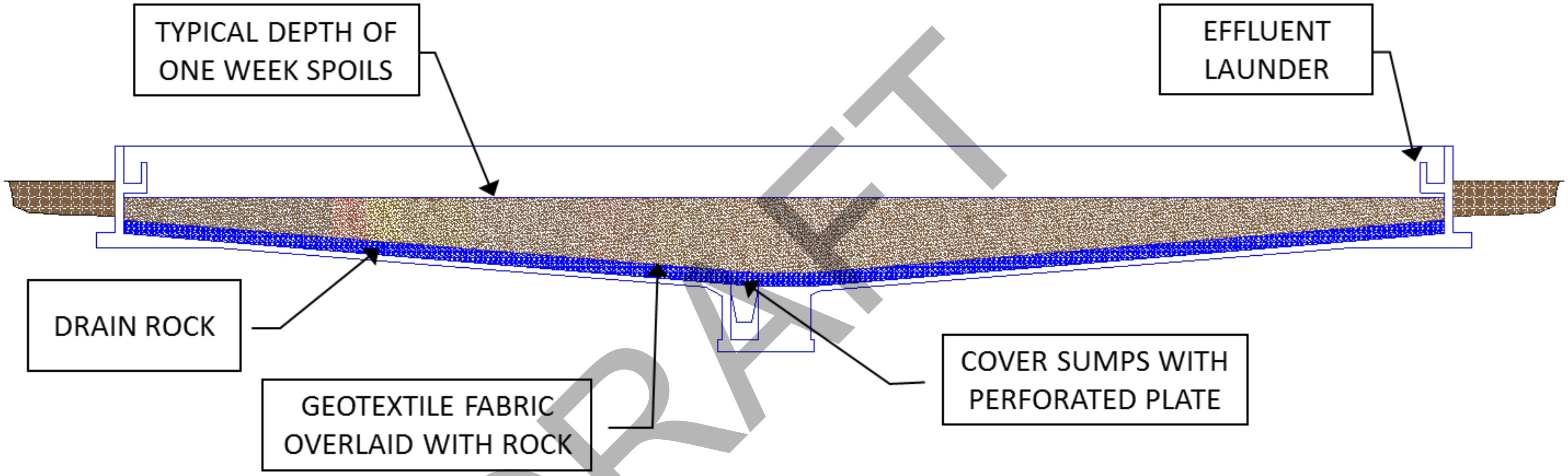
FIGURE 3. SECTION OF CONVERTED CLARIFIER



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Application/ROWD–Town of Samoa: Project Description, 4th Submittal

California Engineering Company, Inc.
Main Office
1110 Civic Center Blvd., Suite 404
Yuba City, CA 95993
530-751-0952 Office
530-751-0953 Fax
www.cecusa.net

Application/Report of Waste Discharge- Town of Samoa Project Description – 4th Submittal

Zero Discharge
Waste Water Treatment and Disposal Facility
Town of Samoa
Humboldt County, CA

DRAFT

Owner – Samoa Pacific LLC

Engineer: California Engineering Company, Inc.

Date: September, 2015

Prepared by: David L. Swartz, PE, PLS, QSD, QSP

EXECUTIVE SUMMARY

BACKGROUND

The Samoa Pacific Group (SPG), the current owners of the Town of Samoa, located on the Samoa Peninsula in Humboldt County, California (Figure 1-1**)**, is proposing to reconfigure existing property lines, where the land use is currently residential homes and vacant open space, to provide a variety of land uses which will include additional single family residential and multi-family affordable housing; along with commercial properties, both coastal dependent and recreational; and a business park. Part of the requirements of this proposed project, issued by the County of Humboldt and the California Coastal Commission is to rehabilitate the existing wastewater collection and treatment system.

There are two distinct wastewater treatment and disposal systems currently serving the existing community of Samoa. They are commonly referred to as the Eastern and Western Systems. As part of this project moving forward, the majority of the existing system, with the exception of grease/septic tanks that were installed for the Samoa Cookhouse in 2011, will be abandoned/removed. Additionally, along with new collection and transport systems, there will be a new centralized treatment system and new dispersal fields installed.

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STATEMENT OF COMPLIANCE

This Report of Waste Discharge provides detailed data and analysis demonstrating that the proposed wastewater treatment plant (WWTP) design and discharge area complies with the following:

- ✓ Basin Plan
- ✓ Conditions Issued by the California Coastal Commission
- ✓ Preliminary issued WDR’s, with enhanced treatment due to comments by Regional Board staff
- ✓ Industry standard small system treatment design

PHASING

The overall project is proposed to occur in phases. Phase I will include: construction of a new collection/transmission system; construction of a new wastewater treatment facility; up-grade of nine dilapidated residences within the existing town; the addition of an 84-unit multi-family housing unit, and connecting existing occupied residences to the new WWTP and abandonment/removal of the existing wastewater treatment system.

Upon completion of Phase I, the proposed final build-out for Phase II of this project will consist of 105 new single-family residential units and 62 multi-family units. Currently Phase III will consist of a Business Park.

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Figure 1-1

Part of what makes this three phase approach feasible is the fact that the SPG has applied for an affordable home grant that will play a significant role in constructing the infrastructure necessary for the first phase of the project. With this in mind, Phase I of this project proposes to provide service to the entire existing town and a new affordable home project, consisting of approximately 84 additional multi-family housing units. This ROWD request covers Phase I, however, future expansions are anticipated to occur under this permit by reopening it with each phase. Figure 1-2 shows the three planned phases of the WWTP and dispersal field utilization. Note, the expansion and build out of the WWTP is ahead of new construction and development phases, as the treatment capacity must be available in advance of proposed development.

PROPOSED TREATMENT PLANT PROFORMA

The residential waste entering the project is considered to be relatively low strength as compared to higher industry strength waste. Both existing and future residential development are expected to produce influent concentrations similar to what is being produced at present time (Appendix A) and therefore, current with influent data from the existing wastewater system being used as design base loads.

In May of 2015, the Regional Board issued preliminary waste discharge limits (Appendix B). Since that time conversations with Regional Board staff have indicated that the reissued limits may actually be more conservative, and as such we have prepared a design treatment and dispersal system that will accommodate the most restrictive requirements ascertained from Regional Board staff.

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The treatment processes proposed are summarized as follows:

1. Primary settling with filtration
2. Secondary effluent settlement with flow equalization
3. Pre-Anoxic basin
4. Filtration and recirculation (4:1 ratio) through advanced packed bed media filters
5. Carbon/Alkalinity addition
6. Post Anoxic tank
7. Up-flow Filtration/Denitrification
8. Polishing packed bed media filters
9. UV Disinfection
10. Dispersal

This treatment scheme will be able to achieve the following summary effluent concentrations:

Biochemical Oxygen Demand (5-day @ 20C)	10 mg/l Average Monthly
Total Suspended Solids	10 mg/l Average Monthly
Total Nitrogen as N	10 mg/l Daily Max
Total Coliform Organisms	1.1 MPN/100 ml Monthly Median

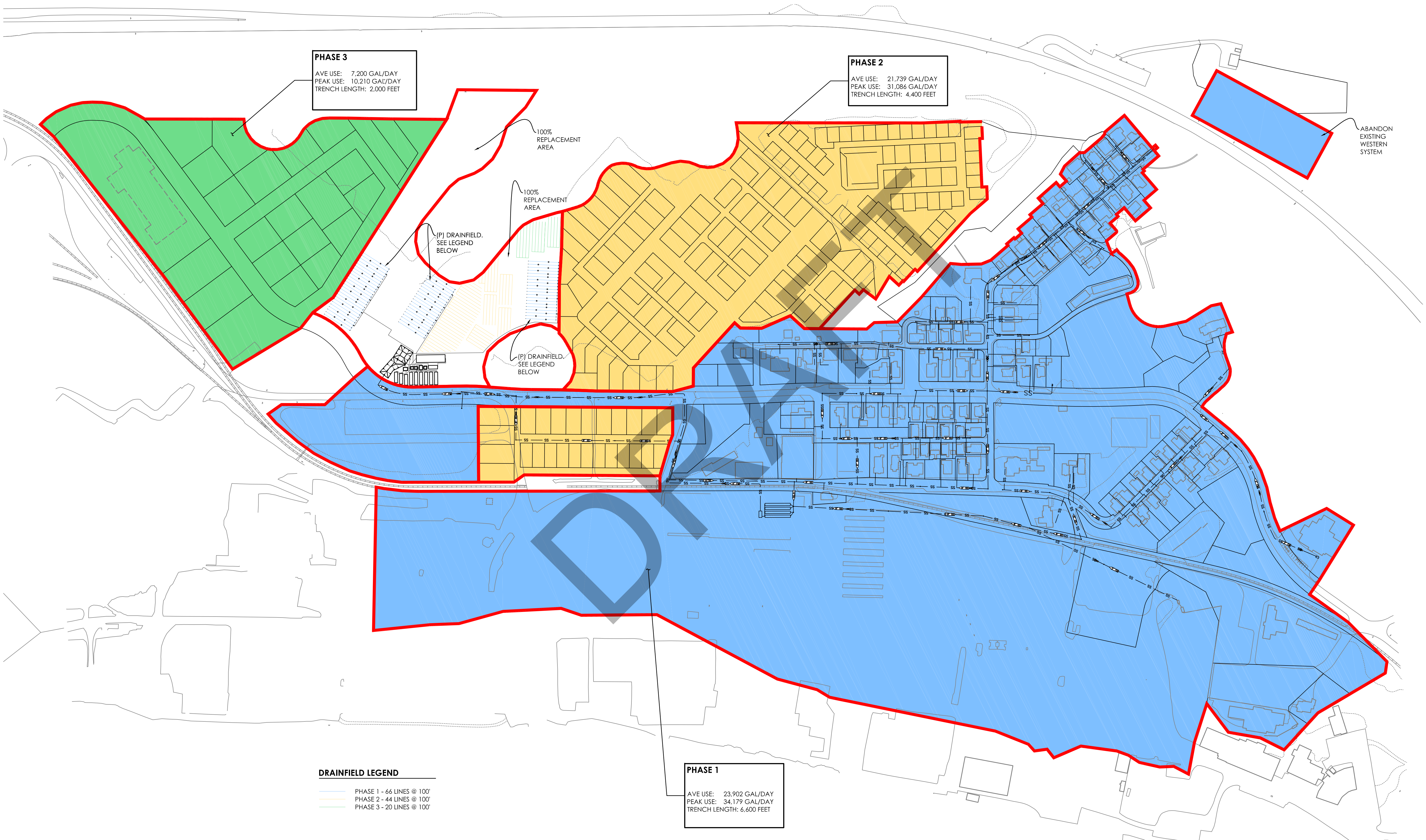

Figure 1-2

PROJECT NUMBER
10-202

SHEET 1 OF 1

SAMOA WASTEWATER TREATMENT PLANT REHABILITATION PROJECT

WASTEWATER FLOW STUDY

TOWN OF SAMOA, HUMBOLDT COUNTY, CALIFORNIA

CEC
Engineering - Planning - Surveying - Community Development
www.cecusa.net
Office (530) 751-0952
Fax (530) 751-0953
1110 Civic Center Blvd., Suite 404
Yuba City, CA 95993

DATE: 02-03-2015
SCALE: 1" = 150'
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DESIGNED BY: AV
CHECKED BY: DLS

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DISPOSAL FIELD SUITABILITY

Over the past 15 years there have been approximately 30 soil borings within the proposed wastewater treatment area ranging in depth between 4 feet bgs (PWA, September 2015) and 60 feet bgs (Freshwater Environmental, November 2014*)*. See Appendix D.

In large part the data collected by SPG consultants have demonstrated a fairly homogeneous characterization of the upper soil strata (0-20 feet) within the proposed dispersal area, in that the underlying soils are basically sand. Furthermore, in recent subsurface investigations, consultants have observed what has been interpreted as bedding plane horizon typical of sand dune morphology in contact with overlying gravel base deposits.

Observed surface gravel base deposits, ranged between 4 inches and 10 inches in thickness. This evidence suggests that while the designated dispersal area may have been graded for the purpose of utilizing the area as a logging deck or other associated activities, it is unlikely that significant amounts of fill had been imported to the site. Furthermore, there was no observed evidence of remnant wood products, such as wood bark or wood chips. For details on subsurface investigation information please see Appendix D.

Figures 1-3 and 1-4 are cumulative illustrations of groundwater elevations from subsurface exploration test holes within the proposed dispersal area that are discussed herein, with details in Appendix D – Site Characterization. This figure illustrates data ranging between the years of 2000 and 2015.

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DISPERSAL FIELD LAY-OUT

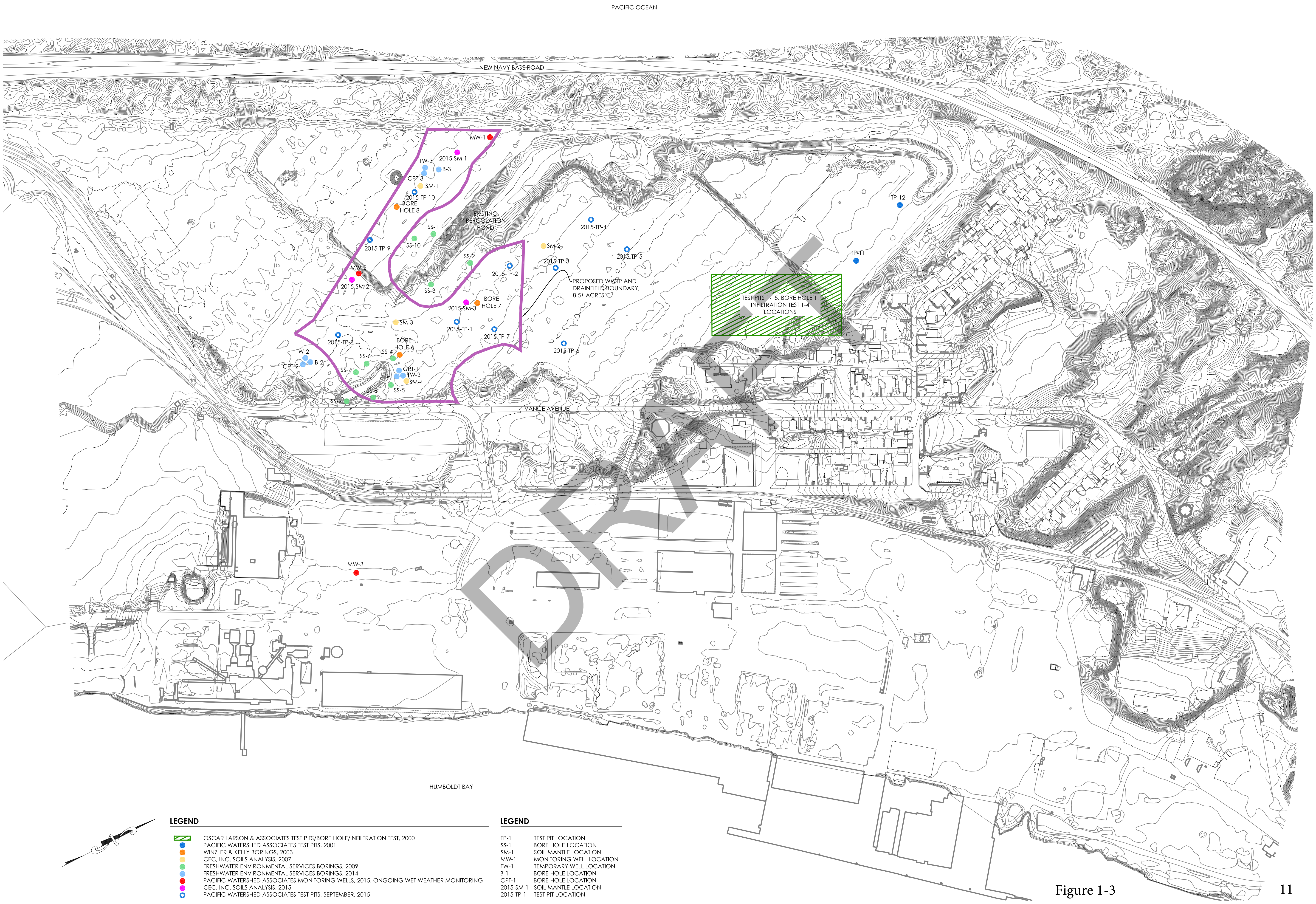
Dispersal of treated effluent is proposed via Quick 4 High Capacity Infiltrator Chambers. Leach trenches are proposed to be 36-inches wide spaced 10 feet on center with an average depth of 24-inches. Leachlines are proposed to be 100-feet in length. Based on specification sheets for Infiltrator Chamber the Quick 4 - High Capacity Chamber is 34-inches wide at the base and 16-inches high at the crest (Specification Sheet 12 of 18).

Table 1. Wastewater effluent flow by phase is estimated as follows*:

Phase	Design Daily Flow (gpd)
Phase I	23,902
Phase II	21,739
Phase III	7,200
Total Daily Flow – Full Build-out	**52,841**

*See Flow Study (Appendix C).

The design detailed in Appendix C uses an effluent loading rate of 0.69 gal./ft^2/day. Table 2 below outlines the absorption area required by phase with this loading rate.



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LEGEND

▨	OSCAR LARSON & ASSOCIATES TEST PITS/BORE HOLE/INFILTRATION TEST, 2000
●	PACIFIC WATERSHED ASSOCIATES TEST PITS, 2001
●	WINZLER & KELLY BORINGS, 2003
●	CEC, INC. SOILS ANALYSIS, 2007
●	FRESHWATER ENVIRONMENTAL SERVICES BORINGS, 2009
●	FRESHWATER ENVIRONMENTAL SERVICES BORINGS, 2014
●	PACIFIC WATERSHED ASSOCIATES MONITORING WELLS, 2015. ONGOING WET WEATHER MONITORING
●	CEC, INC. SOILS ANALYSIS, 2015
○	PACIFIC WATERSHED ASSOCIATES TEST PITS, SEPTEMBER, 2015

LEGEND

TP-1	TEST PIT LOCATION
SS-1	BORE HOLE LOCATION
SM-1	SOIL MANTLE LOCATION
MW-1	MONITORING WELL LOCATION
TW-1	TEMPORARY WELL LOCATION
B-1	BORE HOLE LOCATION
CPT-1	BORE HOLE LOCATION
2015-SM-1	SOIL MANTLE LOCATION
2015-TP-1	TEST PIT LOCATION

Figure 1-3

NO.	DATE	DESCRIPTION

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Engineering - Planning - Surveying - Community Development
www.cecusa.net

Office (530) 751-0952
Fax (530) 751-0953
1110 Civic Center Blvd., Suite 404
Yuba City, CA 95993

SAMOA WASTEWATER TREATMENT PLANT REHABILITATION PROJECT

SOIL EVALUATION EXHIBIT

TOWN OF SAMOA, HUMBOLDT COUNTY, CALIFORNIA

PROJECT NUMBER
10-202

SHEET 1 OF 1

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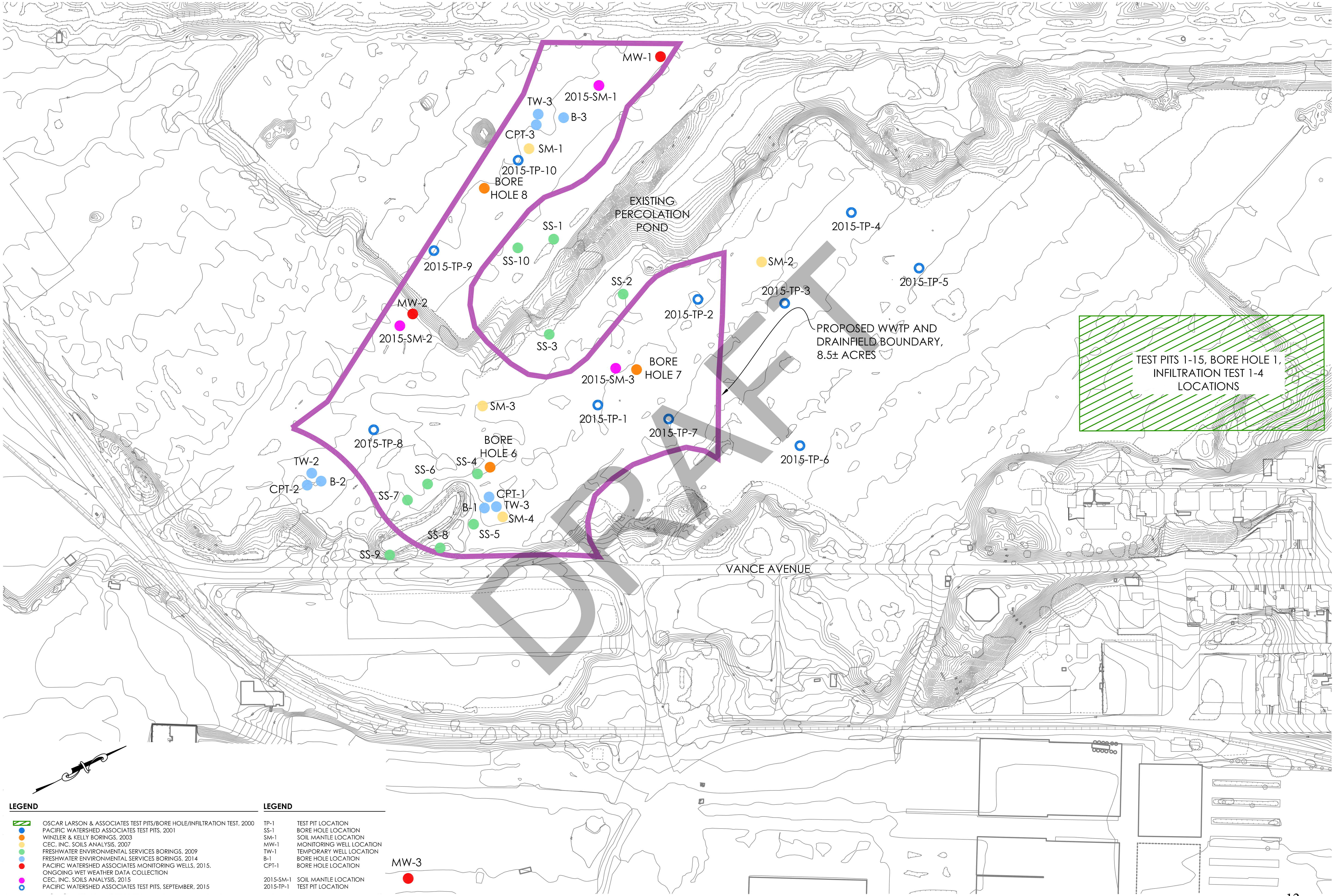

LEGEND

▨	OSCAR LARSON & ASSOCIATES TEST PITS/BORE HOLE/INFILTRATION TEST, 2000
●	PACIFIC WATERSHED ASSOCIATES TEST PITS, 2001
●	WINZLER & KELLY BORINGS, 2003
●	CEC, INC. SOILS ANALYSIS, 2007
●	FRESHWATER ENVIRONMENTAL SERVICES BORINGS, 2009
●	FRESHWATER ENVIRONMENTAL SERVICES BORINGS, 2014
●	PACIFIC WATERSHED ASSOCIATES MONITORING WELLS, 2015. ONGOING WET WEATHER DATA COLLECTION
●	CEC, INC. SOILS ANALYSIS, 2015
○	PACIFIC WATERSHED ASSOCIATES TEST PITS, SEPTEMBER, 2015

LEGEND

TP-1	TEST PIT LOCATION
SS-1	BORE HOLE LOCATION
SM-1	SOIL MANTLE LOCATION
MW-1	MONITORING WELL LOCATION
TW-1	TEMPORARY WELL LOCATION
B-1	BORE HOLE LOCATION
CPT-1	BORE HOLE LOCATION
2015-SM-1	SOIL MANTLE LOCATION
2015-TP-1	TEST PIT LOCATION

Figure 1-4

SAMOA WASTEWATER TREATMENT PLANT REHABILITATION PROJECT

SOIL EVALUATION EXHIBIT

TOWN OF SAMOA, HUMBOLDT COUNTY, CALIFORNIA

PROJECT NUMBER
10-202

SHEET 1 OF 1

CEC
Office (530) 751-0952
Fax (530) 751-0953
1110 Civic Center Blvd., Suite 404
Yuba City, CA 95993
Engineering - Planning - Surveying - Community Development
www.cecusa.net

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Table 2. Projected Leachfield Absorption Area Required by Phase

Phase	Gallons per day	Linear Loading Rate	Absorption Area Required (ft^2)	Acres Require *(1 acre = 43,560 ft^2)*	Number of Zones	Absorption Area (ft^2) (5,000 ft^2/zone)	Acres Utilized
I	44,650	0.69	64,710	1.48	13	65,000	1.5
II	21,739	0.69	31,505	0.72	10	50,000	1.4
III	7,200	0.69	10,434	0.24	3	15,000	0.30
Total Acres Required for full build-out						**2.44**	
Total Acres Dedicated for full build-out						**3.2**[1]	

1. Based on the leachfield lay-out as shown in Figure 1, greater than 3.2 acres have been designated for the required 2.4 acres needed for full build out of this system, providing a greater than 20% safety factor. The entire land designated for wastewater infrastructure is 8.5 acres, which provides for greater than 100% replacement leachfield area.

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Based on a compilation of subsurface investigations on the peninsula, observed ground water elevations have ranged between 3-5 feet above mean sea level. Additionally, during recent measurements of the depth of ground water below the ground surface (bgs) in this area, tidal influences have shown to have minimal impact (See Design Information and Calculations).

The proposed leachfield ranges between 14 feet and 25 feet above mean sea level (USGS, NGVD 29). This locates the proposed wastewater treatment area within some of the highest elevated, non-developed property within the community of Samoa. The bottom of the leach trench is proposed to be 2-feet bgs which keeps the bottom of the leach trench between 9 – 19 feet above measured ground water. See Appendix D – Site Characterization.

APPLICATION RATE

This design focused on the mitigation of ground water mounding and is consistent with the nitrate dispersion analysis in Appendix F. Given the soils are homogeneous, porous, and deep, coupled with a highly treated effluent which significantly reduces concern for a bio-mat buildup, the application rate used for the dispersal field is 0.69 gal/ft^2/day.

SEA LEVEL RISE

Coastal Commission documents require the project as a whole to analyze infrastructure considering a sea level rise of 4 ½ feet within the next 200 years. The worst case location within the discharge area is the area closest to New Navy Base Road, where the ground surface elevations are approximately 13-14 feet above mean sea level. Recent investigations by SPG consultants have demonstrated the proposed WWTF area to be above the influence of projected sea level rise. This particular area, again, was chosen due to its topography to mitigate this circumstance, and was addressed prior to the Coastal Commission project approval in 2011.

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INTRODUCTION

I. Setting

The Town of Samoa is an unincorporated community situated between the Pacific Ocean and Humboldt Bay on the Samoa Peninsula, in Humboldt County, California. The town is approximately three miles west of the City of Eureka, and seven miles southwest of the City of Arcata (Figure 1-1). Samoa is one of three unincorporated communities located on the Samoa Peninsula, the others being Manila to the north and Fairhaven to the south. Elevations within the community range from sea level to approximately 35 feet above sea level and ground surface elevations within the proposed treatment areas ranging between approximately 14- 25 feet above sea. The peninsula is more than six miles long, with its southerly terminus at the Humboldt Bay entrance. Humboldt Bay is a significant regional geographic feature, and at 17,500 acres in size, is the second largest marine embayment in California. [1]

II. Summary of Master Plan and EIR

The proposed Master Plan site covers approximately 171.7 acres, which does not include existing railroad property that lies within the site. The attached Master Plan EIR (Appendix E), shows the area parcels, existing and planned land uses, and alternatives that were considered. The calculations herein assume the most conservative approach and intense use.

III. Summary of Entitlement Process and Approvals to date.

The town was purchased by Samoa Pacific Group (SPG) in 2000. The coastal area, in the State of California is perhaps one of the most heavily regulated and difficult regions to develop in the entire world. It took nearly 11 years for the SPG to navigate both the State Environmental Impact Process otherwise known as CEQA, followed by the California Coastal Commission Review process. Below is a summary of the reviewing agencies whom have been involved with the project over the past 12 years.

- Humboldt County Community Development Services Department
- Humboldt Bay Harbor Development, Conservation and Recreation Commission
- City of Eureka
- California Regional Water Quality Control Board
- California Coastal Commission
- California State Department of Transportation – Caltrans District 1
- Audubon Society
- North Coast Environmental Center
- Humboldt Bay Municipal Utility District

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IV. Existing Development and Waste Water Treatment and Disposal Systems

Until 1998, the main development influence on the Town of Samoa has been the timber industry. The peninsula, with its proximity to the bay and the railroad, was a prime location for timber operations and centralized transport. From 1893 until 1998 the Town of Samoa was a hub of Humboldt County's lumber industry. From 1973 to 1998, California experienced a major decline in the logging and lumber industries as existing forestry inventories were depleted and changes in regulations removed areas of private and public timberlands from harvesting. As a result, there was also a general decline in wood processing and shipping. [1]

Currently the Town of Samoa has approximately 102 single family homes, of which only about 93 are occupied. The remaining homes are dilapidated and need significant work before being inhabited. Additionally, the town contains the Samoa Cookhouse Restaurant, gym, Woman's Club, museum, hostelry, and a small grade school.

Currently there are three waste water treatment and disposal systems that serve the town; An Eastern System, Western System and a School System.

Eastern System

The Eastern System serves the majority of the town, including the Samoa Cookhouse, Woman's Club, hostelry, and approximately 68 of the existing residences (seven of the nine dilapidated residential units, and the museum currently do not have sewer service and the gym is not connected to a system).

The Eastern system consists of gravity sewer lines, two bark filters, pumps and pressurized force main lines, septic tanks, an equalization pond, and land disposal area. Wastewater from the Samoa Cookhouse is collected in a pump vault located approximately 50 feet northeast of the building. Kitchen waste water flows into a 3,000 gallon grease interceptor prior to reaching the vault. Wastewater is then pumped approximately 750 feet to a 5,000 gallon primary tank located southwest of the Cookhouse. From here, effluent flows into a 1,500 gallon pumping tank adjacent to the primary tank and is pumped approximately 650 feet southwest to Bark Filter A, which consists of bark filters and a 15,000 gallon septic tank. In addition to effluent from the Cookhouse, effluent from 16 homes and hostelry flow to Bark Filter A. From this location, effluent flows approximately 750 feet southwest to Bark Filter B which consists of bark filters and a 25,000 gallon septic tank.

Wastewater from 52 homes and the Woman's Club flows directly to Bark Filter B. Effluent is then pumped to the treatment wetland/pond. The pond is approximately 25 feet wide by 200 feet long and 13 feet deep. The soils of the pond embankments appear to be coarse gravel and sand and have significant vegetation along the sides.

---

[1] Information used from the 2006 Samoa Town Master Plan EIR

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The pond is estimated to have a capacity of 0.5 million gallons and provides about 26 days of treatment (CEC, 2002). Effluent from the pond flows into the percolation/infiltration area. This area is approximately 30 feet wide at the upstream end, approximately 125 feet wide at the downstream end, and approximately 750 feet long. The eastern portion, or upstream, of the wetland area is consistently wet throughout the year and is dominated by willows and blackberries and other local plant species. To the west, the wetland transitions into wax myrtle before transitioning into a bog dominated by wetland sedge species. Information related to where the wastewater wetland ends and the natural wetland begins can be found in the Biological Resources section (2.4) of the EIR.

Western System

The Western System serves approximately 25 residences located on the west side of the ridge line of the peninsula, and is a gravity flow system into a 15,000 gallon septic tank and classic leach trench system. The school system is also a gravity flow leach trench system; however, the school system will not be part of this project. It will continue to use the existing treatment system it is currently utilizing..

The Western System is governed by Waste Discharge Requirements Order No. 85-40 adopted by the Regional Board on March 27, 1985. With the permit renewal in 2001, language was incorporated into the order that covers both the Eastern and Western Systems under Order No. R1-2001-62, ID NO. 1B85017RHUM.

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V. Proposed Development

Development of the Town of Samoa has been a decade long and iterative process. There were approximately 10-11 alternatives considered during the CEQA process. The various infrastructure engineering studies that have been conducted were all derived from the development proposed via the CEQA process.

With the conclusion of the CEQA process, another environmental review by the California Coastal Commission commenced. This effort centered on wetlands, tsunami, ocean rise due to global warming, and land use planning. The Coastal Commission has a policy which requires an applicant to complete their entitlement processing with the lead agency before they will consider the proposed development. Throughout the initial EIR process, SPG sought input from Coastal Commission staff regarding the development plan in an effort to incorporate Coastal Commission comments. The net result has been a land use and proposed development which is less intense than was approved under the CEQA process.

The finding from the Coastal Commission are in the form of conditions, and do not expressly mention any revisions to the number of units approved within the Master Plan. Rather, their comments relate to increased wetlands area, and modifications in land uses.

The utilities plan that was developed under the Master Plan and EIR, adopted by the County of Humboldt, provide for an ultimate service level greater than what is currently being proposed due to the aforementioned reductions resulting from the California Coastal Commission findings. Currently the development being contemplated is summarized as follows (Table 3 below)**.**

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Table 3. Proposed Development Phase I, Phase II and Phase III
(From Appendix C – Flow Study)

Existing Town[1]			
Phase I	102 Residential Units	93 Currently Occupied	9 to be rehabilitated
	Samoa Cookhouse		
	Samoa Woman's Club		
	Museum		
	Hostlery		
Proposed Development			
Phase I	84-Unit – Medium Density Housing Unit		
	9 Lots Commercial General	7 of which have sewer hook-ups, 2 without	
	2 Lots Public Facilities	No Sewer Connection	
	6 Lots – Public Recreation	No Sewer Connection	
	11 Lots – Commercial Recreation	3 lots with Sewer Connections, 8 lots without	
	2 Lots Industrial Coastal Dependent	No Sewer Connection	
	1 Lot Natural Resources	No Sewer Connection	
Phase II	105 – Low Density Residential Lots		
	62 - Medium Density Residential Units		
Phase III	24 Lot Business Park	All Connected to sewer	

[1] These facilities are currently connected to the existing wastewater treatment facility and will be transferred over to the new WWTP

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VI. WWTP and Disposal System Design – Phasing of Improvements

With this project, with the exception of the Cookhouse 3,000 gallon grease interceptor, 5,000 gallon primary tank, and 1,500 gallon pump tank & components, the entire Eastern and Western systems will be removed and/or abandoned in place per Humboldt County Standards. This includes the bark filters, tanks, pumps, manholes and street pipes. At this time, the project is projecting a three phased development with Phase I to include the existing town plus an affordable home project, and Phase II and Phase III to include both residential and industrial/business development (See Tables 4, 5 & 6 below).

The WWTP has been designed to be expandable which will allow additional components to be added as future phases are completed. The summary below outlines the development of the wastewater system. This is also detailed in the Wastewater Flow and Dispersal Study (Appendix C). WWTP design drawings have been prepared and are included with this submittal under separate cover.

Phase I – WW System Development

Phase I of infrastructure development of the waste water system would involve the following:

1.) Replace the Eastern and Western wastewater collection, treatment and disposal systems with a new treatment plant and land discharge dispersal system (Leachfields).
2.) Size the new treatment plant and dispersal system to treat the wastewater load as noted in Table 4 below.
3.) Replace all sewer mains and laterals, with new plumbing.
4.) Replace the main transport line between the existing town and the proposed treatment plant, including replacement/removal of two existing holding tanks located near the Post Office and just below the Hostelry.
5.) Keep and utilize existing tanks and components for the Cookhouse.
6.) Reconstruct existing equalization pond and size for 187% of Phase I Estimated Daily Wastewater Flow (Appendix C, Sheet 8).

Table 4. Full Build-Out Phase I and Projected Sewer Connection Needs
(From Appendix C – Flow Study)

Proposed Use	**Number of Units**	**Sewer Connection**	
Residential Low Density (RL)	102 Lots	Yes	
Residential Medium Density (RM)	84-units	Yes	
Commercial General (CG)[1]	9 Lots	7 Lots with Sewer Connections	2 Lots with no sewer connection
Public Facilities (PF)	2 Lots	No Connection	
Public Recreation (PR)	6 Lots	No Connection	
Commercial Recreation (CR)	11 Lots	3 Lots with Sewer Connections	8 Lots with-no Sewer Connection
Industrial Coastal Dependent (MC)	2 Lots	No Connections	
Natural Resources (NR)	1 Lot	No Connection	

1. *Includes Cookhouse, Hostelry, Museum, and Woman's Club.*

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Phase II – WW System Development

Phase II includes new residential and low income housing:

> Phase II infrastructure expansion of the wastewater treatment system begins once all of the Phase I developed lots are connected to the new system. Phase II of the project expands the treatment plant and dispersal area as development of new residential parcels occur. The proposed final build-out for Phase II of this project will consist of 105 new single-family residential units and 62 multi-family units (See Table 5 below).

Table 5 – Full Build-Out Phase II and Projected Sewer Connection Needs
(From Appendix C – Flow Study)

Current Use:		
None		
Proposed Use:		**Sewer Connection**
Residential Low Density (RL):	105 lots	Yes
Residential Medium Density (RM):	62 lots	Yes
Total Proposed New Residential Lots = 167		

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Phase III – WW System Development

Phase III includes business park (See Table 6):

> Phase III of this project involves the construction of a business park and coastal dependent industrial development. Based on Table 1.1 in the enclosed EIR, the project proposes approximately 35.2 acres for industrial/coastal dependent businesses along with an 18.6 acre business park. Phase III is the most difficult phase of the project to predict wastewater flows for because so much of this part of the development depends on individual and business investments. However, the SPG has made some preliminary estimations on effluent volumes and for the purpose of design flows (Table 5 in Appendix C).
>
> The County adopted Master Plan document and the EIR evaluation both included calculations and sizing to accommodate the business park and coastal dependent industrial zoned areas. It’s estimated that the type and intensity of development that may occur, given the proximity to the coast and size of parcels, that effluent produced from these sites would be equivalent to that produced by commercial grade kitchens, their customers, and any future business development employees.

Table 6 – Full Build-Out Phase III and Projected Sewer Connection Needs
(From Appendix C – Flow Study)

Current Use:		
None		
Proposed Use:		Sewer Connection
Business Park (MB):	24 lots	Yes

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ROWD–Town of Samoa: Design Documents & Calculations, 4th Submittal

Report of Waste Discharge - Town of Samoa
Design Documents and Calculations – 4th Submittal

ero Discharge
Waste Water Treatment and Disposal Facility
Town of Samoa
Humboldt County, CA

DRAFT

Owner – Samoa Pacific LLC

Engineer: California Engineering Company, Inc.

Date: September, 2015

Prepared by: David L. Swartz, PE, PLS, SD, SP

SITE CHARACTERIZATION AND SUITABILITY ASSESSMENT

The proposed waste dispersal area is located south of the existing town development and west of Vance Avenue, in the vicinity of the existing disposal area. Consultants conducting subsurface investigations in this area have observed thick sand deposits, typical of the sand dunes of the Samoa Peninsula. Additionally, recent subsurface investigations have revealed stratification within the shallow subsurface that is consistent with sand dune morphology. Appendix D provides detailed soil logs that are located within the proposed project area.

This project dedicates 8.5 acres of total area upon which the treatment facility and dispersal area is located. Based on some simple calculations which incorporate effluent flows for the final proposed build-out, and a conservative loading rate of 0.69 gallons/ft^2/day, the SPG calculates approximately 3.2 acres is needed for the proposed final build-out leachfield. The area designated for the wastewater treatment facility is over 8.5 acres, thereby adding a safety factor in the event of system failure and replacement. There are several key elements that were considered in selecting this site:

1.) The existing system has been located in this vicinity for decades, and includes an equalization pond which is a proposed component of the new WWTP.

2.) The topographic elevations are some of the highest elevations on the property and thereby provide for some of the greater separations between the bottom of the treatment area (leach trench) and measured depths to groundwater. Local groundwater has been measured at depths ranging between 9 and 21 feet below the ground surface (Appendix D), which equates to approximately 3 to 5 feet above mean sea level, with tidal influences causing minimal fluctuations.

3.) Being so close to the coast is a concern with any development in connection with the projected sea level. In this area, the Coastal Commission has required build-out to consider a 4.5 foot rise in sea level over the next 200 years. Again, with the wastewater treatment area being at the highest undeveloped elevations above sea level on the property, the SPG considers this the safest location for the proposed WWTP.

4.) The soils in this area have been well documented as sands, with upper horizons displaying dune morphology/bedding characteristics and have been found to be relatively homogeneous throughout the dispersal area.

5.) Protection of groundwater pursuant to the Basin Plan, specifically from nitrate, coliform and groundwater mounding influences is a critical component to the proposed system. A detailed study was conducted between November 2014 and February 2015 which modeled the impact of effluent to groundwater (Appendix F - SHN Report). This report

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demonstrates through a field study, modeling efforts, and historical data, the nitrate influences to the groundwater will be well below basin plan policy concentrations.

WWTP DESIGN DOCUMENTS AND CALCULATIONS

The WWTP design selection process was a key consideration throughout this decade long process. Several treatment and disposal options were studied, including but not limited to ocean outfall disposal, treatment wetlands, rapid infiltration basins, package activated sludge treatment plants, and connecting to the surrounding communities of Manila and Eureka. Given the opportunities and constraints of the site and expected effluent limits, it was decided that a multi-step treatment process coupled with subsurface disposal was the best choice for this site

Given the outside external constraints placed on the project, and extremely low target effluent limits, there are few technologies accepted in California that would provide a high level of treatment. The external factors, in effect, designate the design technology used for this project which considers a series of settling, equalization, filtration, denitrification and disinfection processes.

The proposed treatment plant provides the following processing of wastewater influent.

1. Primary settling with filtration will occur in a series of four 25,000 gallon concrete, two compartment septic tanks (100,000-gal total) plumbed in parallel. Phase I build-out is anticipated to have an average daily wastewater flow of 23,902 gallons per day. These tanks will have a retention time of less than 3 days, yet provide for about 90% of primary settling of solids. The tanks' outlets will be furnished with Orenco Inc. Bio-tube filters, which further screen out solids prior to entering the equalization pond.

2. Secondary effluent settlement with flow equalization will occur in the area currently occupied by the existing wastewater pond. The design calls for some re-grading and reconstruction of the pond, and for the new pond to be lined with a high strength geomembrane to prohibit any leakage. The pond useable volume is approximately 150,000 gallons (Phase I), which provides 3 days of storage/settling of peak wet weather flows, including 1 ft. of free board. The pond also serves to equalize the flows that are sent to the treatment plant, thus limiting the potential of overloading the plant and also serves to simplify operations and maintenance.

3. The Pre-Anoxic Basin will recirculate with the packed bed media filters and reduce the nitrogen between 50-70 percent.

4. Filtration and recirculation (4:1 ratio) through advanced packed bed media filters are estimated to reduce the BOD and TSS down to levels

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approaching or below 10 mg/l (Orenco, Inc. Manufacturer specifications).

5. Carbon/ Alkalinity addition will assist with the denitrification in the post anoxic tank.
6. The post anoxic tank provides for the conversion of nitrate to ammonia prior to entering the up-flow filter.
7. Up-flow filter will denitrify, thus further reducing the nitrogen through conversion to below 10 mg/l.
8. Polishing packed bed media filters will provide final polishing and ensure that the BOD and TSS remain below the 10mg/l effluent limits.
9. UV Disinfection will utilize UV Pure's Hallett 30 Wastewater System for final treatment.
10. Disposal will utilize Infiltrators, with zones that are dosed between 2-3 times per day. Light doses, will allow for drying of the leach disposal areas, and spread out the effluent over a larger footprint which will reduce the impacts on groundwater mounding.

Treatment Effluent Limits – based on the Regional Board reviews to date, an earlier WDR permit draft and subsequent conversations with Regional Board staff, the above system is designed to meet or exceed the following effluent limits:

Biochemical Oxygen Demand (5-day @ 20C)	10 mg/l Average Monthly
Total Suspended Solids	10 mg/l Average Monthly
Total Nitrogen as N	10 mg/l Daily Max
Total Coliform Organisms	1.1 MPN/100 ml Monthly Median

Design Documents_– Attached as a separate package, however considered a part of this 4th submittal, are the 65% WWTP design documents (90% complete on the process equipment), which provide detailed construction elements for this WWTP. The Process and Instrumentation Electrical Design is currently underway.

Calculations – The WWTP design calculations pertaining to loading rates and sizing of the WWTP filters are shown at the end of this section. Other design calculations used for the treatment plant design such as the untreated influent characterization flows can be found in the attached appendices.

Phase I Treatment Plant - The current treatment plant for Phase I expected flow rate is 23,092 gal/day Average Dry Weather Flow (ADWF) however, the Phase I treatment plant design flow rate is 44,650 gal/day ADWF or 87% above the anticipated flow rate. This higher design flow rate has been calculated in order to provide a significant safety factor on the system.

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Existing vs. Future Flow Rates for Phase I - The existing system is dilapidated and past its useful life. It has been reported by SPG staff that there is significant infiltration and inflow into the system, especially in areas where infrastructure is located below 8 feet above mean sea level. The Wastewater Flow Study detailed in Appendix C, provides a detailed analysis of the flow rates for Phase I, both pre and post completion. In summary the flow study identifies the current average daily flow as 18,977gallons per day, where the projected average flow rate after completion of Phase I is 23,902 gallons per day, a 20.6% increase in overall flows from the existing development vs. the proposed development of Phase I outlined herein. Although there is an increase in flow, the proposed configuration of the treatment plant will regulate flows to the leachfield and will provide a higher level of effluent to the receiving waters than they are currently receiving.

WWTP EFFLUENT DISPERSAL DOCUMENTS AND CALCULATIONS

Dispersal of treated effluent is proposed via pressurized leach trenches utilizing Infiltrator chambers. Pressurized 1 -inch PVC Schedule 40 leach pipe will be secured to the top of the chamber with orifices facing up.

Under the current plan, wastewater will essentially meet the effluent water quality standards prior to discharging to the dispersal field. Due to the low levels of nutrient loading of effluent, a bio-mat buildup at the trench/soil interface is not anticipated. Current design criteria includes dividing the dispersal/leach field into 13 zones. The goal is to disperse effluent to each zone and provide adequate resting time between doses so any one zone would have adequate time to dry prior to receiving additional effluent. **See Appendix C for the detailed flow study.**

The dispersal application rate depends on a number of factors:

1.) Treatment level of effluent
2.) Dispersal dosing methodology (i.e. number and volume of doses)
3.) Potential for bio-mat buildup – as this would become the ultimate percolation rate
4.) Underlying soils most restrictive layer/sensitive receptors

Based on soils analysis and classifications already conducted herein (Appendix D), the soils underlying the dispersal area are primarily sand, with sand typically having a relatively fast percolation rate. However, we have chosen a moderate application rate of 0.69 gal/sf/day to minimize groundwater mounding and nitrate loading**.**

This dispersal field is proposed to be constructed utilizing uick 4 High Capacity Infiltrator Chambers. Leach trenches are proposed to be 36-inches wide spaced 10 feet on center with an average depth of 24-inches. Leachlines are proposed to be 100-feet in length. Based on specification sheets for Infiltrator Chamber, the uick 4 - High Capacity Chamber is 34-inches wide at the base and 16-inches high at the crest (Specification Sheet 12 of 18). See Table 1 below for leachfield absorption area calculations.

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The master plan dispersal field is shown on Figure 1-2 herein. The dispersal fields are color coded to match the phases of the project, projected expansions of the WWTP, and collection system. A detail of a dispersal field is shown in Appendix C. The site soils are characterized in Appendix D herein, however are considered to be sand.

Table 1. Projected Leachfield Absorption Area Required by Phase
(Also Table 8 in Appedix C – Flow Study)

Phase	**Gallons per day**	**Linear Loading Rate**	**Absorption Area Required (ft^2)**	**Acres Require** ***(1 acre = 43,560 ft^2)***	**Number of Zones**	**Absorption Area (ft^2) (5,000 ft^2/zone)**	**Acres Utilized**
I	44,650[1]	0.69	64,710	1.48	13	65,000	1.5
II	21,739	0.69	31,505	0.72	10	50,000	1.4
III	7,200	0.69	10,434	0.24	3	15,000	0.30
Total Acres Required for full build-out						**2.44**	
Total Acres Dedicated for full build-out						**3.2[2]**	

1. Design Flow, 87% above calculated flow
2. Based on the leachfield lay-out as shown in Figure 1, greater than 3.2 acres have been designated for the required 2.4 acres needed for full build out of this system, providing a greater than 20% safety factor. The entire land designated for wastewater infrastructure is 8.5 acres, which provides for greater than 100% replacement leachfield area.

PHASE I DISPERSAL

The WWTP has been designed for a wastewater load of 44,650 gallons. This is projected to provide sufficient factor of safety within this system. When looking at the dosing of the leachfields in Phase I, utilizing 44,650 gallons per day and 13 zones, each zone is projected to receive 3,434 gallons per day. Each zone will have 5 lines, each 100 feet in length. We propose to dose each zone 6.3 times per day.

Using the estimated flows for Phase I of 23,902 gallons would provide for each of the 13 zones to receive 1,838 gallons per day. With a dose of 704 gallons per dose, that provides each zone with 2.6 doses per day. Additionally, having an equalization pond within the system will allow the dispersal fields to be dosed at variable rates, so as to not over saturate the absorption field.

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SEASONAL GROUNDWATER MONITORING

As discussed herein and shown in the appendices, there is substantial subsurface data that finds no evidence of elevated groundwater for any extended periods of time within 9 feet of the ground surface. Typical indicators of elevated groundwater in localized areas would be redoximorphic features or mottled soils. Redoximorphic features are extremely important indicators in subsurface dispersal field data research and design as they are indicative of seasonal saturated conditions within the soils.

With the determination made that elevated groundwater for extended periods of time does not saturate the vadose zone of the underlying soils. A seasonal groundwater study was commenced to determine the impacts, if any, of seasonal or intermitted elevated groundwater and to what extent localized and intermittent conditions such as rainfall and tide have on the groundwater elevation. Groundwater data was collected and groundwater modeling was conducted by SHN Engineers (Appendix F) across the designated dispersal area. As part of their analysis, temporary groundwater monitoring wells were installed by Freshwater Environmental (TW-1, TW-2 and TW-3) which document the gradient of groundwater flow.

Based on this report, three groundwater monitoring wells (MW-1, MW-2, MW-3) were installed by Pacific Watershed Associates to a depth of 25 feet below ground surface (bgs). These wells were monitored at both low and high tides without rainfall to ascertain the impact of tides without other influences on the groundwater. Additionally, these wells are monitored just prior and immediately following rainfall events, again to understand the relationship between rainfall amounts and groundwater elevations. The results are summarized in the following tables, which indicate that the underlying groundwater lense does not mimic tidal influence, thus it is probably not a "perched aquifer". The tidal influences on groundwater are shown to effect groundwater to within 1/2–inch elevation change.

Based on the data summarized herein and presented in the appendices, it does not appear that the groundwater fluctuates considerably underneath the designated disposal area.

Solids Handling Plan

The WWTP designed for the Samoa development will produce a byproduct called sludge. Periodically, this material will have to be physically removed from within the facility and disposed of off-site. The design collection system flows all raw wastewater into a battery of holding (septic) tanks (4 x 25,000 gal each – Phase I) for the purpose of initial settling before being pumped into a large equalization pond. Primary solids handling focuses on the operation and maintenance of the concrete holding tanks, however, it is recognized that over the long term the equalization pond may also require removal of sludge.

With average daily flows at 23,902 gpd (Phase I), this provides approximately three full days of setting time in the primary tanks, whereby approximately 90 percent of

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Observation Well Log - Field Data

Project Name Samoa LLC **A.P. No.** 401-031-065

Observation Well No.: MW-1 **Depth of Pipe:** 25' bgs **Elevation of Pipe above Ground:** 19.5"

Date	Time	Well Number	Depth to Water Surface (from top of pipe)	Pipe Height (above ground)	Depth to Ground Water	Rainfall During the Past 24 hours	Total Rainfall to Date	Comments
3/12/2015	4:00 PM	MW-1	103.5	19.5	**84**	0	27.03	Depth to water reading is approximate and un-stabilized. High tide reading. Tide at 4:00 P.M. = 3.72" above mean sea level.
3/16/2015	11:05 AM	MW-1	71.5	19.5	**52**	0	27.57	Post-storm monitoring. High tide reading. Tide at 11:05 = 15.48" above mean sea level.
3/23/2015	12:35 PM	MW-1	93	19.5	**73.5**	0.49	29.23	High tide reading. Tide at 12:35 P.M. = 1.92" above mean sea level.
3/24/2015	9:45 AM	MW-1	100	19.5	**80.5**	0.6	29.83	Low tide reading. Tide at 9:45 A.M. = 48" below mean sea level.
3/25/2015	11:30 AM	MW-1	103	19.5	**83.5**	0	29.83	Low tide reading. Tide at 11:30 A.M. = 41.64" below mean sea level.
4/6/2015	8:50 AM	MW-1	102	19.5	**82.5**	1.66	31.97	Low tide reading. Tide at 8:50 A.M. = 37.8" below mean sea level.
4/7/2015	8:58 AM	MW-1	100	19.5	**80.5**	0.06	32.03	Low tide reading. Tide at 8:58 A.M. = 42.6" below mean sea level.
4/7/2015	2:50 PM	MW-1	99	19.5	**79.5**			High tide reading. Tide at 2:50 P.M = 20.16" above mean sea level.
4/8/2015	9:35 AM	MW-1	99	19.5	**79.5**	0	32.03	Low tide reading. Tide at 9:35 A.M. = 43.2" below mean sea level.
4/8/2015	3:40 PM	MW-1	99	19.5	**79.5**			High tide reading. Tide at 3:40 P.M. = 17.4" above mean sea level.

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Observation Well Log - Field Data

Project Name Samoa LLC **A.P. No.** 401-031-065

Observation Well No.: MW-2 **Depth of Pipe:** 25' bgs **Elevation of Pipe above Ground:** 17"

Date	Time	Well Number	Depth to Water Surface (from top of pipe)	Pipe Height (above ground)	Depth to Ground Water	Rainfall During the Past 24 hours	Total Rainfall to Date	Comments
3/16/2015	10:55 AM	MW-2	210	17	**193**	0	27.57	Post-storm monitoring. High tide reading. Tide at 10:55 A.M. = 18.6" above mean sea level.
3/23/2015	12:25 PM	MW-2	132	17	**115**	0.49	29.23	Low tide reading. Tide at 10:55 A.M. = 1.8" below mean sea level.
3/24/2015	9:55 AM	MW-2	214.8	17	**197.8**	0.6	29.83	Low tide reading. Tide at 9:55 A.M. = 47.88" below mean sea level.
3/25/2015	11:37 AM	MW-2	223	17	**206**	0	29.83	Low tide reading. Tide at 11:37 A.M. = 40.92" below mean sea level.
4/6/2015	8:57 AM	MW-2	221	17	**204**	1.66	31.97	Low tide reading. Tide at 8:57 A.M. = 36.96" below mean sea level.
4/7/2015	8:50 AM	MW-2	222	17	**205**	0.06	32.03	Low tide reading. Tide at 8:50 A.M. = 43.2" below mean sea level.
4/7/2015	2:57 PM	MW-2	222	17	**205**			High tide reading. Tide at 2:57 P.M. = 20.16" above mean sea level.
4/8/2015	9:31 AM	MW-2	221.5	17	**204.5**	0	32.03	Low tide reading. Tide at 9:31 A.M. = 43.56" below mean sea level.
4/8/2015	3:44 PM	MW-2	221	17	**204**			High tide reading. Tide at 3:44 P.M. = 17.4" above mean sea level.

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Observation Well Log - Field Data

Project Name Samoa LLC **A.P. No.** 401-031-065

Observation Well No.: MW-3 **Depth of Pipe:** 25' bgs **Elevation of Pipe above Ground:** 19.5"

Date	Time	Well Number	Depth to Water Surface (from top of pipe)	Pipe Height (above ground)	Depth to Ground Water	Rainfall During the Past 24 hours	Total Rainfall to Date	Comments
3/12/2015	1:15 PM	MW-3	91.5	19.5	**72**	0	27.03	Depth to water reading is approximate and un-stabilized. Low tide reading. Tide at 1:15 P.M. = 22.08" below mean sea level.
3/14/2015	3:00 PM	MW-3	62.5	19.5	**43.0**	0	27.03	Pre-storm monitoring. Low tide reading. Tide at 3:00 P.M. = 30.84" below mean sea level.
3/16/2015	10:45 AM	MW-3	60.5	19.5	**41**	0	27.57	Post-storm monitoring. High tide reading. Tide at 10:45 A.M. = 20.88" above mean sea level.
3/23/2015	12:15 PM	MW-3	57	19.5	**37.5**	0.49	29.23	Low tide reading. Tide at 12:15 P.M. = 4.56" below mean sea level.
3/24/2015	10:06 AM	MW-3	51.5	19.5	**32**	0.6	29.83	Low tide reading. Tide at 10:06 A.M. = 47.4" below mean sea level.
3/25/2015	11:43 AM	MW-3	63	19.5	**43.5**	0	29.83	Low tide reading. Tide at 11:43 A.M. = 40.2" below mean sea level.
4/6/2015	9:04 AM	MW-3	62	19.5	**42.5**	1.66	31.97	Low tide reading. Tide at 9:04 A.M. = 35.76" below mean sea level.
4/7/2015	8:45 AM	MW-3	53	19.5	**33.5**	0.06	32.03	Low tide reading. Tide at 8:45 A.M. = 43.32" below mean sea level.
4/7/2015	3:02 PM	MW-3	53	19.5	**33.5**			High tide reading. Tide at 3:02 P.M. = 20.16" above mean sea level.
4/8/2015	9:26 AM	MW-3	55	19.5	**35.5**	0	32.03	Low tide reading. Tide at 9:26 A.M. = 43.8" below mean sea level.
4/8/2015	3:48 PM	MW-3	55	19.5	**35.5**			High tide reading. Tide at 3:48 P.M. = 17.4" above mean sea level.

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settleable solids will be removed from the raw effluent. These collection/holding tanks are water tight, and have two chambers, a solids and liquid side, separated by a baffle. The liquids side of the tank contains an Orenco, Inc. bio-tube effluent filter, prior to exiting to a pumping station. The purpose of this filter is to further reduce the amount of solids that are pumped to the equalization pond located adjacent to the treatment plant.

The characteristics of the raw sewage effluent for Phase I is expected to be consistent with the historical data, or that of residential strength effluent. For this reason, the following calculations are provided as a check to ensure that the proposed tanks, at least in theory, are capable of several years of service prior to any solids handling.

Theoretical Accumulation Rates

Based on historical data from the treatment plant, the influent raw water BOD_5 is approximately 150 mg/l, and the TSS is approximately 100 mg/l. At the design flow rate, these loading rates produce approximately 93 lbs/day primary loading. We anticipate anaerobic digestion to occur which will decompose approximately 50% of this loading down to 46.5 lbs/day. Dewatered sewage sludge density is approximately 45 lbs./cu-ft., sludge is estimated to be 20%-30% solids. Considering that the sludge is 75% water, and 25% solids, we estimate the bulk density of the sludge mixture to be 58 lbs/cu-ft.

The approximate solids side of a holding tank is 20,000 gallons or 2,673 cu-ft. Removal of solids is to occur when the tank is approximately 1/3 full. Since there are 4 holding tanks, this equates to 3,560 cu-ft. of total storage. This much storage provides approximately 7.8 years of theoretical storage.

Given that the equalization pond is 150,000 useable gallons, and is projected to receive approximately 10% of the settleable solids, we assert that it will be many decades before removal of any sludge is necessary from the equalization pond.

Operations and Maintenance of the Septic/Holding Tanks

The final design documents will contain a detailed O&M Manual for operating and maintaining the treatment plant, however, it should be noted herein that quarterly sludge level readings will document accumulation for each of the holding tanks. Solids removal will occur based on best practices, not theoretical calculations. Additionally, as part of the ongoing maintenance, the bio-filters will be removed and cleaned on a monthly basis as part of ongoing maintenance of the system.

Types of Sludge/Solids Handling Plans

Regulations governing the treatment and disposal of domestic septage depend on the type of facility receiving the septage. Federal regulations identify four major treatment options (USEPA, 1993):

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1. Land application is the spreading of domestic septage on land at controlled rates to fertilize crops and improve the soils. This domestic septage can either be sprayed or spread on the soil surface, or plowed, disked, or injected into the soil. The specific rules governing land application differentiate between non-public contact sites and public contact sites.

2. Septage can be discharged into treatment works (sewage and wastewater treatment plants) for treatment as follows. Domestic septage to septage-only treatment works, or both domestic and non-domestic septage to municipal facilities that normally treat domestic sewage. This discharge is permissible provided that a treatment facility is available which will accept the septage.

3. Septage can be placed in a landfill or other surface disposal site. Again, the rules of the landfill operator and applicable State and Federal rules must be followed.

4. Septage can be incinerated. In this case, the rules of the incinerator operator and the applicable State and Federal rules must be followed.

Septage Treatment and Disposal Methods - California

There are five primary methods for treatment and disposal of septage practiced in California. The five methods are consistent with and fit within the four disposal options identified by EPA. The methods are: 1) Land application 2) Co-treatment at a sewage/wastewater treatment plant 3) Independent septage treatment facilities 4) Septage ponds with subsequent solids disposal and 5) Disposal at a sanitary landfill. There are some variations that may combine several treatment options but for purposes of this report these will not be separated out or quantified.

Samoa WWTP Current Solids Handling Plan

Consideration was given to the above methodologies for handling of the sludge produced by the WWTP periodically. Namely, because the septage removal is anticipated to be done infrequently, periodic removal by hauling to a licensed facility has been determined to be the best option for the Town Samoa. According to a publication by Chico State University California Wastewater Training and Research Center, 2002, there are several facilities that are available to accept septage currently, and are listed below in order of preference:

Steve’s Septic Service – Mc innleyville, Ca.

Greater Eureka Area WWTP – Eureka, Ca. Ukiah WWTP – Ukiah, Ca.

Anderson Septic Ponds – Anderson, Ca. City of Hayfork

It’s anticipated that septage will be pumped and hauled by Steve’s Septic Service. Currently Steve’s Septic Service is below maximum capacity and is able to collect and process additional solids into their system (personal communication from Steve’s Septic, Sept. 2015). However, in the event there is an issue with this private disposal facility, there are several other options available.

Emergency Back-up Power

The Samoa WWTP and main pump station (located next to the four 25,000 gallon concrete septic tanks), are planned to be powered by a single standby generator during power outages. The entire WWTP, pumping station, and discharge pumps to the dispersal field, will have a power requirement of approximately 25 hp. The control room where the programmable logic controller (PLC) and other equipment are contained is anticipated to be supplied with a 400 amp panel, which will suffice for both pumps and equipment.

Until the electrical plans for the WWTP are completed which will include specific load calculations for both in operation, and start up, the exact size and specification of a standby generator will not be known. The WWTP will be served with 120/240 single phase power and conductor.

The standby generator is anticipated (to be verified by an electrical engineer) to be a Generac T03624ANA 45 kW Liquid Cooled Generator, enclosed by a steel case, and will be equipped with an automatic transfer switch that will self-test periodically and exercise the generator. The generator will contain its own fuel tank, (diesel fuel), along with a solar cell battery charger and lighting to signify when the generator is in service.

UV Disinfection Of Effluent

The treatment plant design plans, at the recommendations of the WWTP manufacture, have specified a UV Pure's Hallett 30 Wastewater UV Disinfection System. Orenco, Inc. has partnered with this company and finds that this technology is suitable to work with their products. This UV system is used for residential and light commercial wastewater treatment applications with the ability to treat very low quality wastewaters (low UV transmittance). This particular model can treat flows up to 1 MGD for wastewater, reuse, and potable applications.

Specifications on the unit are outlined below:

Model	Hallett 30 - 1.5" (WW) w/ 4-20 mA	Hallett 30 -1.5" (WW)	Hallett 30 -1" (WW)	Hallett 30 - 1" (WW) w/ 4-20 mA
PART NUMBER (115 Volt)	C000010	C000014	C000021	C000019
PART NUMBER (240 Volt)	C000022	C000015	C000023	C000024
Validation / Certification	Engineered to meet dosing and disinfection requirements of wastewater effluent. Typically a minimum dose of 30 m /cm to reduce coliform			

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	to 200 counts / 100ml. Higher doses available for re-use and non-detect applications (2 counts / 100 ml). In use on Title 22 applications. Approved by the MENV for use in uebec. Certified to AB 1953.
UV Dose	Minimum dose of 30 m /cm at end of lamp life
Minimum UV Transmittance	40%
Max Flow Rate	28 US gpm (106 L/min) (6.36 m /hr) @ 65% UVT, 30 m /cm dose (flow rates depend on required dose and source water UVT)
Water Pressure	0 psi (69 kPa) to 100 psi (690 kPa) units are tested to 240 psi (1.6 MPa)
Dynamic Flow Restrictor	No internal restrictor installed
Pressure Drop at 75% of nominal flow capacity	2.5 psi (17 kPa)
Multiplexed Flow Capacity	Engineered for multiple systems in parallel, for flow rates up to 1 MGD (696 US gpm) (2629 L/min) (158 m /hr)
Redundancy	Additional backup systems can be added cost effectively
Solenoid Shut-Off Valve	Automatic shut-off valve available as option
Inlet and Outlet Connections	1” flexible FIP connection for easy installation
Voltage	Models available in either 115V or 240V configurations (please see different part numbers above)
Protection from Power Fluctuations	115V Models include power conditioner that meets UL 1449. External power conditioner recommended on 240V models
Maximum Power Consumption	175W
Electrical Certification	Intertek ETL (UL, ULC and CE equivalent)
Lamps	Low pressure, high output proprietary lamps contain up to 30 mg of mercury (Hg) rated for 9000 hours (1 year) of continuous use
Maintenance	Onboard 9000 hour lamp life with lamp hour countdown to end of life. Automatic self-cleaning device prevents quartz sleeve from fouling and requires no maintenance
Electronic Ballast	Auto power-regulated smart ballast protected

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	from power fluctuations
Self-Cleaning	Stainless Steel patented automatic wiper-blade system keeps quartz free from scaling or bio-film
On-Board Micro-Processor and Monitor	Patented dual smart UV sensors continuously monitor UV dose, lamp intensity (UVI) and water transmittance (UVT) on-board LED's indicate system status: O , warning or alarm conditions. Optional External digital monitor (HDT) displays above in millivolts.
4-20 mA Analog Output	Not installed
Dry Contacts	Included as standard for remote alarms, auto-dialer integration, or similar.
Remote Alarm	Included as standard on all models.
Dimensions (H, W, D)	32 x 8 x 9” (810 x 200 x 230mm)
Weight – Dry	30 lbs (13.6 kg)
Weight – Wet	32.5 lbs (14.7 kg)
Warranty	1 year limited warranty on bulbs and sensor probes 3 year limited warranty on electrical components and quartz sleeve 5 year limited warranty for structural, hardware and mechanical components
EPA FIFRA Certified	EPA Est. No. 075213-CAN-001
Patents	Patented in US 6,707,048, Canada 2,463,503, Australia 2002333084, Mexico 248805, Patents pending in Europe, Eurasia, apan, U

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WWTP Order of Construction – Phase I

Construction Activities 1, 2 and 3 to be conducted concurrently.

1. Construction of the proposed new WWTP, and septic tanks through leachfields:
    a. Install four 25,000-gallon ensen Precast septic tanks, in Parallel (see note 1, sheet 6).
    b. Install ensen Precast concrete sanitary sewer manholes (SSMH) (see notes 2-3, Sheet 6).
    c. Place 6" PVC SDR-35 pipe for equalization (see note 4, Sheet 6).
    d. Install 10,000-gallon ensen Precast pump tank (see note 38, Sheet 6, see Sheet 13 for Orenco, Inc. pump components).
    e. Install 1,750 linear feet (LF) of 4-inch PVC SCH 80 sewer force main between pump tank and equalization pond (see note 6, Sheet 6).
    f. Concurrent with step "e" above - Install 546 LF 10-inch PVC SDR-35 with associated SSMH (see notes 7, 8, 9, 32, and 33, Sheet 6).
    g. Install 101 LF 12-inch PVC SDR-35 (see notes 30-31, Sheet 6).
    h. Install six Orenco, Inc. A -Max 300 units (see notes 9-14, Sheet 7).
    i. Install three Orenco, Inc. A -Max 250 units (see notes 16-18, Sheet 7).
    j. Install pump two stations (see notes 15 and 19, Sheet 7, construction details Sheet 11).
    k. Install two 8' x 12' treatment control buildings (see notes 23 and 24 Sheet 7, construction details Sheet 17).
    l. Install A -Max pipe network (see note 21, Sheet 7, details Sheet 8).
    m. Construct concrete generator pad (see note 30, Sheet 7).
    n. Install 20,000-gallon ensen Precast Anoxic tank (see note 20, sheet 7).
    o. Install 25' x 95' Upflow Filter (see note 22, Sheet 7, details sheet 18).
    p. Rehabilitate equalization pond (see note 25, Sheet 7, details, sheet 15).
    q. Construct Pre-Anoxic pond (see note 26, Sheet 7, details, sheet 15).
    r. Install Orenco, Inc. equalization pump basin (see note 27, sheet 7, details on sheet 15).
    s. Install Orenco, Inc. Pre-Anoxic pump basin (see note 28, Sheet 47, details sheet 15).
    t. Construct leachfields.

2. Begin to install new wastewater collection system from septic tanks to residence:
    a. Install 963 LF 8-inch PVC SDR-35 with associated SSMH (see note 29, sheet 6, note 1-4, & 23-25, Sheet 4).
    b. Install 785 LF 8-inch PVC SDR-35 with associated SSMH (See notes 11-13 & 20-22, Sheet 4).
    c. Install 314 LF 6-inch PVC SDR-35 with associated SSMH (See notes 1-2, 23-24, 35, sheet 5).

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    d. Install 221 LF 6-inch PVC SDR-35 with associated SSMH (See notes 26-27 & 13, 14 & 16, sheet 4).
    e. Install 1,525 LF 8-inch PVC SDR-35 with associated SSMH (See notes 15, 28 sheet 6 notes 15, 28-29, sheet 4, note 4, 8, , 9, 10, 12, 28, 30, 32, 34 sheet 5).
    f. Install 1,028 LF 6-inch PVC SDR-35 with associated SSMH (See notes 13 - 17, 36, 38-46, sheet 5).
    g. Install 637 LF 4-inch PVC SCH 80 sewer force main (See note 37, sheet 5).
    h. Install 765 LF 6-inch PVC SDR-35 with associated SSMH (See notes 3, 5, 11, 26, 27, 31, 33 sheet 5).
    i. Install 86 LF 2-inch PVC SCH 80 force main (See note 25, sheet 5).
    j. Install pump vault and standby generator (See note 46, sheet 5).
    k. Install associated clean-outs (COTG) (see notes 18-22, sheet 5).
    l. Install 691 LF 8-inch PVC SDR-35 with associated SSMH and COTG (See notes 7, 29, sheet 5 19, 20, 21, 22, sheet 6).
    m. Install 637 LF 6-inch PVC SDR-35 with associated SSMH and COTG (See notes 6, sheet 5 14, 16-18, 23-26 sheet 6).
    n. Install 373 LF 6-inch PVC SDR-35 with associated SSMH and COTG (See notes 17, 30, sheet 4).
    o. Install 459 LF 3-inch PVC SCH 80 force main with associated SSMH (See notes 10, 18 sheet 4).
    p. Install pump vault and standby generator (See note 9, sheet 4).
    q. Install 545 LF 2-inch PVC SCH 80 force main with associated SSMH (See notes 10, 18 sheet 4).
    r. Install 870 LF 8-inch PVC SDR-35 with associated SSMH and COTG (See notes 710-13, 34-37 sheet 6).

3. Simultaneous construction of 84-unit multi-family housing

4. Begin Operations of New WWTP
    a. Fill all tanks and pods with clean water
    b. Disconnect Cookhouse plumbing from Bark Filter A and redirect to new septic tanks.
    c. Simultaneously begin to connect existing residents to the sewer mains
    d. Connect 84-unit multi-family housing to WWTP

5. Begin Construction of Commercial Properties

Phases II and III to follow

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ROWD–Town of Samoa: Design Documents & Calculations, 2nd Submittal

California Engineering Company, Inc
Main Office
1110 Civic Center Blvd., Suite 404
Yuba City, CA 95993
530-751-0952 Office
530-751-0953 Fax
www.cecusa.net

Report of Waste Discharge- Town of Samoa
Design Documents and Calculations – 2nd Submittal

Zero Discharge
Waste Water Treatment and Disposal Facility
Town of Samoa
Humboldt County, Ca.

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Owner – Samoa Pacific LLC

Engineer: California Engineering Company, Inc.

Date: April, 2015

Prepared by: David L. Swartz, PE, PLS, QSD, QSP

SITE CHARACTERIZATION AND SUITABILITY ASSESSMENT

The waste disposal area is located south of the existing development, and west of Vance Avenue among the newer proposed development and in the vicinity of the existing disposal area. **Appendix** C **&** D provides a detailed examinations of the proposed site. The site dedicates 8.5 acres of total area upon which the treatment facility and disposal area is located. This area is nearly double the size necessary, thus providing a factor of safety of 2 for the disposal area. There are several key elements that were considered in selecting this site:

1.) The existing system has been located in this vicinity for decades, and includes an equalization pond, and shows no signs of failure.

2.) The topographic elevations are such that the area is well above the groundwater. Local groundwater ranges in elevations between 3-5 feet, with tidal influences causing approximately 1-2 feet fluctuations. Much of the ground surface in this area is around 20’ and some of the western areas are around elevation 14’. Thus this location is large enough, and high enough to protect the system from sea level rise of 4.5’ as required by the Coastal Commission, and maintain separation between the groundwater and disposal trenches of more than 9 feet given the tidal influences.

3.) The soils in this area are well documented and homogeneous and present well drained characteristics. The soils are basically sand.

4.) Protection of groundwater pursuant to the Basin Plan, specifically from nitrate, coliform and groundwater mounding influences. This issue was studied closely and a detailed study was conducted between November 2014 and February 2015 which modeled the groundwater report outlines the impact See Appendix F SHN Report. This report demonstrates though a field study, modeling efforts and historical data, that given the effluent limitations anticipated, to be discharged from the treatment plant, the nitrate influences to the groundwater will be well below basin plan policy concentrations.

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1. Information used from the 2006 Samoa Town Master Plan EIR

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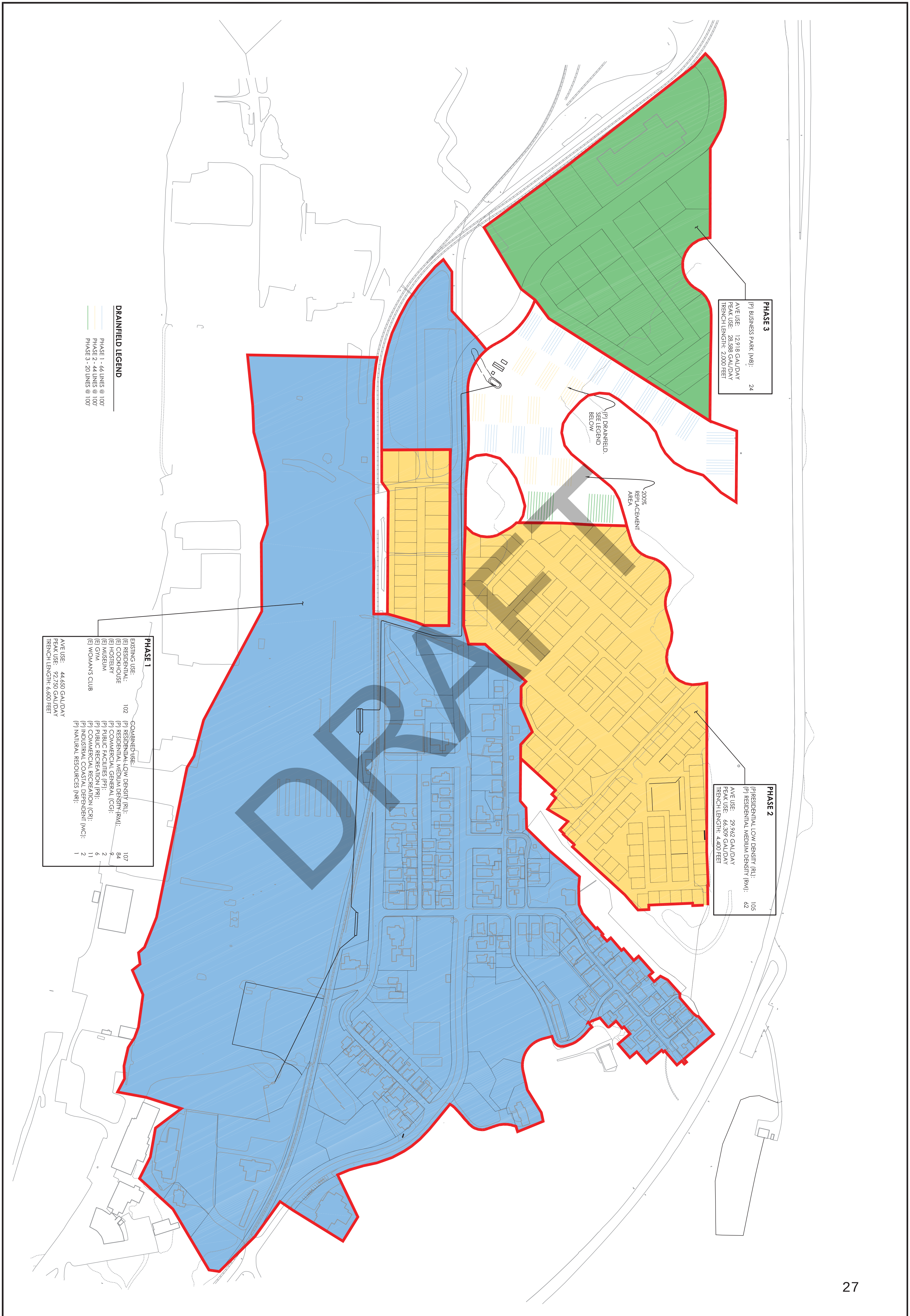

PROJECT NUMBER
10-202

SHEET 1 OF 1

SAMOA WASTEWATER TREATMENT PLANT REHABILITATION PROJECT

WASTEWATER FLOW STUDY

TOWN OF SAMOA, HUMBOLDT COUNTY, CALIFORNIA

CEC
Office (530) 751-0952
Fax (530) 751-0953
1110 Civic Center Blvd., Suite 404
Yuba City, CA 95993
Engineering - Planning - Surveying - Community Development
www.cecusa.net

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NO.	DATE	DESCRIPTION

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WWTP DESIGN DOCUMENTS AND CALCULATIONS

The wastewater treatment plant design selection process was has been a key consideration throughout this more than decade long process. Original designs planned to utilize the ocean outfall, or transport effluent to Manila and even considered transporting effluent to Eureka. Follow-up designs contemplated a treatment wetlands, similar to Arcata, utilizing the existing areas located on the Peninsula. This were not feasible following their determination from the Coastal Commission as designated ESHA's and their requirements to remove all waste disposal from these areas. Other designs considered technologies similar to Manila, and even package treatment plants such as a PERC plant. However, the regional board staff have indicated that the permit limits would be substantially lower than Manila, which eliminates this from consideration, and a "package" plant is labor intensive, difficult to operate and have very short useful lives, and give the harsh ocean air environment, the useful life make these plants infeasible.

Given the outside external constraints placed on the project, and extremely low effluent limits, there are few proven and tested technologies accepted in California that would provide a level of treatment coupled with an ability to successfully operate given the current labor market in the Eureka area and provide a discharge that would be minimal impact to the successful operation and maintenance of the disposal system. The external factors, in effect, designated the design technology used for this project which was a series of setting, equalization, filtration, denitrification and disinfection processes. The current treatment plant provides the following processing of wastewater effluent.

1. Primary settling with filtration in large 25,000 gal concrete tanks. These tanks will have a retention time of between 8-12 hours and provide for primary settling of solids. The tanks outlets contain biofilters, which help to screen out solids prior to entering the equalization basin.
2. Secondary effluent settlement with flow equalization. This basin provides approximately 3 days of retention, and equalizes the effluent flow into the treatment plant which eliminates the possibility of overloading the system and simplifies operations by providing a near constant flow to the system.
3. Pre-Anoxic Basin will recirculate with the packed bed media filters and reduce the nitrogen between 50-70 percent.
4. Filtration and recirculation (4:1 ratio) through an advanced packed bed media filters will reduce the BOD and TSS down to levels approaching or below 10 mg/l.
5. Carbon/ Alkalinity Addition will assist with the denitrification in the post anoxic tank.
6. Post Anoxic Tank provides for the conversion of nitrate to ammonia prior to entering the upflow filter.
7. Up-flow Filtration/Denitrification – will further reduced the nitrogen through conversion to well below 10 mg/l

1. Information used from the 2006 Samoa Town Master Plan EIR

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8. Polishing Packed Bed Medial Filters – will provide final polishing and are really an insurance that the BOD and TSS remain well below the 10mg/l effluent limits.
9. UV Disinfection
10. Disposal via infiltrators, with approximately 13 doses per day. Light doses, will allow for drying of the leach disposal areas, and spread out the effluent over a larger footprint which will reduce the impacts on groundwater mounding.

<u>Treatment Effluent Limits</u> – based on the limited reviews to date, an earlier WDR permit draft and subsequent conversations with Regional Board Staff the above system is designed to meet or exceed the following effluent limits:

Biochemical Oxygen Demand (5-day @ 20C) 10 mg/l Average Monthly
Total Dissolved Solids 10 mg/l Average Monthly
Total Nitrogen as N 10 Average Monthly
Total Coli form Organisms 23 MPN/100 ml Average Monthly

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<u>Design Documents</u> – Attached as a separate package however considered a part of this 2nd submittal are the 65% WWTP design documents, which provide detailed design drawings demonstrating the WWTP that will be constructed. These documents are nearing completion, and are still lacking some of the actual pump sizing and specifications. Electrical and SCADA drawings, and O&M manuals. However, following this review and concurrence by the Regional Board, these items will be completed and revised design drawings will be resubmitted to the Regional Board for review and approval prior to construction.

<u>Calculations</u> – The WWTP design calculations pertaining to that loading rates and sizing of the WWTP filters etc.. are shown on the following pages. Other design calculations used for the treatment plant design such as the untreated influent characterization, flows, etc.. can be found in the attached appendices.

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1. Information used from the 2006 Samoa Town Master Plan EIR

Orenco®
Orenco Systems®, Incorporated

AdvanTex® Treatment System

Project Name: SAMOA WWTP Project Location: Samoa, CA

Application: Municipal

DESIGN PARAMETERS

The facility addressed in this proposal includes mainly residential units and a few additional commercial/industrial properties. Projected wastewater flow rates and organic loading were provided and based upon historic and projected usage for the existing facility.

Wastewater Flow Rates

Wastewater design flows for the service area were provided by CEC, Inc. on March 16th, 2015 and are outlined in the table below.

Table 1. Hydraulic Design Parameters —Design Average Day Flow (DADF)

Hydraulic Design Parameters for Proposed Facilities		
Service Type	**Flow Assumptions**	**Daily Flow (gpd)**
Municipal		44650

Wastewater Strengths

Predicted wastewater strengths for the service area were provided CEC, Inc. on March 16th, 2015 and are outlined in the tables below. For nitrogen restrictive permit limits, the primary treated effluent should have a minimum temperature of 15ºC, with pH ranging from 7.2 to 8, and a residual alkalinity of greater than 100 mg/L maintained throughout the process. This will typically require an alkalinity feed system.

Table 2. Constituent Loading Assumptions

Parameter	DADF, gpd	Concentration (mg/L)	Primary Treated Load (lbs/day)
Biochemical Oxygen Demand (BOD5), mg/L:	44,650	150	55.89
Total Suspended Solids (TSS), mg/L:	44,650	100	37.26
Total Kjeldahl Nitrogen (TKN), mg/L:	44,650	67	24.97

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Permit Limits and Loading Rates

The following table provides the discharge limitations as provided by CEC, Inc. on March 16th, 2015. The scope of this proposal is pertinent only to BOD_5, TSS, and TN.

Table 3. Permit Limits

Permit Constituent or Parameter	Average
Biochemical Oxygen Demand (BOD5), mg/L:	10
Total Suspended Solids (TSS), mg/L:	10
Total Nitrogen (TN), mg/L:	10

Table 4. Standard AdvanTex Loading Rates

Permit Constituent or Parameter	Design AVERAGE Day	Design MAXIMUM Day
Hydraulic	25 gpd/sq.ft•d	50 gpd/sq.ft•d
BOD_5	0.04 lbs/sq.ft•d	0.08 lbs/sq.ft•d
TKN	0.014 lbs/sq.ft•d	0.028 lbs/sq.ft•d

TECHNOLOGY DESCRIPTION & SIZING

Packed bed filters (PBFs) – incorporating treatment media such as sand, gravel, and textile – have been used successfully for decades to treat onsite wastewater flows. These filters reliably produce high quality effluent that is superior to that discharged by the majority of our nation's municipal treatment facilities. The most effective of these filters is AdvanTex Treatment System. This proposal provides an estimate of system sizing and costs based upon the information provided. This proposal does not constitute a design.

Table 5. Treatment Tank Minimum Recommendations

Tank Stage	HRT @ DADF	VOLUME
Primary	2.0 days	89300 U.S. Gallons
Pre-Anoxic	2.0 days	89300 U.S. Gallons

Table 6. Standard AdvanTex System Sizing

Permit Constituent or Parameter	Load Value (DADF)	Loading Rate	AdvanTex Unit Size
Hydraulic	44650 gpd	25 gpd/sq.ft•d	1786 sq.ft.
Biochemical Oxygen Demand (BOD5), mg/L:	55.89 lbs	0.04 lbs/sq.ft•d	1397 sq. ft.
Total Suspended Solids (TSS), mg/L:	37.26 lbs	0.04 lbs/sq.ft•d	932 sq. ft.
Total Nitrogen (TN), mg/L:	24.97 lbs	0.014 lbs/sq.ft.•d	1783 sq. ft.

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Table 7. Stage 2 AdvanTex System Sizing

Permit Constituent or Parameter	Load Value (EADF)*	Loading Rate	AdvanTex Unit Size
Hydraulic	44,650 gpd - EADF	75 gpd/sq.ft.	595 sq.ft.
Biochemical Oxygen Demand (BOD5), mg/L:	5.59 lbs	0.02 lbs/sq.ft.•d	279 sq.ft.
Total Suspended Solids (TSS), mg/L:	n/a	n/a	n/a
Total Nitrogen (TN), mg/L:	1.25 lbs	0.007 lbs/sq.ft.•d	178 sq.ft.

* Hydraulic load value and loading rate selected using equalized average day design flow

* Pounds shown for all nitrogen constituents are for TKN component only

EQUIPMENT SELECTION

Table 8. Orenco AX-Max Treatment Equipment

First Stage Treatment Unit(s):	(6) AX-MAX300-42
First Stage Pump Basin Unit:	T-MAX-14
First Stage Pumping Setup:	(4) Duplex PF14520
First Stage Treatment Volume:	64800 U.S. Gallons
First Stage Pump Basin Volume:	7500 U.S. Gallons

Second Stage Treatment Unit(s):	(3) AX-MAX200-28
Second Stage Pump Basin Unit:	T-MAX-14
Second Stage Treatment Volume:	27240 U.S. Gallons
Second Stage Pump Basin Volume:	5000 U.S. Gallons
Second Stage Pumping Setup:	(3) Duplex PF7510

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Table 9. Alkalinity Feed System

Feed System:	DCF-3660
Chemical Used:	Soda Ash (Sodium Carbonate)
Feed Rate:	2.6 lbs/hour
30 Day Storage:	22.48 cu. ft.

Table 10. Carbon Feed System

Feed System:	LCF-3048
Chemical Used:	Methanol
Feed Rate:	0.67 U.S. gal/hour
30 Day Storage:	96.5 U.S. Gallons

WWTP EFFLUENT DESIGN DISPOSAL DOCUMENTS AND CALCULATIONS

Disposal is proposed to be via underground individual trenches utilizing a technology called infiltrators. Infiltrators are ½ pipes that are installed just below the ground surface whereby the disposal lines are elevated from the ground surface inside specially designed pipes called infiltrators about 6 inches. Other disposal options are available, and considered and discussed early on with regional board staff members, such as rapid infiltration basins, however, were not selected due to the consideration of this being considered a "surface" discharge, and the potential for groundwater mounding and nitrate concentration and degradation of the underlying ground water. Based on the soil conditions present we do not believe that standard pressure dose trenches installed within the sand soils would be an appropriate technology, as the dune sand is quite fine, and may cause the system piping to plug. Under the current plan waste water will essentially meet the effluent water quality standards prior to discharging to the infiltrator disposal scheme. This water will not cause any bio-mat build up in the soils. Additionally, there will be approximately 13 different zones receiving water successively, so any one zone would have adequate time to dry prior to receiving effluent. **See Appendix C for the detailed flow study.** The dosing philosophy is to dose small doses, and often. Lastly, with spreading the effluent dispersion over a large footprint, the potential for ground water mounding and any nitrate concentration is mitigated.

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The disposal application rate depends on a number of factors;

1.) Treatment level of effluent
2.) Disposal dosing methodology (i.e. number and volume of doses),
3.) Potential for bio mat buildup – as this would become the ultimate percolation rate
4.) Underlying soils most restrictive layer within the vadose zone.

With the effluent discharge requirements being imposed by the Regional Board, the build up of a bio-mat within the disposal area is not concern, thus this would not be considered any limiting factor. Additionally, there will be adequate drying time between the 13 specific dosing areas, which further limit the buildup of any bio-mat within the disposal area. The soils are relatively homogenous as it pertains to percolation rates. Based on soils analysis and classifications already conducted herein, the soils underlying the disposal area are nearly pure sand, which has a very high percolation rate. Standardized septic systems within Humbolt County, with similar soils allow percolation rates of 1.6 gal/sf/day. This is largely for septic tank effluent that has only primary settlement for treatment. For systems which discharge treated effluent, application rates extend up to 9 gal/sf/day in similar soils, as is documented in Appendix __G__ for the Gold Beach and Los Osos Systems. Our focus for selecting an application rate to the soils was to minimize groundwater mounding and any chance of nitrate concentrations to the underlying groundwater, additionally we chose to have more than 200% replacement area

1. Information used from the 2006 Samoa Town Master Plan EIR

available as further design factor of safety. ***The entire area designated for wastewater disposal is 8.5 acres. At full build out this is more than double the area required for effluent disposal.***

Seasonal Ground Water Monitoring

As discussed herein and shown in the appendices, there is substantial subsurface data that find no evidence of elevated groundwater for any extended time periods within 9 feet of the ground surface. Typical indicators that indicate elevated groundwater in localized areas would be redoximorphic features in the soils, or another term that can be used to describe this are"mottles". Redoximorphic features are extremely important indicators in subsurface disposal, field data research and design. These features in the soil are formed by reduction, movement, and oxidation of Iron and Manganese oxides. May times these deposits or nodules are seen with the naked eye during the soil mantel exploration. Often times the low chroma colors of the soils also indicate elevated groundwater over extended time periods.

With the determination made that elevated ground water for extended time periods does not saturate the vadose zone of the underlying soils, a seasonal groundwater study was commenced to determine the impacts, if any, of seasonal or intermitted elevated groundwater, and to what extend localized and intermittent conditions such as rainfall and tide have on the groundwater elevation. Ground water data and ground water modeling was conducted by SHN Engineers across the designated disposal area, and through their analysis ground water monitoring wells were located which document the gradient of underground water flow, will allow future assessments to monitor any nitrate concentrations, and best represent a cross sectional area to represent the groundwater elevations. Three ground water monitoring wells were installed with the recommendations of this report to a depth of 25 feet below ground surface. These wells are monitored at both low and high tides without rainfall to ascertain the impact of tides without other influences on the groundwater. Additionally these wells are monitored just prior and immediately following rainfall events, again to ascertain the potential impacts of moisture falling directly atop the area. The results are summarized in the following table, which indicate that the underlying groundwater lense is probably not a "perched and confined" lense. The tidal influences on groundwater are shown to impact the elevation only by a few inches locally. Rainfall seems to mimic the effect of tides only having minimal impacts on groundwater elevations locally at this site.

Based on the data summarized herein and presented in the appendices it does not appear that the groundwater fluctuates appreciably locally underneath the designated disposal area.

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1. Information used from the 2006 Samoa Town Master Plan EIR

Observation Well Log - Field Data

Project Name Samoa LLC

A.P. No. 401-031-065

Observation Well No.: MW-1

Depth of Pipe: 25' bgs

Elevation of Pipe above Ground: 19.5"

Date	Time	Well Number	Depth to Water Surface (from top of pipe)	Pipe Height (above ground)	Depth to Ground Water	Rainfall During the Past 24 hours	Total Rainfall to Date	Comments
3/12/2015	4:00 PM	MW-1	103.5	19.5	**84**	0	27.03	Depth to water reading is approximate and un-stabilized. High tide reading. Tide at 4:00 P.M. = 3.72" above mean sea level.
3/16/2015	11:05 AM	MW-1	71.5	19.5	**52**	0	27.57	Post-storm monitoring. High tide reading. Tide at 11:05 = 15.48" above mean sea level.
3/23/2015	12:35 PM	MW-1	93	19.5	**73.5**	0.49	29.23	High tide reading. Tide at 12:35 P.M. = 1.92" above mean sea level.
3/24/2015	9:45 AM	MW-1	100	19.5	**80.5**	0.6	29.83	Low tide reading. Tide at 9:45 A.M. = 48" below mean sea level.
3/25/2015	11:30 AM	MW-1	103	19.5	**83.5**	0	29.83	Low tide reading. Tide at 11:30 A.M. = 41.64" below mean sea level.
4/6/2015	8:50 AM	MW-1	102	19.5	**82.5**	1.66	31.97	Low tide reading. Tide at 8:50 A.M. = 37.8" below mean sea level.
4/7/2015	8:58 AM	MW-1	100	19.5	**80.5**	0.06	32.03	Low tide reading. Tide at 8:58 A.M. = 42.6" below mean sea level.
4/7/2015	2:50 PM	MW-1	99	19.5	**79.5**			High tide reading. Tide at 2:50 P.M = 20.16" above mean sea level.
4/8/2015	9:35 AM	MW-1	99	19.5	**79.5**	0	32.03	Low tide reading. Tide at 9:35 A.M. = 43.2" below mean sea level.
4/8/2015	3:40 PM	MW-1	99	19.5	**79.5**			High tide reading. Tide at 3:40 P.M. = 17.4" above mean sea level.
4/14/2015	9:50 AM	MW-1	102	19.5	**82.5**	0.49	32.62	High tide reading. Tide at 10:00 A.M. = 60" above mean sea level.
4/24/2015	4:00 P.M.	MW-1	102.5	19.5	**83**	0.06	32.68	High tide reading. Tide at 6:03 P.M. = 62" above mean sea level.

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Observation Well Log - Field Data

Project Name Samoa LLC

Observation Well No.: MW-2

Depth of Pipe: 25' bgs

A.P. No. 401-031-065

Elevation of Pipe above Ground: 17"

Date	Time	Well Number	Depth to Water Surface (from top of pipe)	Pipe Height (above ground)	Depth to Ground Water	Rainfall During the Past 24 hours	Total Rainfall to Date	Comments
3/16/2015	10:55 AM	MW-2	210	17	**193**	0	27.57	Post-storm monitoring. High tide reading. Tide at 10:55 A.M. = 18.6" above mean sea level.
3/23/2015	12:25 PM	MW-2	132	17	**115**	0.49	29.23	Low tide reading. Tide at 10:55 A.M. = 1.8" below mean sea level.
3/24/2015	9:55 AM	MW-2	214.8	17	**197.8**	0.6	29.83	Low tide reading. Tide at 9:55 A.M. = 47.88" below mean sea level.
3/25/2015	11:37 AM	MW-2	223	17	**206**	0	29.83	Low tide reading. Tide at 11:37 A.M. = 40.92" below mean sea level.
4/6/2015	8:57 AM	MW-2	221	17	**204**	1.66	31.97	Low tide reading. Tide at 8:57 A.M. = 36.96" below mean sea level.
4/7/2015	8:50 AM	MW-2	222	17	**205**	0.06	32.03	Low tide reading. Tide at 8:50 A.M. = 43.2" below mean sea level.
4/7/2015	2:57 PM	MW-2	222	17	**205**			High tide reading. Tide at 2:57 P.M. = 20.16" above mean sea level.
4/8/2015	9:31 AM	MW-2	221.5	17	**204.5**	0	32.03	Low tide reading. Tide at 9:31 A.M. = 43.56" below mean sea level.
4/8/2015	3:44 PM	MW-2	221	17	**204**			High tide reading. Tide at 3:44 P.M. = 17.4" above mean sea level.
4/14/2015	9:50 AM	MW-2	222	17	**205**	0.49	32.62	High tide reading. Tide at 10:00 A.M. = 60" above mean sea level.
4/24/2015	4:00 P.M.	MW-2	222.5	17	**205.5**	0.06	32.68	High tide reading. Tide at 6:03 P.M. = 62" above mean sea level.

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Observation Well Log - Field Data

Project Name Samoa LLC

A.P. No. 401-031-065

Observation Well No.: MW-3

Depth of Pipe: 25' bgs

Elevation of Pipe above Ground: 19.5"

Date	Time	Well Number	Depth to Water Surface (from top of pipe)	Pipe Height (above ground)	Depth to Ground Water	Rainfall During the Past 24 hours	Total Rainfall to Date	Comments
3/12/2015	1:15 PM	MW-3	91.5	19.5	**72**	0	27.03	Depth to water reading is approximate and un-stabilized. Low tide reading. Tide at 1:15 P.M. = 22.08" below mean sea level.
3/14/2015	3:00 PM	MW-3	62.5	19.5	**43.0**	0	27.03	Pre-storm monitoring. Low tide reading. Tide at 3:00 P.M. = 30.84" below mean sea level.
3/16/2015	10:45 AM	MW-3	60.5	19.5	**41**	0	27.57	Post-storm monitoring. High tide reading. Tide at 10:45 A.M. = 20.88" above mean sea level.
3/23/2015	12:15 PM	MW-3	57	19.5	**37.5**	0.49	29.23	Low tide reading. Tide at 12:15 P.M. = 4.56" below mean sea level.
3/24/2015	10:06 AM	MW-3	51.5	19.5	**32**	0.6	29.83	Low tide reading. Tide at 10:06 A.M. = 47.4" below mean sea level.
3/25/2015	11:43 AM	MW-3	63	19.5	**43.5**	0	29.83	Low tide reading. Tide at 11:43 A.M. = 40.2" below mean sea level.
4/6/2015	9:04 AM	MW-3	62	19.5	**42.5**	1.66	31.97	Low tide reading. Tide at 9:04 A.M. = 35.76" below mean sea level.
4/7/2015	8:45 AM	MW-3	53	19.5	**33.5**	0.06	32.03	Low tide reading. Tide at 8:45 A.M. = 43.32" below mean sea level.
4/7/2015	3:02 PM	MW-3	53	19.5	**33.5**			High tide reading. Tide at 3:02 P.M. = 20.16" above mean sea level.
4/8/2015	9:26 AM	MW-3	55	19.5	**35.5**	0	32.03	Low tide reading. Tide at 9:26 A.M. = 43.8" below mean sea level.
4/8/2015	3:48 PM	MW-3	55	19.5	**35.5**			High tide reading. Tide at 3:48 P.M. = 17.4" above mean sea level.
4/14/2015	9:50 AM	MW-3	59	19.5	**39.5**	0.49	32.62	High tide reading. Tide at 10:00 A.M. = 60" above mean sea level.

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Samoa Town Master Plan: Final Master EIR, Notice of Determination

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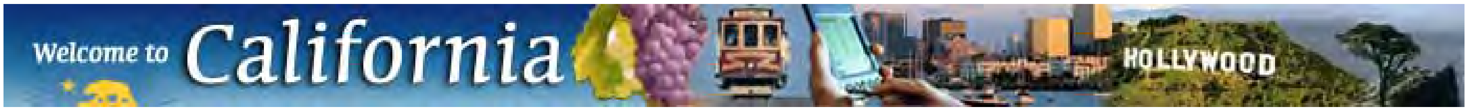

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Samoa Town Master Plan General Plan Amendment/Zone Reclassification GPA-02-01/ZR-02-02

SCH Number: 2003052054

Document Type: NOD - Notice of Determination

Alternate Title: Samoa Town Master Plan Recirculation Draft 3 Master EIR Samoa Town Master Plan Recirculation Draft 2 Master EIR Samoa Town Master Plan Samoa Town Master Plan EIR

Project Lead Agency: Humboldt County

Project Description

A General Plan Amendment (Local Coastal Plan Amendment), Zone Reclassification, Urban Limit Line extension, and interpretation of environmentally sensitive habitat areas (ESHA) for six parcels making up the Samoa town site and encompassing approximately 171.7 acres. The parcels are to be part of large scale community development and revitalizing project to be carried under the Samoa Town Master Plan developed by the Samoa Pacific Group. Additional permits required for the phased implementation of the Master Plan include: Coastal Development Permits, Conditional Use Permits, Special Permits, Final Map Subdivisions, and Planned Unit Developments. The purpose of the proposed General Plan Amendment, Local Coastal Plan Amendment, and Zone Reclassification is to facilitate the implementation of the Master Plan and involves changing the land use designations consistent with the Plan. The project area is located in the Coastal Zone. In order to proceed with the project, the Department determined that a Local Coastal Plan (LCP) Amendment is required to ensure consistency with the General Plan. The LCP Amendment would add the land use designation of Business Park (MB) and Natural Resources (NR) within the proposed Samoa urban limit line and would further specify requirements for development within tsunami run-up areas.

Contact Information

Primary Contact:
Michael E. Wheeler
Humboldt County Community Development Services
(707) 268-3730
3015 H Street
Eureka, CA 95501-4484

Project Location

County: Humboldt
City:
Region:
Cross Streets: New Navy Base Road
Latitude/Longitude:
Parcel No: 401-021-29; 401-031-29, 38, 45, 46, 55, 59, 60
Township: 5N
Range: 1W
Section: 16
Base: HB&M
Other Location Info: City/Nearest Community: Samoa

Determinations

This is to advise that the ☒ Lead Agency ☐ Responsible Agency Humboldt County Board of Supervisors has approved the project described above on 2/26/2008 and has made the following determinations regarding the project described above.

1. The project ☒ will ☐ will not have a significant effect on the environment.

2. ☒ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.

   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.

3. Mitigation measures ☒ were ☐ were not made a condition of the approval of the project.

4. A Statement of Overriding Considerations ☒ was ☐ was not adopted for this project.

5. Findings ☒ were ☐ were not made pursuant to the provisions of CEQA.

Final EIR Available at: Humboldt County Community Development Services

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Date Received: 3/3/2008

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Town of Samoa Wastewater Flow & Dispersal Area Study

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California Engineering Company, Inc
Main Office
1110 Civic Center Blvd., Suite 404
Yuba City, CA 95993
530-751-0952 Office
530-751-0953 Fax
www.cecusa.net

Town of Samoa Wastewater Flow and Dispersal Area Study

Waste Water Treatment and Dispersal Facility
Town of Samoa
Humboldt County, Ca.

DRAFT

Owner – Samoa Pacific LLC

Engineer: California Engineering Company, Inc.

Date: September, 2015

Prepared by: David L. Swartz, PE, PLS, SD, SP

Willows Office
259 N. Villa Ave
Willows, CA 95988

Glenhaven Office
9445 E Hwy 20
Glenhaven, CA 95443

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PHASE I – INSTALLATION OF PROPOSED WASTEWATER TREATMENT PLANT AND REPLACEMENT OF EXISTING WASTEWATER COLLECTION SYSTEM

INTRODUCTION

The Town of Samoa is located on the Samoa Peninsula in Humboldt County, California, and is currently owned by the Samoa Pacific Group (SPG). As discussed earlier in this document, the SPG is proposing a three (3) Phased (Phase I, Phase II, and Phase III) rehabilitation and restoration of this existing historic lumber company town and construction of new development.

As part of the overall proposed project, Phase I will entail construction of a new wastewater treatment plant phased construction of a new wastewater collection system along with subsequent removal of the existing wastewater collection system connection to a new wastewater treatment facility, and finally removal of the existing Bark Filters. In addition to a new wastewater collection and transport system and the new wastewater treatment facility, Phase I also proposes to retrofit existing units with low-flow fixtures and construct a new 84 unit multi-family housing unit (MHU). Current projections under Phase I are for the MHU to begin construction concurrently with the new wastewater treatment facility.

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While this ROWD is primarily tied to Phase I of this project, the successful completion of Phase I is integral to the success of the full project, as Phase I includes construction of a projected 60% of the wastewater infrastructure required to reach maximum build-out and rehabilitation/revival of the historic town of Samoa.

Projected wastewater flows from Phase I, Phase II and Phase III of this project are summarized in Table 1 below. Details of existing and projected flows are noted below.

Table 1. Summary of projected wastewater flows.

Project Phase	Existing Average Daily Flow (Gal/day)	Calculated Average Daily Flow (Gal/day)	Design Flow (Gal/day) (Includes Safety Factors)
Phase I	18,977	23,902	44,650
Phase II	N/A	21,739	44,650 21,739 66,389
Phase III	N/A	7,200	66,389 7,200 73,589

*** Note;** Phase I of the Treatment Facility is designed for a flow rate of 44,650 or 87% above the calculated Phase I flow rate to allow for a factor of safety, and to ensure the treatment plant does not violate the 85% capacity rule for expansion.

EXISTING WASTEWATER SYSTEM

Currently, wastewater within the community of Samoa originates from 93 occupied residences, the Samoa Cookhouse Restaurant, a Post Office, Hostelry, a museum, and the Samoa Woman's Club and the Samoa Elementary School.

Primarily based on geography, wastewater flows into one of three wastewater collection, treatment and disposal systems: an Eastern System, a Western System and a School System. The School System's wastewater treatment is independent of the town, is not a part of this project and is therefore, not a part of this ROWD. The Eastern System serves the majority of the town, including the Samoa Cookhouse Restaurant, Woman's Club, Hostelry, and 68 of the existing occupied residences. Within the area serviced by the Eastern System there are 7 dilapidated (vacant) residential units and the gym, neither which currently have sewer service. The Western System serves approximately 25 existing occupied residences located on the west side of the ridge line of the peninsula.

EASTERN SYSTEM

Within the Eastern System, influent from the Cookhouse and the Museum flow into a pump vault located approximately 50 feet northeast of the building. Kitchen waste water flows into a 3,000-gallon grease interceptor prior to reaching the vault. Wastewater is then pumped approximately 750 feet to a 5,000 gallon primary tank located southwest of the Cookhouse. From the 5,000-gallon primary tank, effluent flows into an adjacent 1,500-gallon pump tank and is pumped approximately 650 feet southwest to Bark Filter A. The treatment system at Bark Filter A consists of bark filters and a 15,000-gallon septic tank. In addition to effluent from the Cookhouse, effluent from 16 homes located on Fenwick Street and the Hostelry flow to Bark Filter A. From this location, effluent flows approximately 750 feet southwest to Bark Filter B which consists of additional bark filters and a 25,000-gallon septic tank.

Wastewater from an additional 52 homes and the Woman's Club also flow to Bark Filter B. Effluent from Bark Filter B is pumped to the treatment wetland/pond located within the vicinity of the proposed treatment facility. Additionally, the Eastern System is highly monitored with effluent flow being measured for both quantity and quality. These flow volumes are utilized in the following sections.

WESTERN SYSTEM

The Western System serves approximately 25 residences located on the west side of the ridge line of the peninsula, and is a gravity flow system to a 15,000-gallon septic tank and classic leach trench system.

The Western System is governed by Waste Discharge Requirements Order No. 85-40 adopted by the Regional Board on March 27, 1985. With the permit renewal in 2001 language was incorporated into the order that covers both the Eastern and Western

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Systems under Order No. R1-2001-62, ID NO. 1B85017RHUM. Partly as a result of including the Eastern System into this Waste Discharge Requirement Order, the flow volumes and flow characteristics of the Eastern System are quantified and reported. However, because of the age of the Western System and the type of wastewater treatment system, gravity flow to septic tanks and dispersal to leachfield, there are no flow measurements for the Western System.

WWTP Design

DESIGN WASTEWATER FLOW

Design flow rates in this section are based largely on flow volumes and flow characteristics as measured from the Eastern Wastewater Treatment System, which is then extrapolated back to the Western System.

Based on Flow Monitoring Reports for 2014 as reported to the NCRW CB as part of the Waste Discharge Requirements Order No. 85-40 requirements, the Eastern Wastewater Treatment System processes an average of 16,282 gallons influent/day Appendix A. Because there are currently no flow meters on the existing commercial facilities (Cookhouse, Hostlery, Post Office and Museum) EPA industry standards have been utilized to estimate the daily wastewater flow from these facilities (Table 2).

Based on calculations, the daily average wastewater flow for the Eastern System for 2014 (16,282 gpd), minus average daily commercial flow, is 13,876 gpd (Table 2). As discussed earlier, there are a total of 68 residential units currently occupied on the Eastern System. By calculating the average daily influent from those 68 units, based on a measured average daily flow, results in an average daily flow per residence of 204 gpd (Table 2). By utilizing this logic and applying 204 gpd of wastewater generated by each residence serviced by the Western System, the combined residential wastewater flow (Eastern System – 13,876 gpd Western System – 5,101 gpd), is 18,977 gpd.

Due to the age and integrity of the existing system, it is believed that there is significant infiltration of groundwater. In this ROWD, we have worked to normalize flow volumes in an effort to account for infiltration of groundwater. Values utilized in the calculations have been conservatively estimated. As an example, when choosing the loading rates from the EPA Onsite Wastewater Systems Manual, we consistently chose the higher number in the range. Additionally, by using the 2014 wastewater load measurements (Appendix A), we have utilized a low rainfall year. Still, it is considered that the calculated wastewater flow includes approximately 12% infiltration rate.

If we consider that the total measured average daily residential influent flow to be 18,977 gpd and reduce that number by 12%, we have an estimated residential wastewater flow of 16,700 gpd. Spreading that average flow over 93 currently occupied residents provides an average daily wastewater flow of 179.5 or 180 gallons per residence per day.

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Table 2. Estimating Existing Flows for both Eastern and Western Systems (Residential/Commercial Use).

Source of Wastewater				**Flow Volumes (GPD)**
Average Daily Flow				16,282[1]
Samoa Cookhouse (Breakfast and Lunch)	Est. 100 Customers/day	14 gal/customer (10 gpd – customer 4 gpd kitchen)		1,400[2]
Post Office (Average 2 employees/day)				
2 employees/facility/day x 16 gal/employee/day[2]				32
Museum				
2 employees/facility/day x 16 gal/employee/day[2]				32
Hostlery				
2 employees/facility/day x 16 gal/employee/day[2]				32
2 customers/bed X 11 beds X 60 gal/customer[2]				660
Commercial Kitchen				100
Woman's Club (Estimated Average over 30 days)[3]				150
Average Daily Flow minus Cookhouse, Hostelry, Post Office and Museum				**13,876**
Number of Residential Units	68 Homes	13,876 gpd / 68 residences	204 gpd/residence	
Utilizing similar logic for the Western System				
Number of Residential Units	25 residence 204 gpd/residence			5,101 gal/day
Total Existing Average Daily Flows All Structures				**18,977 gal/day[4]**
Subtracting an estimated 12% for I/I				**16,700**
Per Residence Calculation (68 eastern + 25 western)			**16,700/93**	**180 gpd**

1. *Based on Average Flow Volumes from the Eastern Treatment System, January, March – December 2014. Note, the Flow Meter broke during the month of February (Appendix A this Volume).*
2. *Based on Onsite Wastewater Treatment Systems Manual, 2002 Table 3-4.*
3. *Based on a meeting hall/assembly hall with 75 person capacity X 4 gallons per seat X ½ time use.*
4. *Average Daily Use includes an estimated 12% (2,330 gpd) of I/I*

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With this information we can proceed with defining the future estimated average daily flow for the full build-out of Phase I along with the proposed build-out for Phase II and Phase III.

As stated in the Project Description, Phase I encompasses a full revamping of the existing Eastern and Western Wastewater Treatment Systems, with the exception of the recently installed infrastructure for the Samoa Cookhouse and Museum. In addition, Phase I includes an 84-unit multi-family housing unit, and nine new commercial lots. The commercial lots are currently proposed to be small retail stores for the purpose of servicing the residents of the town, and to draw customers/tourists to the peninsula. Table 3 below summarizes the full build-out planned for Phase I of this project while Table 4 summarized the projected full build-out flows.

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Table 3. Full Build-out Phase I and Projected Sewer Connection Needs

Proposed Use	**Number of Units**	**Sewer Connection**	
Residential Low Density (RL)	102 Lots	es	
Residential Medium Density (RM)	84-units	es	
Commercial General (CG)[1]	9 Lots	7 Lots with Sewer Connections	2 Lots with no sewer connection
Public Facilities (PF)	2 Lots	No Connection	
Public Recreation (PR)	6 Lots	No Connection	
Commercial Recreation (CR)	11 Lots	3 Lots with Sewer Connections	8 Lots with-no Sewer Connection
Industrial Coastal Dependent (MC)	2 Lots	No Connections	
Natural Resources (NR)	1 Lot	No Connection	

1. *Includes Cookhouse, Hostelry, Museum, and Woman's Club.*

Table 4. Phase I Daily Use Design Calculations – Post Construction of WWTP and Collection System.

Proposed Use	**Number of Units**	**Daily Average Flow per Lot/Unit**	**Gallons per day**
Residential Low Density (RL)	102 Lots	180[1] with 25% Flow Reduction Daily Flow is 135 gal/unit/day	13,770
**Note State mandate 25% savings coupled with revised fixture standards*			
Residential Medium Density (RM)	84-units	50 gal/person or 122 gal/unit [2] *(US Census assumes 2.44 individuals/unit)*[3]*	7,686
**Note State mandate 25% water savings coupled with revised fixture standards = 37.5 gal/pp/day or 91.5 gal/unit/day*			
Commercial General (CG) *Includes both proposed and existing*	7 Lots with Sewer Connections	2/employees 10/gal/day/employee [2] *(20 gpd)* 10 customer/day 3 gal/customer [2] *(30 gpd)*	140 157.5
Cookhouse	Including a 25% Flow Reduction for fixtures		1,050
Hostelry			570
Woman's Club			112.5
**Note these values include the State mandate 25% water savings coupled with revised fixture standards*			
Commercial Recreation (CR)	3 Lots with Connections	135 gpd/Lot	405
**Assumed to be similar in flow as a standard unit.*			
Total Average Daily Flow for Phase I at Full Build-out			**23,902**
This represents a 20.6 % Increase from the current calculated Average Daily Flows.			

1. *From Table 2 above.*
2. *Based on Onsite Wastewater Treatment Systems Manual, 2002 Table 3-4.*
3. *U.S. Census Data, 2010*
4. *Based on Onsite Wastewater Treatment Systems Manual, 2002 Table 3-6.*

The flow from existing development (pre-construction Phase I) produces approximately 18,977 gal/day. Phase I post-construction flow is offset by the I&I and mandated California State water reductions. The expected flow generated once the new collection system is installed for Phase I is estimated to be 23,902 gal/day, which represents a 20% increase from pre-construction flows (Table 4 above). Table 5 proposes Phase II and Phase III projected daily flows for the proposed build-out of those Phases.

Table 5. Phase II and III Estimated Average Daily Flow Calculations

Phase II Daily Use Design Calculations:			
Current Use:			
None			
Proposed Use:		**Sewer Connection**	
Residential Low Density (RL):	105 lots	es	
Residential Medium Density (RM):	62 lots	es	
Total Proposed New Residential Lots 167			
Average Use:			
105 Lots x 135 gal/residence/day		14,175	gal/day
62 Lots x 122 gal/residence/day		7,564	gal/day
Total Average Daily Wastewater flow for Phase II		**21,739**	**gal/day**
Phase III Daily Use Design Calculations:			
Current Use:			
None			
Proposed Use:		Sewer Connection	
Business Park (MB):	24 lots	es	
Average Use:			
Projected Average daily Use for future business park is 300 gpd/lot			
24 Lots x 300 gal/day/lot		7,200	gal/day
Total Average Daily Wastewater flow for Phase III		**7,200**	**gal/day**

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PEAKING FACTORS:

The peaking factor as defined used herein was derived from the Manual of Water Resources Engineering (Linsley/Franzini, Third Edition).

Peaking Factor (PF)   peak daily flow rate/average daily flow rate

Typically smaller communities will experience higher peaking factors than larger communities as in smaller communities a relatively small number of persons contributing to a small system can more easily influenced flows. To determine the peaking factor for Samoa, we used data from the 2014 monitoring reports found in Appendix A herein and examined the months of June, July and August, so that I&I would not play a role. From the data flow loggers we determined the following:

Table 6. Summary of projected wastewater flows with Peaking Factors

Month	Peak G/D	Average G/D	Peak Factor (PF)
June	15,931	11,293	1.41
July	21,216	14,825	1.43
August	16,487	12,129	1.36

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For this project we have used the highest peaking factor for the three month period observed – 1.43.

Table 7. Peaking Factor as applied to Phase I, Phase II and Phase III

Project Phase	**Calculated Average Daily Flow (Gal/day)**	**Peaking Factor of 1.43**	**Design Flow (Gal/day) (Includes Safety Factors)***
Phase I	23,902	34,179	44,650
Phase II	21,739	31,086	44,650 21,736 67,195
Phase I + Phase II		*34,179+31,086*	*65,265*
Phase III	7,200	10,210	67,195 7,140 74,335
Phase I & II + Phase III		*65,26+10,210*	*75,475*

* **Note;** The design flow does not change as it remains higher for Phase II and within 3% of Phase III.

The above calculations demonstrate that with the overbuilding of the treatment plant with Phase I, and consistent expansion that the facility design flows are adequate to handle the projected wastewater flow rates through buildout.

DISPERSAL FIELD DESIGN

This leachfield is proposed to be constructed utilizing uick 4 High Capacity Infiltrator Chambers. Leach trenches are proposed to be 36-inches wide spaced 10 feet on center with an average depth of 24-inches. Leachlines are proposed to be 100-feet in length. Based on specification sheets for Infiltrator Chamber the uick 4 - High Capacity Chamber is 34-inches wide at the base and 16-inches high at the crest (Specification Sheet 12 of 18). See Table 8 below for leachfield absorption area calculations.

Table 8. Projected Leachfield Absorption Area Required by Phase

Phase	**Gallons per day**	**Linear Loading Rate**	**Absorption Area Required (ft^2)**	**Acres Require** ***(1 acre = 43,560 ft^2)***	**Number of Zones**	**Absorption Area (ft^2)** **(5,000 ft^2/zone)**	**Acres Utilized**
I	44,650	0.69	64,710	1.48	13	65,000	1.5
II	21,739	0.69	31,505	0.72	10	50,000	1.4
III	7,200	0.69	10,434	0.24	3	15,000	0.30
Total Acres Required for full build-out						**2.44**	
Total Acres Dedicated for full build-out						**3.2[1]**	

1. Based on the leachfield lay-out as shown in Figure 1, greater than 3.2 acres have been designated for the required 2.4 acres needed for full build out of this system, providing a greater than 20% safety factor. The entire land designated for wastewater infrastructure is 8.5 acres, which provides for greater than 100% replacement leachfield area.

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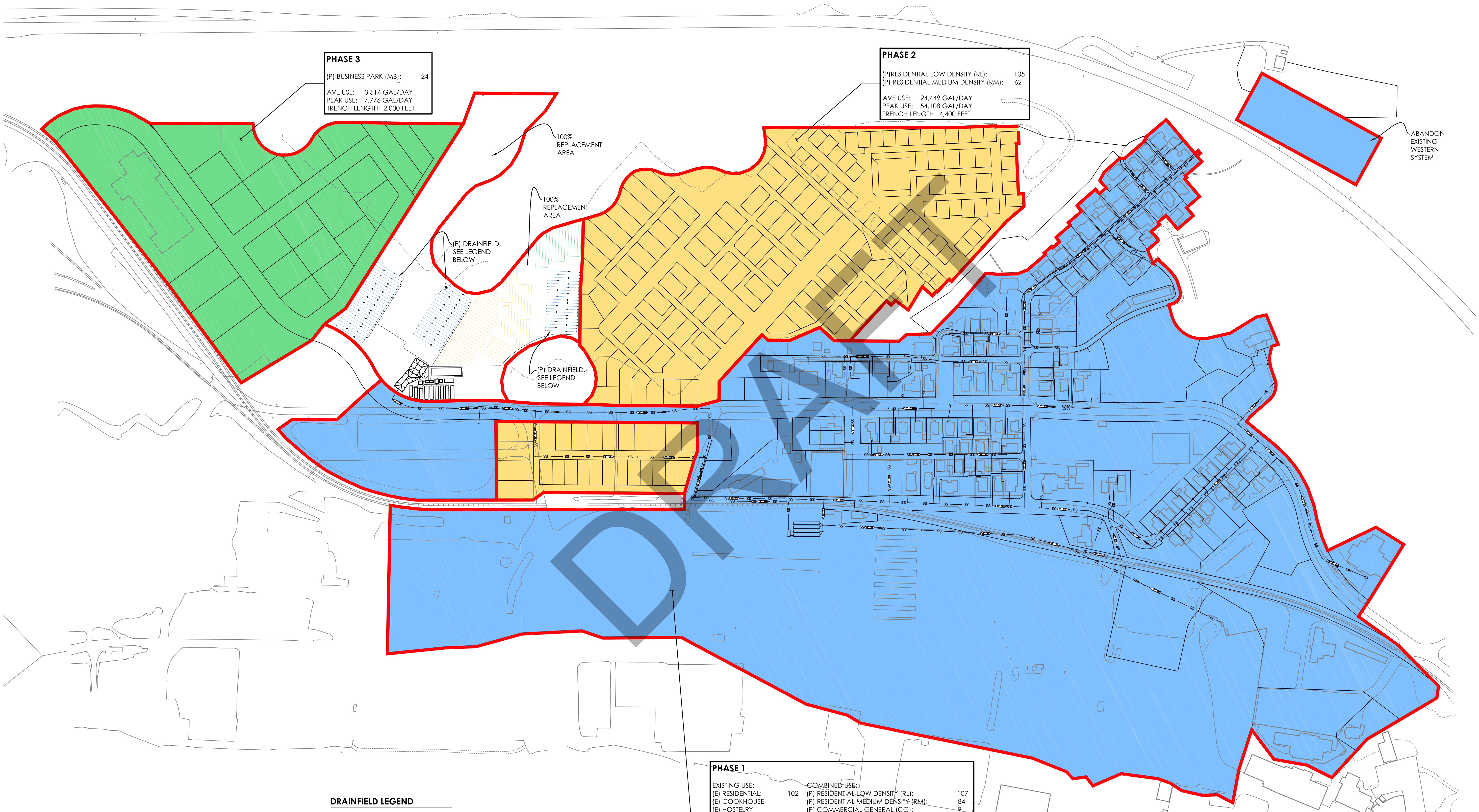
The master plan dispersal field is shown on Figure 1 herein. A detail of a dispersal field is shown herein on Figure 2. The dispersal fields are color coded to match the Phases of the Project and projected expansions of the WWTP and collection system. The site soils are characterized in Appendix D herein, however are considered to be sand.

PHASE I DISPERSAL Dosing

The WWTP has been designed for a wastewater load of 44,650-gallons. This is projected to provide sufficient safety factor within this system. When looking at the dosing of the leachfields in Phase I, utilizing 44,650-gallons per day and 13 zones. Each zone is projected to receive 3,434-gallons per day. Each zone will have 5 lines, 100 feet in length. With a 0.64 gallon /linear foot void space using 1 1/4 –inch PVC Perforated pipe, each zone will have 140-gallons void space. We propose to dose each zone with 5 times the lateral void space, or 704-gallons/dose. At this dosing volume, each zone will be dosed 6.3 times per day.



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PHASE 3

(P) BUSINESS PARK (MB): 24

AVE USE: 3,514 GAL/DAY
PEAK USE: 7,776 GAL/DAY
TRENCH LENGTH: 2,000 FEET

PHASE 2

(P)RESIDENTIAL LOW DENSITY (RL): 105
(P) RESIDENTIAL MEDIUM DENSITY (RM): 62

AVE USE: 24,449 GAL/DAY
PEAK USE: 54,108 GAL/DAY
TRENCH LENGTH: 4,400 FEET

PHASE 1

EXISTING USE:
(E) RESIDENTIAL: 102
(E) COOKHOUSE
(E) HOSTELRY
(E) MUSEUM
(E) GYM
(E) WOMAN'S CLUB

COMBINED USE:
(P) RESIDENTIAL LOW DENSITY (RL): 107
(P) RESIDENTIAL MEDIUM DENSITY (RM): 84
(P) COMMERCIAL GENERAL (CG): 9
(P) PUBLIC FACILITIES (PF): 2
(P) PUBLIC RECREATION (PR): 6
(P) COMMERCIAL RECREATION (CR): 11
(P) INDUSTRIAL COASTAL DEPENDENT (MC): 2
(P) NATURAL RESOURCES (NR): 1

AVE USE: 30,062 GAL/DAY
PEAK USE: 66,452 GAL/DAY
TRENCH LENGTH: 6,600 FEET

DRAINFIELD LEGEND

🟦	PHASE 1 - 66 LINES @ 100'
🟨	PHASE 2 - 44 LINES @ 100'
🟩	PHASE 3 - 20 LINES @ 100'

Figure 1

NO.	DATE	DESCRIPTION

DATE: 02-03-2015
SCALE: 1" = 150'
DRAWN BY: AV
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CEC
Engineering - Planning - Surveying - Community Development
www.cecusa.net

Office (530) 751-0952
Fax (530) 751-0953
1110 Civic Center Blvd., Suite 404
Yuba City, CA 95993

SAMOA WASTEWATER TREATMENT PLANT REHABILITATION PROJECT

WASTEWATER FLOW STUDY

TOWN OF SAMOA, HUMBOLDT COUNTY, CALIFORNIA

PROJECT NUMBER
10-202

SHEET 1 OF 1

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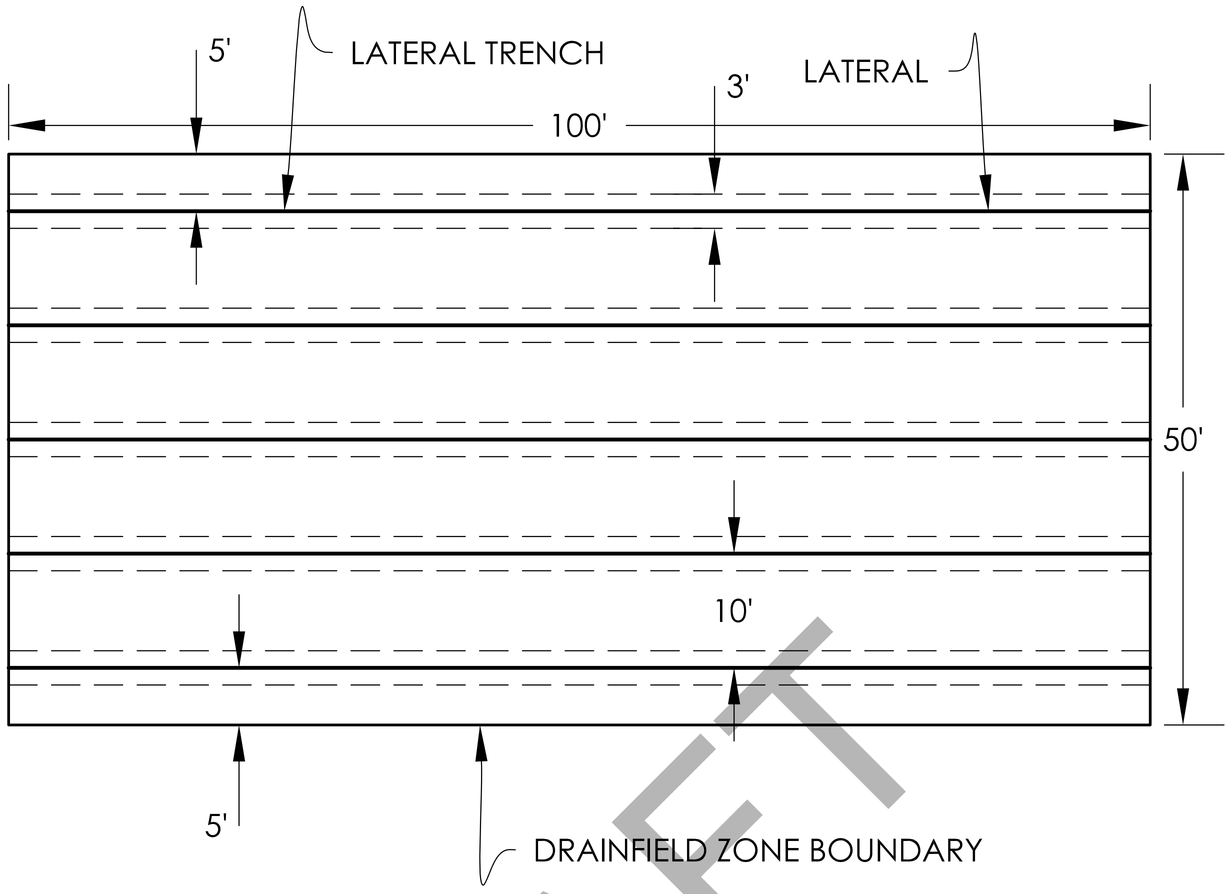

TYPICAL PHASE 1 LOADING CALCULATIONS:

NUMBER OF LATERALS PER ZONE: 5
LATERAL LENGTH : 100'
LATERAL SPACING: 10' O.C.
TRENCH WIDTH: 3'
NUMBER OF ZONES AT PHASE 1 BUILD OUT: 13

ZONE AREA: 100' X 50' = 5000 SF

EFFLUENT DISCHARGE PER ZONE: 44,650 ÷ 13 = 3,434.6 GAL/DAY/ZONE

LOADING RATE ; 3,434.6 GAL/DAY ÷ 5000 SF = 0.69 GAL/SF/DAY

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Figure 2

DRAINFIELD ZONE EXHIBIT
FOR
SAMOA PACIFIC GROUP
TOWN OF SAMOA, HUMBOLDT COUNTY, STATE OF CALIFORNIA

MARCH 30, 2015
SHEET 1 OF 1
PREPARED BY: AV

CEC
Office: 530.751.0952
Fax: 530.751.0953
1110 Civic Center Blvd., Ste. 404
Yuba City, CA 95993
Engineering - Planning - Surveying - Community Development
www.cecusa.net

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However, using the estimated flows for Phase I of 23,902, which would provide for each of the 13 zones to receive 1,838 gallons per day. With a dose of 704-gallons per dose, that provides each zone with 2.6 doses per day. Additionally, having an equalization pond within the system will allow the dispersal fields to be dosed at variable rates, so as to not over saturate the absorption areas.

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