BergerABAM

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12 May 2015

Mr. Stephen Posner
Energy Facility Site Evaluation Council
Washington Utilities and Transportation Commission
P.O. Box 43172
Olympia, WA 98504-3172

Subject: Vancouver Energy
EFSEC Application No. 2013-01, Docket No. EF131590
Response to EFSEC Draft EIS Data Request 8

Dear Mr. Posner:

On behalf of Tesoro Savage Petroleum Terminal, LLC (the Applicant), BergerABAM is providing a response to the Energy Facility Site Evaluation Council's (EFSEC) Draft EIS Data Request 8, dated 6 May 2015.

Please feel free to contact me at 206/431-2373, or irina.makarow@abam.com, if you have any questions about this submittal. We look forward to further coordination with you, your staff, and EFSEC's consultants.

Sincerely,

Irina Makarow
Senior Environmental Project Manager

IM:nb
Attachments

cc: Kelly Flint, Savage Companies
Jay Derr, Van Ness Feldman

Code	Data Request Item	Applicant Response
Project Description		
PD-25	The PDEIS provided a list of vessel types/sizes expected to call at the Facility which included Articulated Tug and Barges (ATBs). Your response to Data request PD-15 states the following: "All of the vessel types indicated in Table 5.2-1 could be anticipated to dock at the Facility. The 46 MDTW vessel is anticipated to be the vessel size usually loaded; however the DEIS should conservatively assume that because the types of vessels could change in the future approximately 15 percent of the vessels calling would be the 105 MDWT and approximately 5 percent would be the 165 MDTW." This response does not include ATBs which are smaller tank vessels. a. Do you anticipate ATBs being used to transport crude oil from the proposed Facility? b. If ATBs would be used, what percentage of the vessels that would call at the proposed Facility would be ATBs? c. An estimate of 365 annual vessel calls per year at the proposed Facility has been used in the risk analysis and a distribution of 80% Handymax, 15% Aframax and 5% Suezmax has been used to characterize the vessel type distribution. How would this distribution change if ATBs are included? d. Please clarify the number of trips by vessel class per year that would be expected to call at the proposed marine terminal.	a. During start-up, these smaller ATBs may call at the Facility to load. ATBs are operated in a similar fashion to tankers. b. The Applicant anticipates ATBs to call only in the very beginning of Facility operations and would represent less than 5 percent of calls. c. The Aframax and Suezmax were only included to demonstrate that larger vessels could call but would have a maximum loading threshold of 600,000 bbls. In actuality, the Handymax ship would call 99 percent of the time and the ATBs would only be used during the initial start-up of the Facility before sufficient Area 300 tankage was available to stage a full load for a Handymax-size vessel. d. On a regular basis, once the Facility is fully operational and storage tanks have been constructed as proposed, an estimated 365 vessel calls would occur, primarily of the Handymax size; however, as indicated in PD-15, to conservatively assess impacts, "the DEIS should conservatively assume that because the types of vessels could change in the future approximately 15 percent of the vessels calling would be the 105 MDWT and approximately 5 percent would be the 165 MDTW."

EX-0022-000003-PCE

Code	Data Request Item	Applicant Response
PD-26	Your response to Data Request PD-12 states that "Vessels will not be bunkered at the Facility Terminal." However, it would be possible for a vessel to obtain bunker fuel from a barge while docked at the proposed Facility marine terminal unless it is specifically prohibited. a. Does the statement in response to PD-12 only apply to shoreside bunkering facilities or do you intend to prohibit bunkering using bunker barges at the proposed Facility marine terminal? b. Can you provide likely locations where bunkering activities may occur for vessels entering and leaving the proposed Facility, either along the Columbia River or elsewhere?	Although it may be possible to load bunkers by barge at the Facility, such bunker loading will be prohibited at the Facility. a. The Applicant will prohibit bunkering at the Facility by any means, barge or shoreside. b. Bunker activities conducted in the Columbia River can occur at locations as specified in the Lower Columbia Region Harbor Safety Committee's Columbia River Anchorage Guidelines*. However, large commercial vessels, tankers, or otherwise operating along the west coast for the most part bunker in large port areas, such as Long Beach, San Francisco, Puget Sound, or Alaska, prior to calling in the Columbia River. *A copy of these guidelines was submitted to EFSEC in August 2014 as part of the PDEIS references and is also available at: http://lcrhsc.org/documents/Anchorage_Guidelines_May_14-2014.pdf.
PD-27	How will ballast water generally be managed by vessels calling at the proposed Facility? a. Approximately what percentage of vessels would use open water ballast water exchange versus onboard or dockside treatment, and b. How many of these vessels would be in each vessel size category?	Vessels calling at the Facility will conduct ballast water exchange prior to entering the Columbia River if there is no approved ship board ballast water treatment system onboard. Once the ballast water treatment systems are approved by U.S. Coast Guard and Environmental Protection Agency, then vessels will be retrofitted onboard and the treatment systems will be used. a. Presently, 100 percent of vessels expected to call at the Facility will use open-water ballast exchange. When water treatment systems are approved, then all vessels will be retrofitted by 2018. Ballast water will not be treated at the Facility dock. b. All vessels calling at the Facility.
PD-28	The PDEIS states that secondary containment with leak detection would be provided for pipeline segments installed belowground and that the interstitial space within the double-bottomed tanks would include a leak detection system between the tank floors, but no further information is provided. Please provide information on the types of leak detection systems that would	The Applicant cannot specify the exact type of leak detection devices to be used as final design of the Facility has not yet occurred. However, there are various types of devices available commercially that have been used successfully for this type of function. Examples of such devices are provided in Attachment 1. • OMNTEC Mfg., Inc., LU1 • OMNTEC Mfg., Inc., LS-ASC-.895

EX-0022-000004-PCE

Code	Data Request Item	Applicant Response
	be installed in both the pipelines and the storage tanks	
PD-29	Page 1-67 of the PDEIS states "In the context of supplying West Coast refinery slates, the quality of Bakken and Canadian crudes have been such that they can be successfully blended to approximate historical Alaska North Slope crudes that refineries are currently configured to process (Doan and Murtaugh 2013)". Do you intend to blend crude oils at the proposed Facility before transportation to West Coast refineries?	The intent of the statement is to describe that refineries receiving Bakken crudes and Canadian heavy crudes can successfully blend them to approximate the qualities of Alaska North Slope (ANS) crude oil such refineries are configured to process. The language from the reference cited (Doan and Murtaugh 2013, provided to EFSEC in October 2014) that this statement is based on is as follows: *"West Coast refineries, capable of running crudes more sour and heavier than the light, sweet oils coming out of U.S. shale plays, are blending Bakken and Canadian heavy in attempts to come up with Alaska North Slope "look-alikes," said Dammen, the software solutions manager for Cambridge, England-based Spiral.* *When you blend them, you can actually come fairly close to ANS, maybe even having the same yield curve," she said."* On the issue of blending, refer to the Applicant's 5 February 2015 letter to Stephen Posner, responding to a request for additional Information to assess EIS alternatives. It states: *"Will Blending of Crude Oil Types or Grades Occur? and What Impact does this have on the Number or Size of Tanks?* *Some minor blending will occur out of necessity, given that on average approximately 4 unit trains will be required to load 1 vessel, and some minor variation in crude qualities among those trains is almost inevitable. In addition, some amount of blending may occur among customers within similar crude grades if permitted by customer specifications to be stored in the same tank. However, as described above in the section on size and number of tanks, customers who use the Facility will likely be interested in ensuring that the quality of the crude oil they sourced remains unaltered because they are managing that crude to feed their specific refinery systems. These customers may, therefore, specify independent storage of their specific crudes at the Facility. These requirements drive the number and size of tanks, as described above."*
PD-30	PDEIS 'Figure 2.2-10. Configuration of Area 400, Marine Terminal' (pasted below) shows Berth 14 (at left of image) to contain the 'pipeline' (thick blue line). It also shows a 'transfer pipeline' as a thin black line to Berth 13. Your response to PD-10 states	The thick blue line is coincident with the lease boundary and was mislabeled. There are no pipelines located on Berth 14. All loading operations will be conducted from Berth 13. a. "Pipeline" in Figure 2.2-10 has been relabeled "transfer pipeline from storage to marine terminal".

Code	Data Request Item	Applicant Response
	"Loading operations will be conducted from the facilities installed at Berth 13." Other Figures in the PDEIS also have these same colored lines (e.g., 'Figure 2.2-7. Transfer Pipeline System'). a. Please explain the 'pipeline' versus the 'transfer pipeline' in Figure 2.2-10. b. What is the purpose of the thick blue 'pipeline' at Berth 14? c. Please confirm which operations would be conducted at Berths 14 and 13. d. If changes to PDEIS figures are required, please provide all updated PDEIS figures where these items are shown.	b. As explained above, this is an error and has been removed. c. The Applicant confirms the response to data request PD-10, submitted 23 February 2015. d. Figure 2.2-10 has been revised to show the correct location of the transfer pipeline on Berth 13. Line color and labeling have been revised for consistency. Figures 2.2-7 and 2.2-10 have been revised as indicated, see Attachment 2. BergerABAM is coordinating the submittal of updated GIS layers and other figures revised as a result of this correction with Ms. Bumpus; they will be submitted under separate cover.
Code	**Data Request Item**	**Applicant Response**
Biological Resources		
BR-1	If available, please provide site specific information on wildlife use of the area such as data from site visits, bird surveys, or nuisance animal problems that has been collected.	The question posed by the reviewer is unclear as to which "area" is being referred to. The Applicant assumes the question is relative to the Facility site and its environs, and is providing an answer on that basis. The Applicant does not have site-specific information on wildlife use of the Facility site or its environs from site visits, bird surveys, or nuisance animal problems. The Applicant's consultant for biological resource issues, BergerABAM, has extensive knowledge of the Facility site and environs based on previous work conducted for the Port and Port tenants. The presence (or lack thereof) of terrestrial wildlife is indicative of the highly disturbed nature of the site (i.e., an active industrial area), and the small amount of habitat present to support wildlife species. The PDEIS identified natural areas surrounding the site and, based on the types of habitat present and documented use, the types of species likely present. The Applicant did not survey surrounding areas as there is ample available information regarding species likely to be present.
BR-2	Please provide the Natural Resource inventory Management Plan cited in the PDEIS.	The Port of Vancouver USA's 2004 Natural Resource Inventory Management Plan is provided as Attachment 3.

EX-0022-000006-PCE

Code	Data Request Item	Applicant Response
BR-3	If available, please provide the Priority Habitat and Species data for the rail and vessel corridors.	BergerABAM obtained state-wide Priority Habitat and Species (PHS) data directly from the Washington Department of Fish and Wildlife (WDFW) and is required to manage such data in accordance with WDFW's Policy POL 5210 to prevent dissemination of sensitive PHS information. A copy of Policy POL 5210 is provided as Attachment 4. Section 4 of the policy states: *"4. **Individuals and Organizations May Release Sensitive Fish and Wildlife Information Obtained From WDFW Subject to the Following Provision:** Parties holding sensitive fish and wildlife information obtained from WDFW may release it only to the parties listed in Section 2 of this policy when such a release accompanies an agreement to abide by the provisions of this policy."* BergerABAM staff have alerted Ms. Sonia Bumpus of the protected nature of this data, and request that EFSEC staff provide written affirmation that transmittal of the data to EFSEC staff and Cardno Entrix is permitted by WDFW and that EFSEC and its contractors who receive the data will abide by the provisions of POL 5210.

IM:nb
Attachments

Attachment 1: Examples of Leak Detection Devices

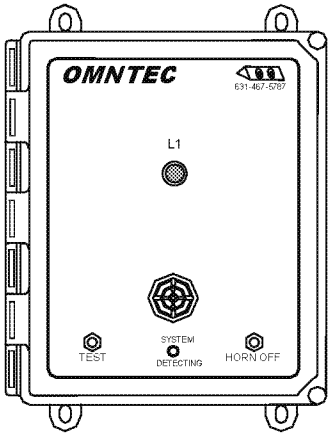
- OMNTEC Mfg., Inc., LU1
- OMNTEC Mfg., Inc., LS-ASC-.895

OMNTEC Mfg., Inc.

1993 Pond Rd., Ronkonkoma, NY 11779 Tank Gauging • Liquid Level and Leak Detection Systems • Relays

LU1

SINGLE CHANNEL CONTROLLER



Phone (631) 981-2001 Fax (631) 981-2007 E-mail omntec@omntec.com www.OMNTEC.com

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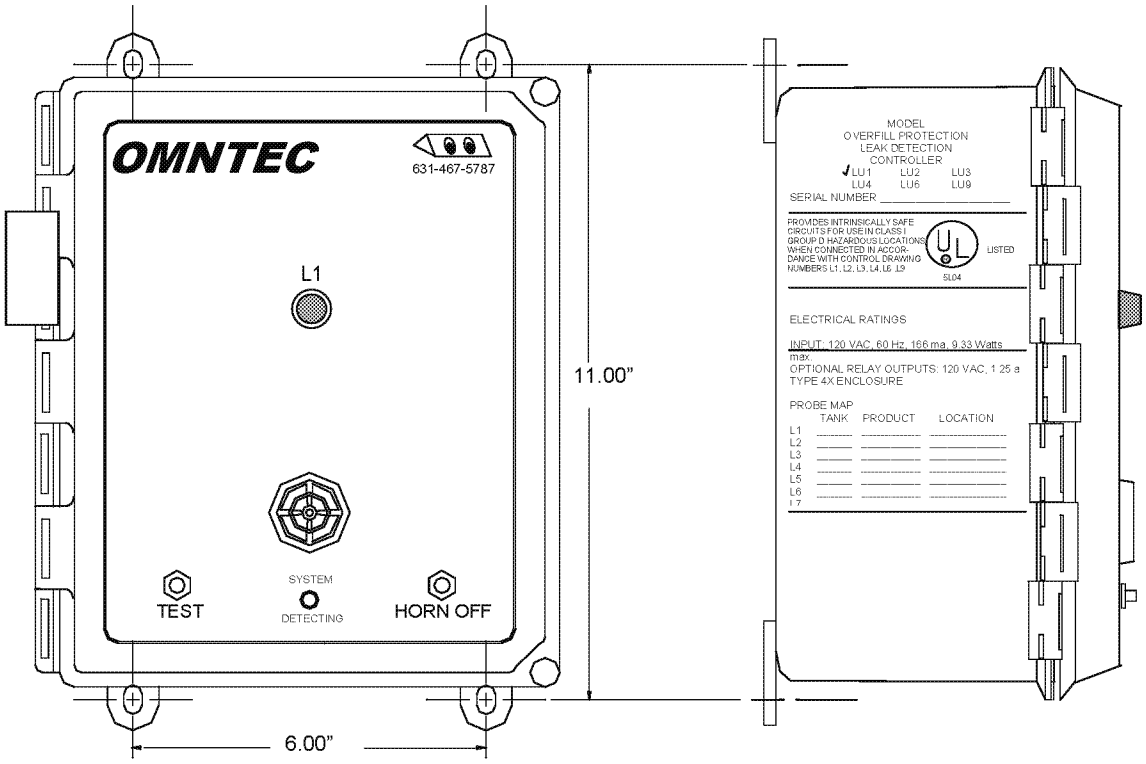
EX-0022-000012-PCE

SPECIFICATIONS



POWER INPUT
85-125 VAC, 47-440 Hz
16 Watts maximum

POWER TO SENSORS
2 VDC @ 13 ma

RELAY OUTPUT
SPST normally open dry contacts 0.5 AMPS, 120 AC switches when an alarm condition occurs

WEIGHT	DIMENSIONS
6 LBS.	(W) 9" x (H) 10.5"

SENSOR CABLE
Shielded 22 AWG UL-E118830 CM
Maximum length 2000 feet

ENCLOSURE	OPERATING TEMPERATURE
NEMA 4X	-40° to 140° F

UL LISTED
Intrinsically safe circuits for use in class I group D hazardous locations when connected in accordance with control drawings L1

AUDIO/VISUAL CONSOLE
Audible Alarm - 95 dB pulsing horn with 30 second timeout
Red Light - I ndicates liquid alarm for L-series sensors
Test Button - When pressed will actually test entire system electronics from control panel to sensors
Green Light - indicates the power is on
Horn Off Button - Silences the audible alarm when pressed

SENSORS

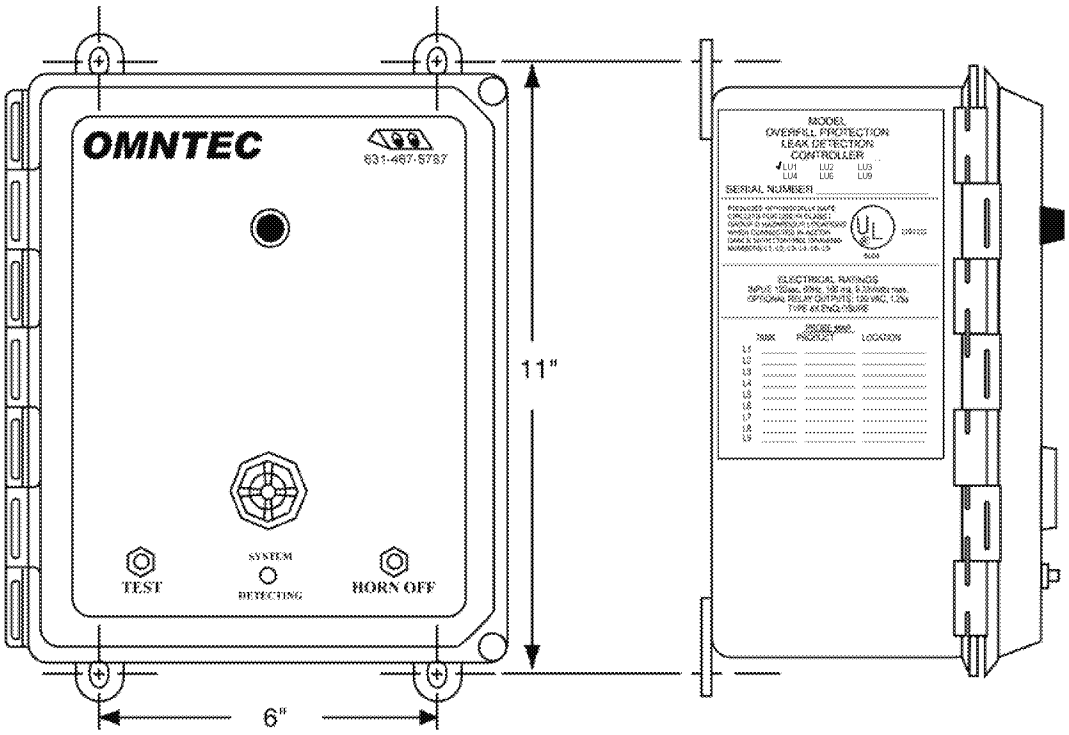
L-1	High level sensor
LS-ASC	Liquid sensor
LWF	Double wall liquid sensor

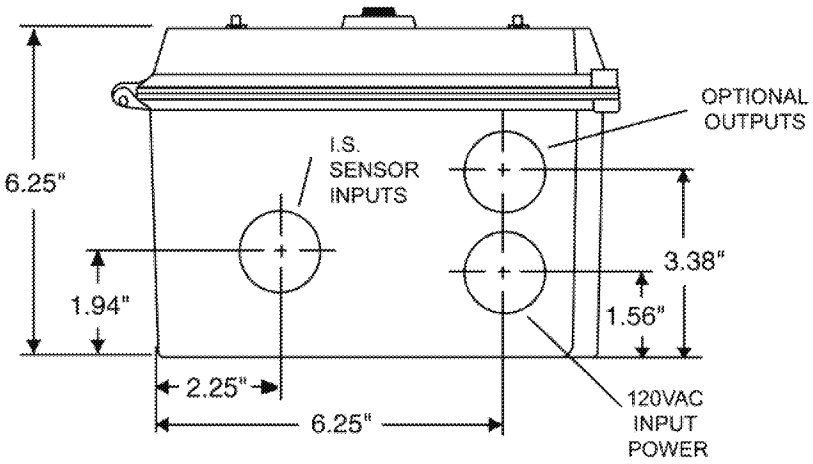
ACCESSORIES

RA-1	Audio/visual remote annunciator
RLY-RA	Relay (consult factory)
RA-1-NYS	Remote annunciator with strobe (consult factory)

LABELS
Provided with controller

Dimensions for mounting and knockouts





READ ALL INSTRUCTIONS PRIOR TO SYSTEM INSTALLATION. ALL WIRING IS TO BE DONE IN ACCORDANCE WITH ALL NATIONAL AND LOCAL ELECTRICAL CODES. POWER IS TO BE OFF DURING ANY WIRING. WIRE AND TEST ENTIRE SYSTEM BEFORE UTILIZING SK-3 CONNECTOR SEALING KITS.

STANDARD EQUIPMENT IS COMPATIBLE WITH MOST PETROLEUM PRODUCTS HOWEVER SOME CHEMICALS AND SOLVENTS REQUIRE SPECIFIC MATERIALS OF CONSTRUCTION. IF UNSURE OF COMPATIBILITY PLEASE VERIFY WITH MANUFACTURER.

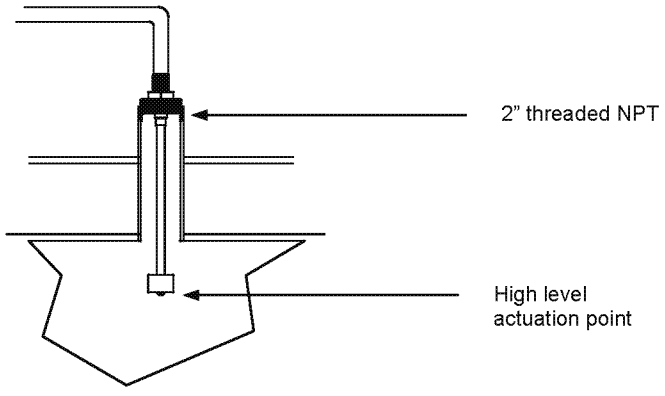
*** For waste oil applications consult factory ***

1. L-SERIES SENSOR

L-1 SENSOR

The L-1 sensor (see pg.8) is primarily used to detect a liquid level inside the tank. The sensor detects a single liquid level and is typically used for overfill protection at 90% tank capacity. Standard sensor part numbers are L-1-S (12”), L-1-L (20”), L-1-D (custom length).

The L-1 sensor is installed into the tank via the 2” bushing which is an integral part of the sensor. This sensor screws directly into a 2” female threaded NPT (use a reducer bushing if necessary).

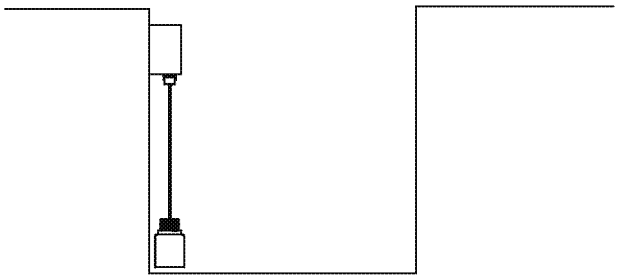


Connection of the sensor to the control unit cable is made in a junction box. For detailed wiring scheme refer to appropriate drawing (see pg.6 and 17). These connections must be made using supplied SK-3 connector sealing kit.

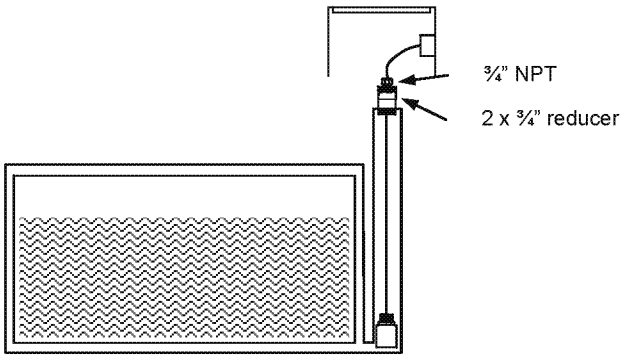
LS-ASC SENSOR

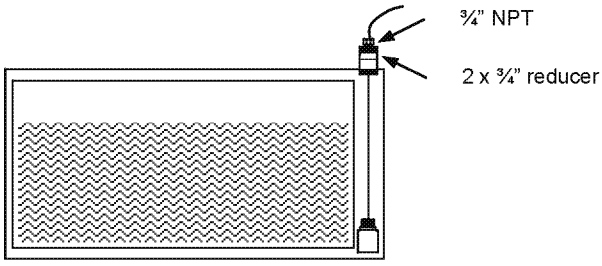
The LS-ASC sensor (see pg.7) is designed to detect liquid in sumps or containment areas and steel interstitial spaces for above ground and underground tanks.

1. To install the LS-ASC sensor as an above ground sump sensor mount a junction box between 2 and 3 feet above bottom of containment area. Attach sensor to junction box via conduit or cable clamp, leaving a ¼" clearance between the sensor end and the bottom of the containment area. For detailed wiring scheme refer to appropriate drawing (see pg.6 and 17). Connect sensor cables to control unit cables in junction box using supplied SK-3 connector sealing kit.



2. To install the LS-ASC as a doublewall tank sensor remove the oiltight from the sensor cable. Feed the cable through the appropriate bushing required to adapt the interstitial port to 3/4" NPT (oiltight). Feed wires through oiltight, leaving it loose. Gently lower sensor down interstitial port until it rests on the bottom. Install oiltight into the bushing. Pull sensor up by the cable until it just comes off the bottom. Maintain this position and tighten the oiltight fitting. This is required to seal the interstitial port. All connections are made using the supplied SK-3 connector kit.

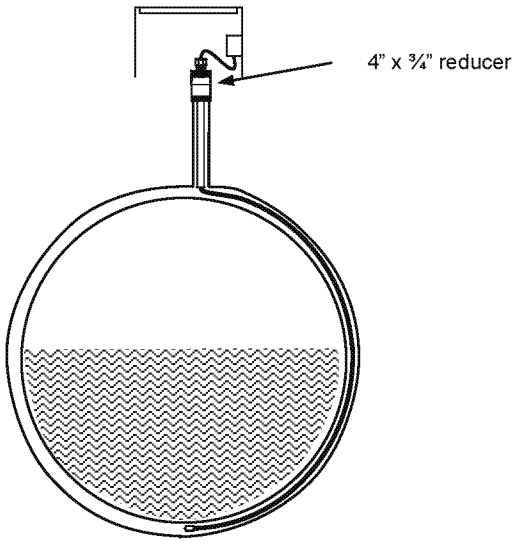




LWF-* SENSOR

The LWF-* sensor (see pg.9) is designed to detect liquid in the interstitial space of a double wall fiberglass tank.

1. The LWF-* sensor is installed through the interstitial port. If the tank is pitched, locate the interstitial sensor at lowest elevation of tank. Insert sensor into the interstitial port and push down around outside of inner tank. When PVC handle contacts the inner tank the sensor should be located at the bottom of interstitial space. Reduce the riser to 3/4" NPT and install the supplied oiltight fitting. The oiltight fitting must be installed to prevent liquids from entering the interstitial space. Run conduit from interstitial man hole to the central junction box, located in the manway. Install a second oiltight on the sensor cable and pull sensor cable through conduit. Connect oiltight to conduit and tighten. For detailed wiring scheme refer to appropriate control drawing (see pg.6 and 17). Connect sensor wires in central junction box to control unit cable(s) and use SK-3 connector sealing kit.



2. CONTROL UNIT

The control unit (see pg.1) should be mounted in a manned area. Route sensor control cable through conduit from the junction box to the control unit. Sensor control cables enter the control unit through the output port only. The cables are wired as shown in the appropriate drawing (see pg.6). The control unit accepts any possible combination of L-series sensors.

INPUT POWER HOOKUP

Input power requirements are:
85 – 125 VAC
16 Watts max
47 – 440 Hz

Input power cable should be wired in accordance with all pertinent electrical codes. This cable should enter the control unit through the input power port only. The power is hooked up to the power supply and wired as per control drawing (see page 17). NOTE: EARTH GROUND TERMINAL MUST BE CONNECTED.

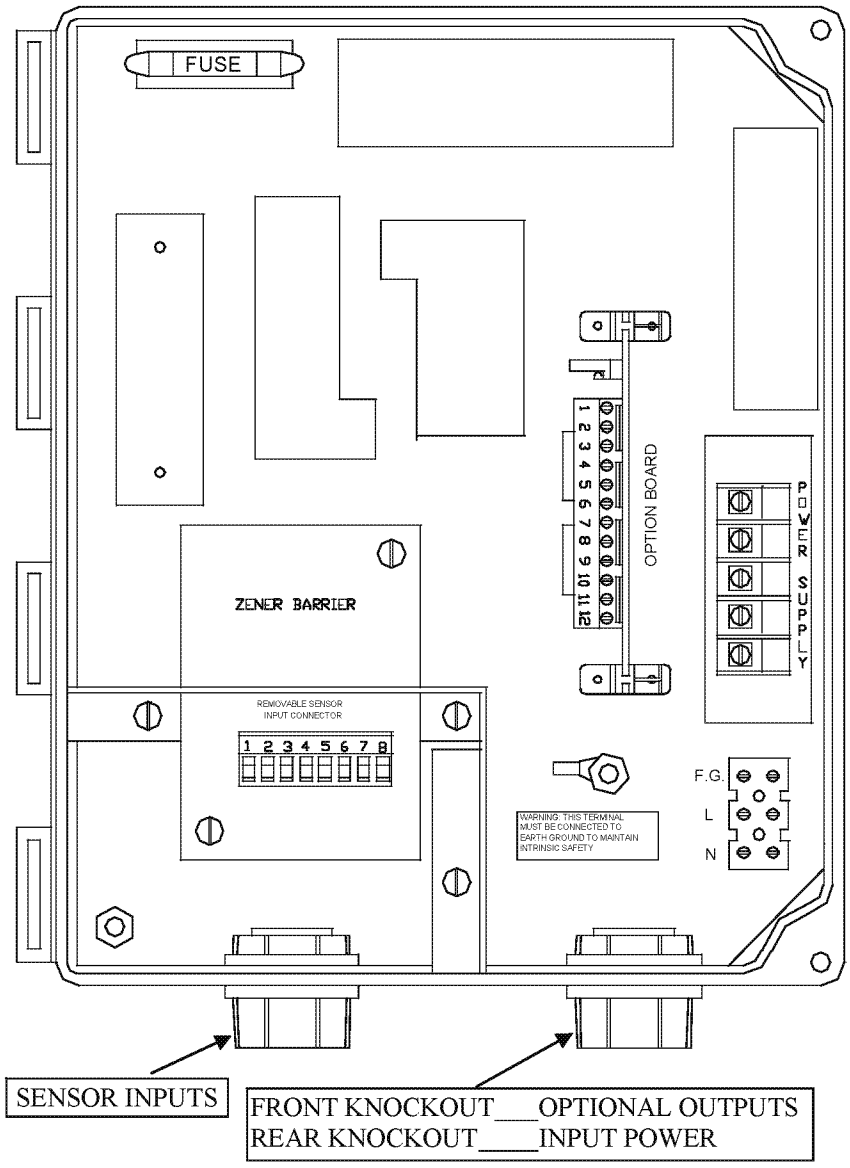
REMOTE ANNUNCIATOR OPTION

Mount remote annunciator (see pg.16) within audio / visual range of the filling operator. NOTE: the remote must be outside of the HAZARDOUS AREA. Pull appropriate low voltage wire from the remote to the control unit. See appropriate drawing for wiring details. Run wires through output port. Connect color coded nuts.

SK-3 CONNECTOR SEALING KIT

Make all splices using SK-3 connector kit (supplied)

LU1 CONTROLLER CONNECTION DIAGRAM



COLOR CODE

CABLES FROM SENSORS TO REMOVABLE SENSOR INPUT CONNECTORS

1	RED	SENSOR #1
2	WHITE	
3	UNUSED	
4	UNUSED	
5	UNUSED	
6	UNUSED	
7	BLACK	GROUND
8	SHIELD DRAIN	FROM SENSOR #1

WIRES TO OPTION BOARD

WIRES FROM RA-SERIES REMOTE

1	GREEN	-HORN
2	RED	+HORN
3	BLACK	GROUND
4	WHITE	SENSOR #1
5	UNUSED	
6	UNUSED	

WIRES FROM RELAY OUTPUTS

7	UNUSED	
8	UNUSED	
9	UNUSED	
10	UNUSED	
11	COMMON	SENSOR #1
12	NORMALLY OPEN	

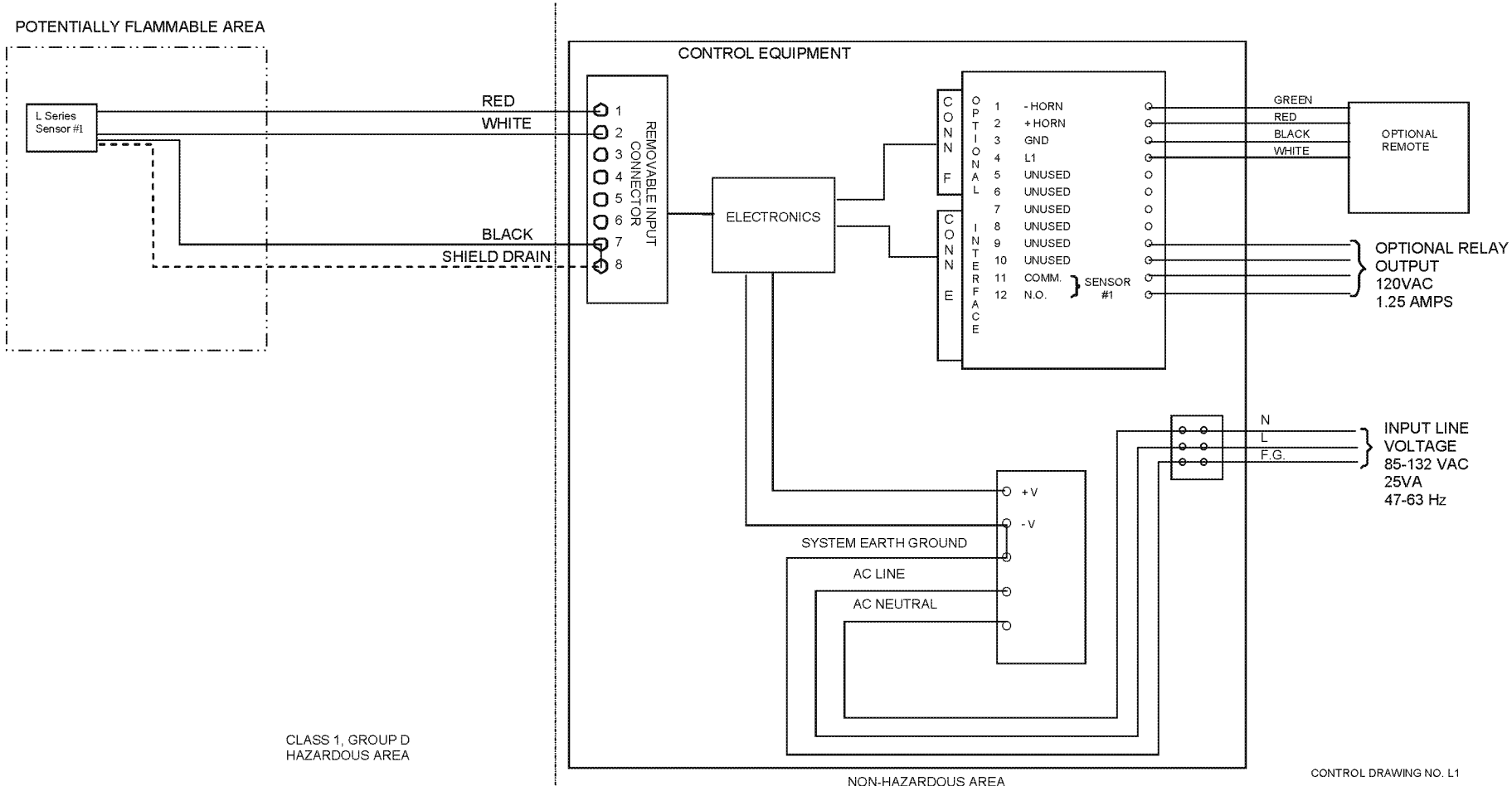
120VAC

WIRES TO POWER SUPPLY

F.G.	FIELD GROUND
L	LINE
N	NEUTRAL

NOTE: To maintain proper shielding, BLACK **sensor** wires and SHIELD DRAINS should **not** be connected together at sensors.

LU1 SYSTEM CONTROL DRAWING



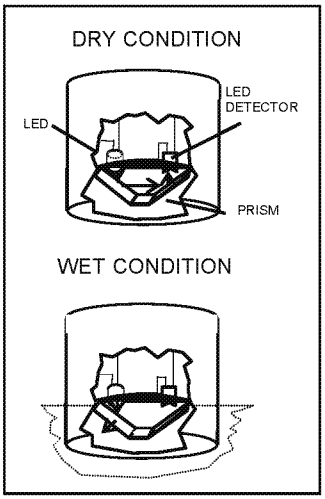
NOTES ON PROBES

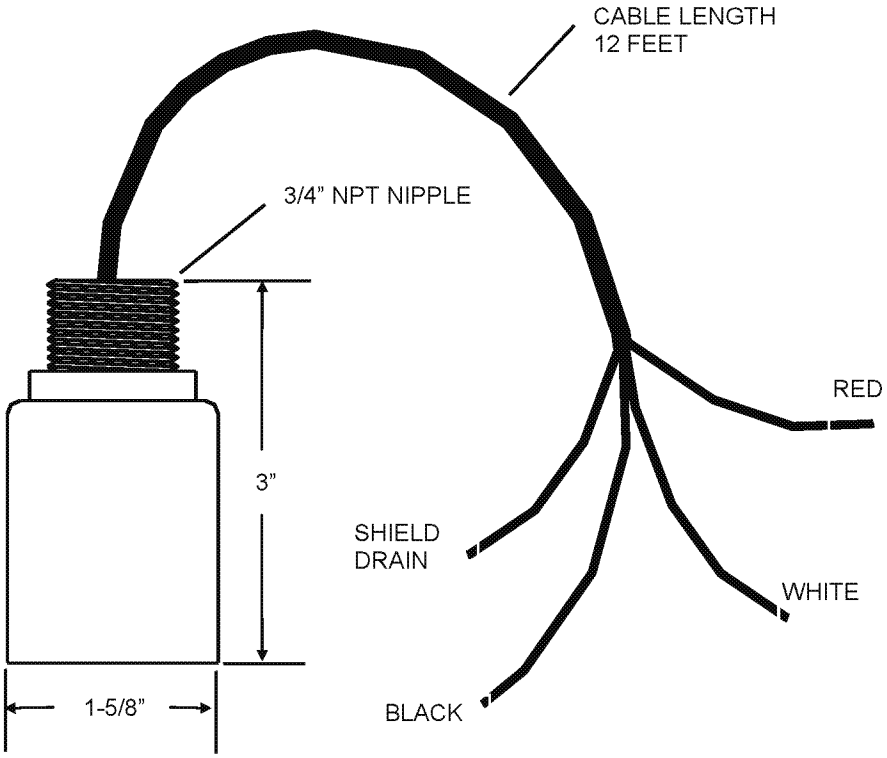
1. THE INTRINSICALLY SAFE FIELD WIRING SHALL BE INSTALLED IN ACCORDANCE WITH ARTICLE 504 IN THE NATIONAL ELECTRIC CODE ANSI/NFPA 70
2. ALL PROBES ARE ELECTRICALLY IDENTICAL AND MAY BE INTERCHANGED ALLOWING SYSTEM FLEXIBILITY
3. PROBE TO CONTROL UNIT CABLE WILL BE TWO PAIR OF #22AWG WITH SHIELD AND DRAIN PVC JACKETED UL-118830 CM. CABLE LENGTH WILL BE LIMITED TO 2000 FEET MAXIMUM

NOTES ON CONTROL EQUIPMENT

1. ALL WIRING MUST MEET LOCAL AND NATIONAL ELECTRICAL CODES
2. SYSTEM EARTH GROUND MUST BE CONNECTED TO TERMINAL F.G. TO INSURE INTRINSIC SAFETY AND MUST BE LESS THAN 1Ω WITH RESPECT TO EARTH GROUND
3. OPTIONAL REMOTE REQUIRES #22 AWG LOW VOLTAGE COMMUNICATION CABLE MINIMUM

Non-product distinguishing Optic Sensor





LS-ASC SPECIFICATIONS

U.L. LISTED 5L04
Intrinsically safe Class I, Group D Hazardous Locations when connected in accordance with control drawing nos. L1, L2, L3, L4, L6, L9

OPERATING TEMPERATURE
-40 TO +140 F

POWER
2 VDC @ 13 mA

WEIGHT
1/2 pound

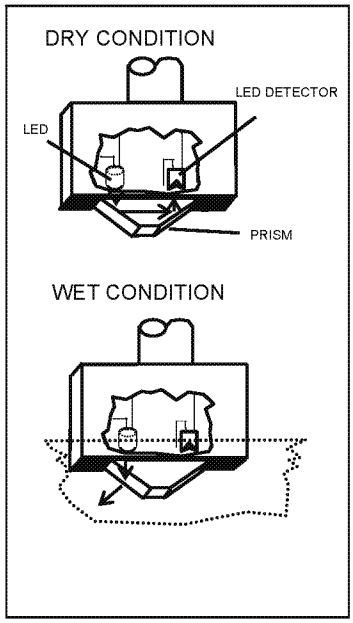
PRINCIPLES OF OPERATION
LIQUIDS (ex: fuel, water) – photo Optic
DRY CONDITION – Normally closed light beam
ALARM CONDITION – Opens (refracts) normally closed light beam

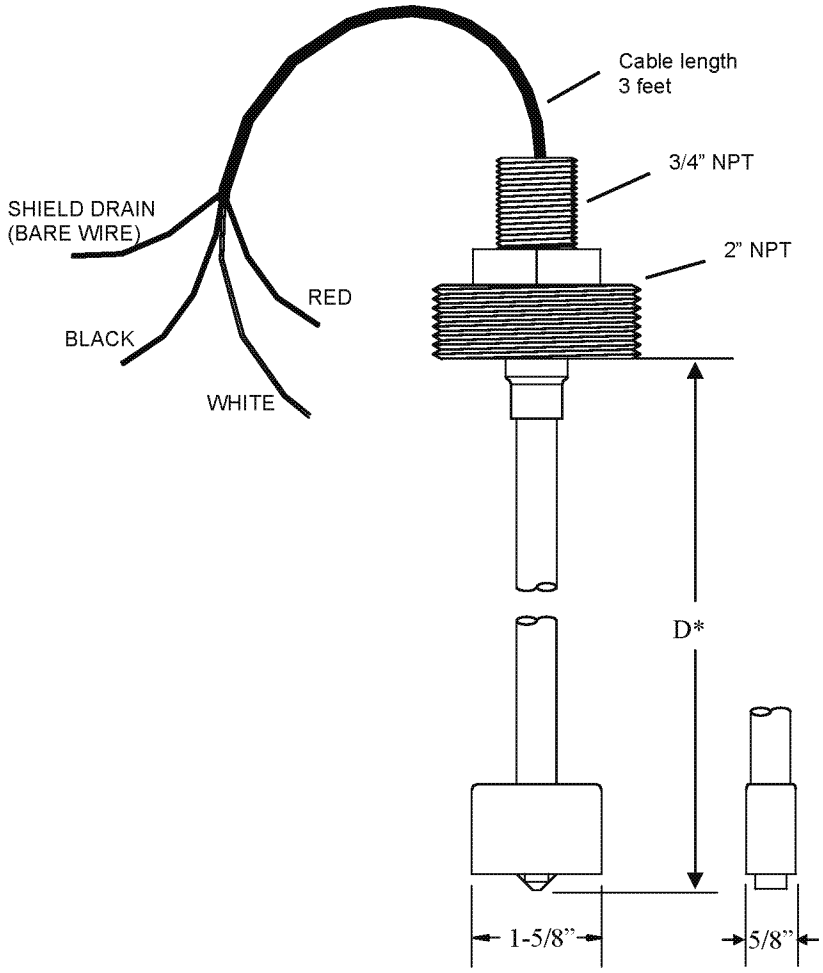
SENSOR CABLE
Shielded 22 AWG UL-E118830 CM
Maximum length 2000 feet

RESPONSE TIME
Immediate

Liquid Level Optic Sensor

Principles of Operation





L-1 SPECIFICATIONS

U.L. LISTED 5L04
Intrinsically safe Class I, Group D Hazardous Locations when connected in accordance with Control Drawing nos. L1, L2, L3, L4, L6, L9

OPERATING TEMPERATURE
-40 TO +140 F

POWER
2 VDC @ 13 mA

WEIGHT
2 pounds

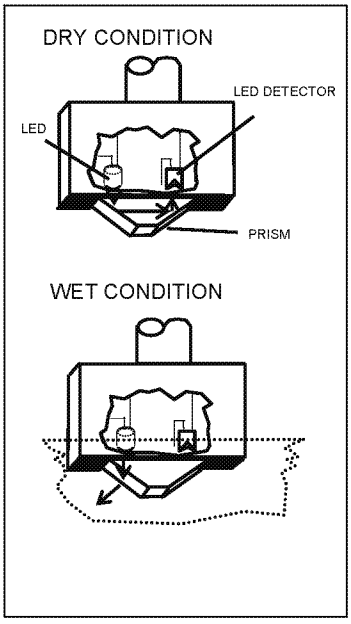
PRINCIPLES OF OPERATION
LIQUIDS (ex: fuel, water) – Photo Optic
DRY CONDITION – Normally closed light beam
ALARM CONDITION – Opens (refracts) normally closed light beam

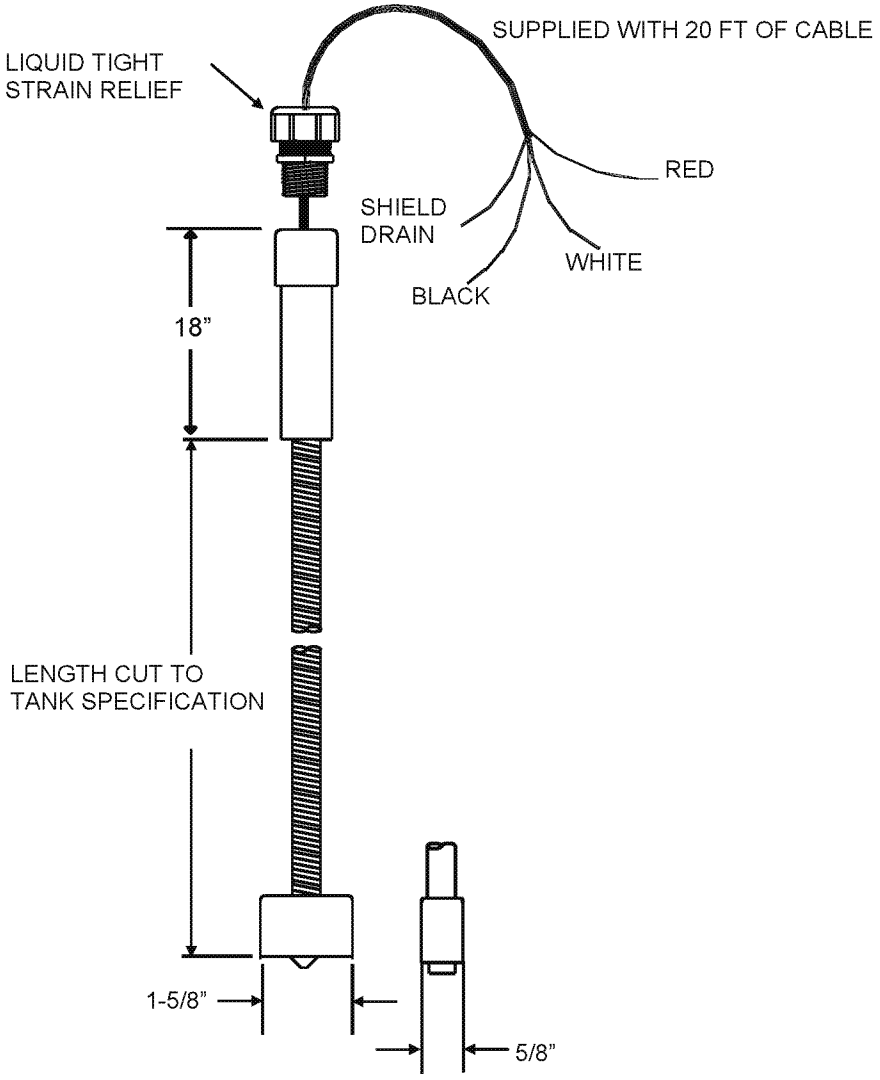
SENSOR CABLE
Shielded 22 AWG UL-E118830 CM
Maximum length 2000 feet

RESPONSE TIME
Immediate

Non-product distinguishing Fiberglass tank dry interstitial sensor

Principles of Operation





LWF SPECIFICATIONS

OPERATING TEMPERATURE
-40 TO +140 F

POWER
2 VDC @ 13 mA

WEIGHT
2 pounds

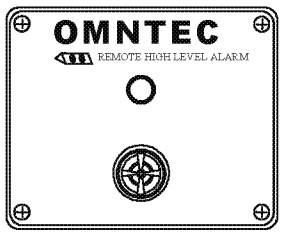
PRINCIPLES OF OPERATION
LIQUIDS (ex: fuel, water) – Photo Optic
DRY CONDITION – Normally closed light beam
ALARM CONDITION – Opens (refracts) normally closed light beam

SENSOR CABLE
Shielded 22 AWG UL-E118830 CM
Maximum length 2000 feet

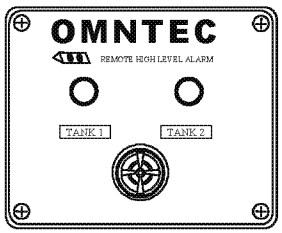
RESPONSE TIME
Immediate

RA-Series Remote High Level Alarm

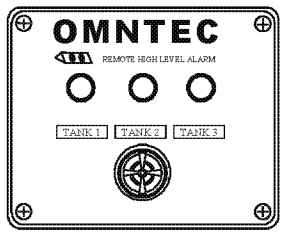
RA-1



RA-2



RA-3



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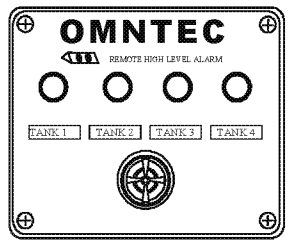
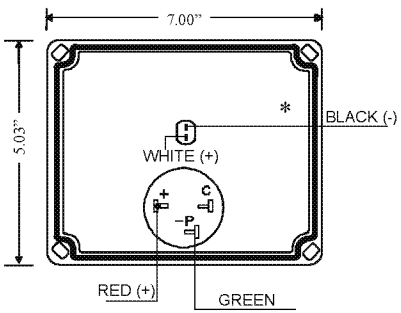
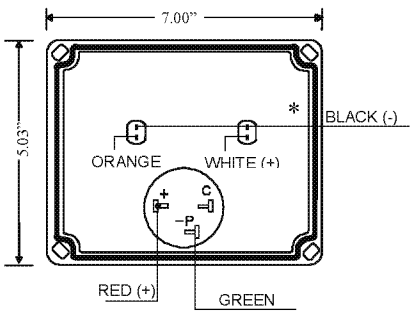
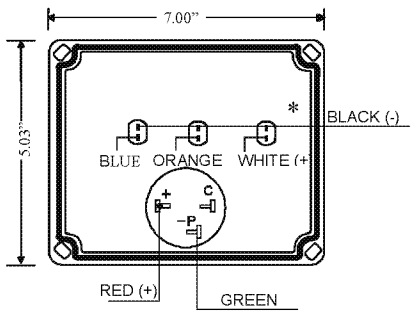
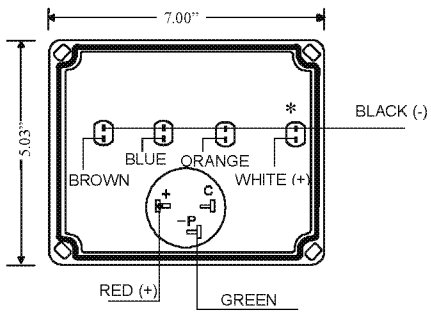


Internal Wiring Color Code







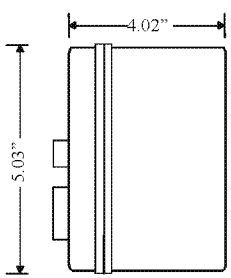


* **WARNING LABEL PLACED HERE**: Warning: Low voltage inputs only

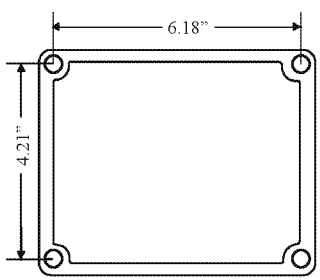
SPECIFICATIONS

Audible Alarm	95 dB pulsing horn
Red Light	Liquid-high-level alarm
Response Time	Immediate
Power Input	12VDC @200mA maximum from controller
Wire	22 AWG minimum
Weight	1 lb.

SIDE VIEW



MOUNTING DIMENSIONS

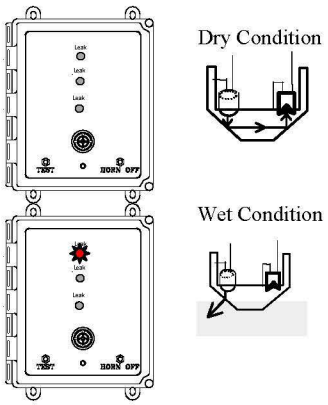


Note: It is recommended that knockouts be placed in the bottom of the enclosure

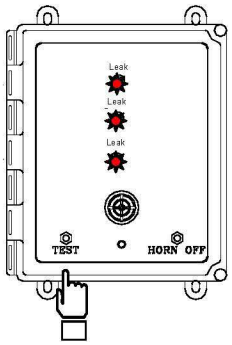
OMNTEC LU-SERIES System Operation and Test Instructions

1. On the front panel the Green "SYSTEM DETECTING" light should be on indicating that system is up and running

2. If sensors are not in alarm, all Red lights should be off
   - Optical sensors are solid state and use a normally closed light loop in a prism for sensing. When liquid is present at sensor, the normally closed loop of light is open, thus sending an alarm signal back to the alarm panel. The panel responds by turning on the appropriate light and sounding an audible alarm



3. Since system sensors are solid state and work with normally closed loop of light, sensors can be tested as follows:
   - Press the test button on alarm panel and observe panel lights
   - If all lights illuminate and audible alarm sounds, system test is complete
   - When test button is pressed a signal is sent to sensor to turn its light off. What this does is put the sensor into an alarm condition
   - The sensor then responds as explained in part (2)



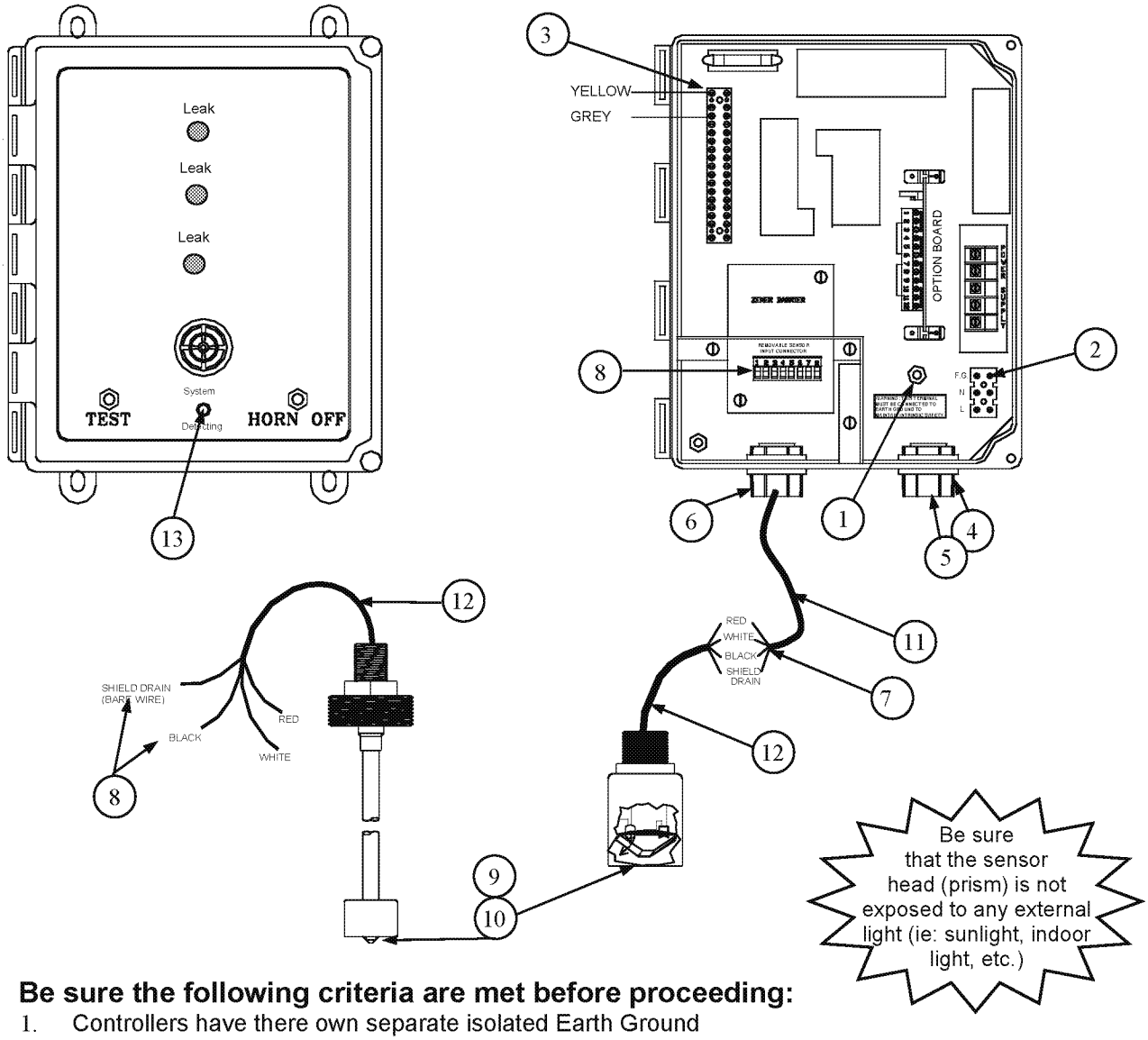
4. System should be tested on at least weekly basis

5. Every alarm, malfunction and test result should be recorded in a dated signed log

Manufactured by:	Installed by:
OMNTEC Mfg., Inc. 1993 Pond Rd. Ronkonkoma, New York 11779 Phone 631-981-2001 Fax 631-981-2007	

LU-Series TROUBLESHOOTING PROCEDURES

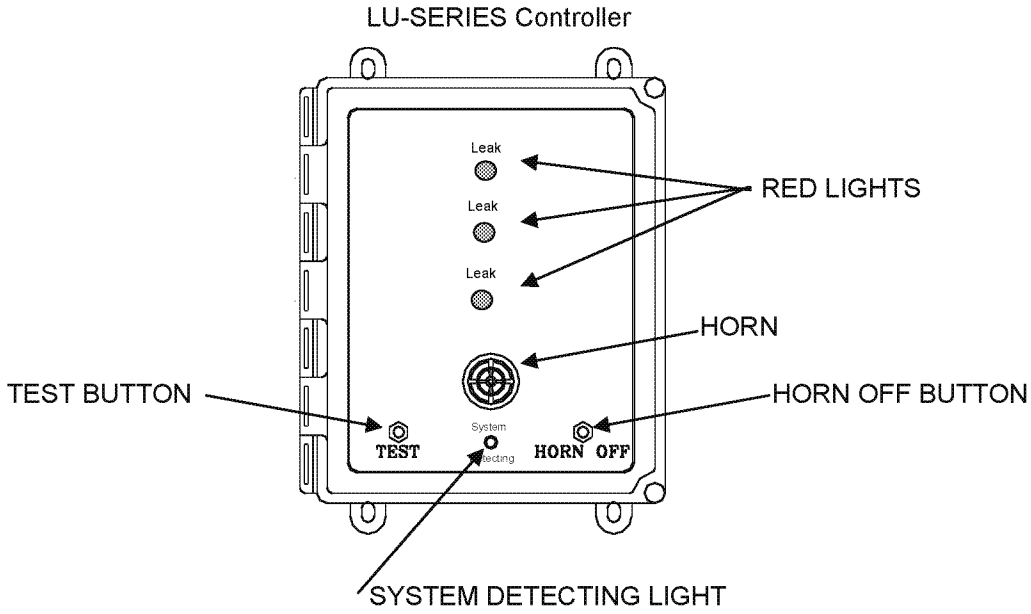
FOR LU-SERIES CONTROLLERS WHEN USED WITH ELECTRO-OPTIC SENSORS



Be sure the following criteria are met before proceeding:

1. Controllers have there own separate isolated Earth Ground
2. Controllers have there own separate isolated Field Ground
3. The Controller should have 13.8 VDC on the output of the power supply (Across the yellow-positive and gray-negative wires)
4. 120VAC wires are in there own separate isolated conduit
5. Remote Annunciator wires are in there own separated isolated conduit
6. Sensor wires are in there own separate isolated conduit
7. Sensor shield drain wire is not connected to black wire at sensor splice
8. Black & shield drain are connected to ground at removable input connector
9. Sensor head (prism) is not exposed to any external light (i.e.: sunlight, indoor light, etc)
10. Sensors are free of dirt and debris
11. Sensor extension cables are minimum 3 conductor #22 AWG shielded with drain wire
12. Sensors wires do not exceed 2000 ft.
13. The “System Detecting Light” should be illuminated

Troubleshooting Procedures



SYMPTOM	TROUBLESHOOTING PROCEDURE	RESULT
"Red Light" does not come on when test button is pressed.	1) Unplug sensors "Removable input connector" at controller. Does the "red Light" illuminate?	(YES) controller is functioning. Proceed to step 2. (NO) controller is not functioning (consult factory).
	2) Check wiring at removable input connector. Concentrate on white, black and shield wire inputs from sensors, making sure no shorts are present. Re-plug connector and press test button. Does the "Red Light" illuminate?	(YES) system is functioning properly. (NO) Proceed to step 3.
	3) Check splice at sensor for moisture or mis-wire (concentrating on white and black wires from sensor). Correct problem and press test button. Does the "Red Light" illuminate?	(YES) problem are in the wire connections at splice (NO) sensor is not functioning properly. Proceed to step 4.
	4) Remove sensor from installation, connect at controller, shroud from light and press test button. Sensor head (prism) is not exposed to any external light (ie: sunlight, indoor light, ect.). Does the "Red Light" illuminate?	(YES) problem in wire run to sensor. System is functioning properly. (NO) The sensor failed (consult factory)

SYMPTOM	TROUBLESHOOTING PROCEDURE	RESULT
"Red Light" remains on.	1) Check if sensor is actually in alarm (submerged)	(YES) correct alarm condition. (NO) proceed to step 2.
	2) Check wiring at removable input connector concentrating on red, white, black and shield wire inputs from sensors. Make sure no open circuits are present. Re-plug the connector and press test. Does the "Red Light" stay on?	(YES) proceed to step 3. (NO) System is functioning properly. Problem was in the wire or connections.
	3) Disconnect sensor wires from removable sensor input connector. Connect a jumper from the white input to the black input at the connector. Make sure all sensor wiring is disconnected. Does the "Red Light" stay on?	(YES) Controller is not functioning properly (consult factory) (NO) Controller driver boards are functioning properly. Proceed to step 4.
	4) Check DC voltage from red input to black input. Is it 7.5 – 9V DC?	(YES) proceed to step 5 (NO) Controller is not functioning properly. Consult factory.
	5) Check splice at sensor for moisture or mis-wire. Correct problem. Does the "Red Light" stay on?	(YES) proceed to step 6. (NO) If light goes off before pressing test button and goes on after pressing test button System is functioning properly. Problem was in the connection or wire.
	6) Connect sensor directly to controller. Make sure sensor head is not exposed to light during test. Does the "Red Light" stay on?	(YES) Sensor is not functioning properly (consult factory) (NO) Problem is in the wire or connections.
Horn does not sound on controller when the "TEST" button is pressed.	1) Are any "Red Lights" illuminated on controller?	(YES) Make sure at least one input is not in alarm state. Then proceed to step 2. (NO) proceed to step 2.
	2) Shut down system for 30 seconds. Turn system back on. Does horn sound when hitting the "TEST" button?	(YES) Controller is functioning properly. (NO) Controller is not functioning properly. Proceed to step 3.
	3) While holding the "TEST" button down put a voltmeter on the positive and negative on the back of the horn. Do you get 13.8 volts +/- 1?	(YES) Your horn does not work. Replace horn. (NO) Your horn board is not working (consult factory)

LOG SHEET

DATE	NAME	SYSTEM STATUS	SIGNATURE

Warranty

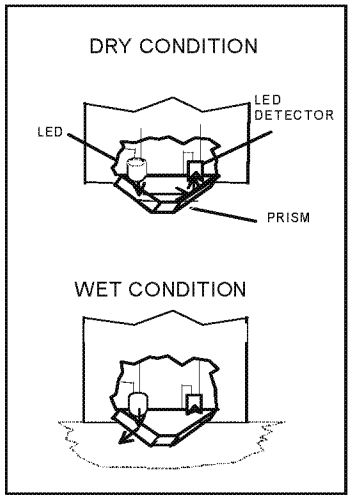
The seller OMNTEC Mfg., Inc. warrants to buyer defects when properly installed, and maintained by user. The sellers sole obligation is to repair or replace parts found to be defective, or non-conforming for one year and only after evaluation by factory. The liability of the seller shall not exceed the price paid for the components found to be defective. The above warranty is exclusive of all other warrantees whether implied or expressed. Seller assumes no obligation for special or, indirect damages incurred by user.

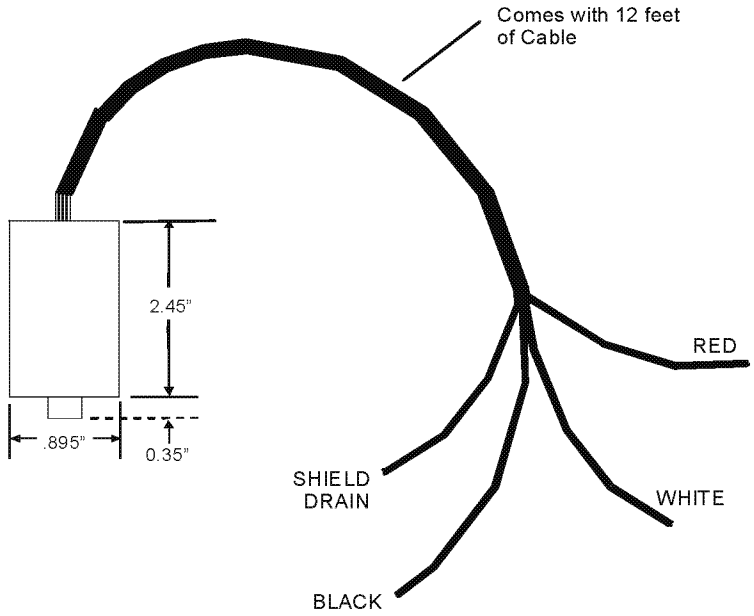
All standard tank gauging systems are free of defects when properly installed and maintained by user. Warranty on tank gauging systems will only be effective after proper documentation has been submitted by the buyer to OMNTEC Mfg., Inc. The sellers sole obligation is to repair or replace parts found to be defective, or non-conforming for one year and only after evaluation by factory. The liability of the seller shall not exceed the price paid for the components found to be defective. The above warranty is exclusive of all other warrantees whether implied or expressed. Seller assumes no obligation for special or indirect damages incurred by user.

All standard replacement parts, "add-ons", or spare parts are free of defects when properly installed and maintained by user. The sellers sole obligation is to repair or replace parts found to be defective or non-conforming for 90 days and only after evaluation by factory. The liability of the seller shall not exceed the price paid for the components found to be defective. The above warranty is exclusive of all other warrantees whether implied or expressed. Seller assumes no obligation for special or indirect damages incurred by user.

Equipment not covered by this warranty includes, but is not limited to: custom equipment, pressure transducers, and control systems.

OMNTEC LS-ASC-.895





SPECIFICATIONS

U.L. LISTED 5L04
Intrinsically safe Class I, Group D Hazardous Locations when connected in accordance with control drawing nos. L1, L2, L3, L4, L6, L9

OPERATING TEMPERATURE
-40 TO +140 F

POWER
2 VDC @ 13 mA

WEIGHT
1/2 pound

PRINCIPLES OF OPERATION
LIQUIDS (ex: fuel, water) – Photo optic
DRY CONDITION – Normally closed light beam
ALARM CONDITION – Opens (refracts) normally closed light beam

SENSOR CABLE
Shielded 22 AWG UL-E118830 CM
Maximum length 2000 feet

RESPONSE TIME
Immediate

Attachment 2: Revised Figures

- Figure 2.2-7
- Figure 2.2-10

EX-0022-000033-PCE

AREA 600
WEST BOILER

NW Lower River Rd

AREA 200 - UNLOADING AND OFFICE

AREA 500 -
TRANSFER PIPELINE

AREA 300
STORAGE

Harborside

Gateway

Harborside

Columbia River

AREA 400 - MARINE TERMINAL

LEGEND

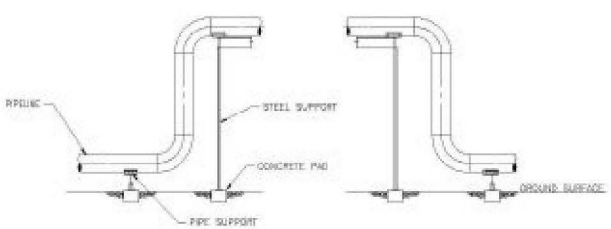
- Site Boundary
- Transfer Pipeline

Vancouver Energy Improvement Areas

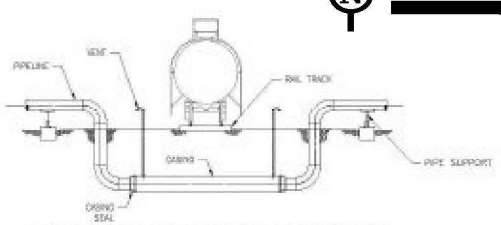
- 200 - Unloading and Office
- 300 - Storage
- 400 - Marine Terminal
- 500 - Transfer Pipelines
- 600 - West Boiler
- Rail Infrastructure

N

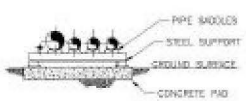
0 500 1,000 1,500 2,000 Feet



TYPICAL PIPELINE TRACK/ROAD OVERPASS



TYPICAL PIPELINE TRACK/ROAD BELOW GRADE CROSSING



TYPICAL PIPE SUPPORT

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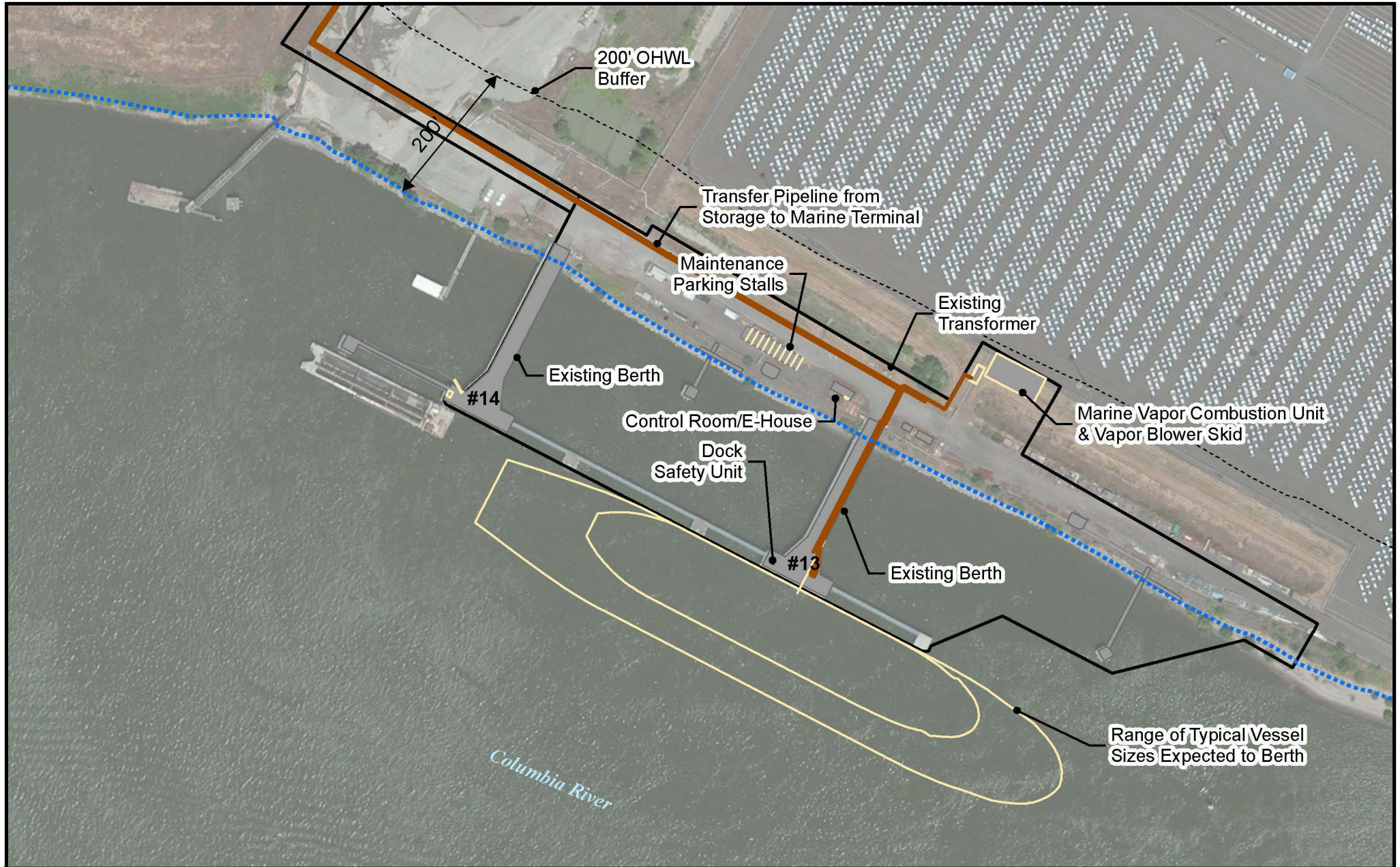


LEGEND

- Ordinary High Water Line
- Ordinary High Water Buffer
- Transfer Pipeline
- Site Boundary

N

0 100 200 300 400 Feet

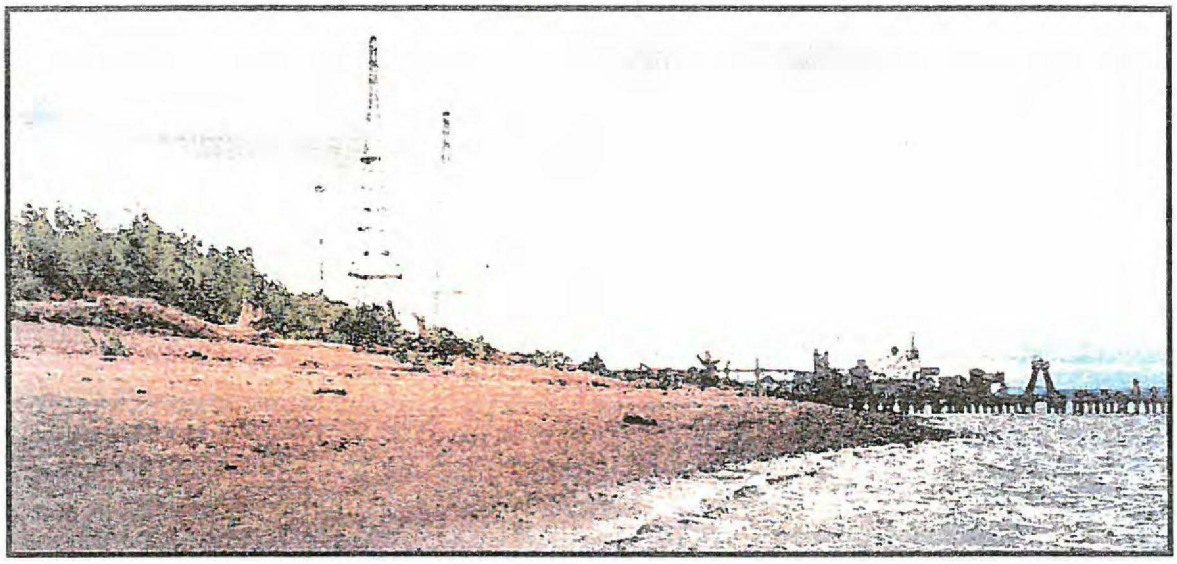
EX-0022-000036-PCE

Attachment 3: Port of Vancouver USA 2004 Natural Resource Inventory Management Plan

REEDER

Port of Vancouver USA

Natural Resources Inventory Management Plan



for

Port of Vancouver, USA
3103 NW Lower River Road
Vancouver, Washington

October 15, 2004

by

VIGIL AGRIMIS, INC.
819 SE Morrison Street, Suite 310
Portland, Oregon

and

Herrera Environmental Consulting
2200 Sixth Avenue, Suite 1100
Seattle, Washington

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INTRODUCTION

Purpose of the Natural Resources Inventory Management Plan

The Port of Vancouver, USA (the Port) prepared this Natural Resources Inventory Management Plan (NRIMP) for its developed industrial property along the Columbia River. The NRIMP will facilitate the development, redevelopment and maintenance of Port property while limiting impacts to aquatic, shoreline and terrestrial habitats. This comprehensive plan will help the Port:

- Streamline the environmental permitting process,
- Avoid project delays by identifying appropriate mitigation/conservation options early in the project development process,
- Assist with budget process for facility improvements by providing cost estimates to implement mitigation options,
- Improve management of Port environmental assets,
- Avoid piece-meal mitigation planning,
- Meet or exceed local, state and federal agency requirements for comprehensive resource protection.

Figure 1 describes the site context for the NRIMP.

Three major sections are included in the NRIMP:

- Framework,
- Natural resources inventory, mapping and functional assessment,
- Habitat management plan.

The framework section reviews pertinent scientific literature, documents, maps and aerial photographs to describe existing conditions at the Port and to identify the key issues and themes addressed in the NRIMP. Preliminary mapping was followed by a natural resources inventory conducted in early September 2003. This inventory focused on the shoreline areas of the developed Port. Water quality, hydrologic and food web and habitat functions were assessed for the inventoried areas. Assessments of the potential impacts to these functions brought about by redevelopment and maintenance activities were the basis for the development of the habitat management plan (the Plan). The Plan provides options for the replacement of lost functions due to future unavoidable impacts to natural resources.

Embedded in the NRIMP are some key concepts that have shaped its development:

- Providing a flexible planning tool,
- Taking a proactive approach to regulatory permitting,
- Focusing on the developed shoreline,
- Addressing the range of natural resource areas (water – shore – land),
- Focusing on Critical Intersections – locations where value is high for both natural resources and Port activities,
- Compensating for unavoidable impacts with mitigation templates based upon location, and habitat type as well as Port activity.

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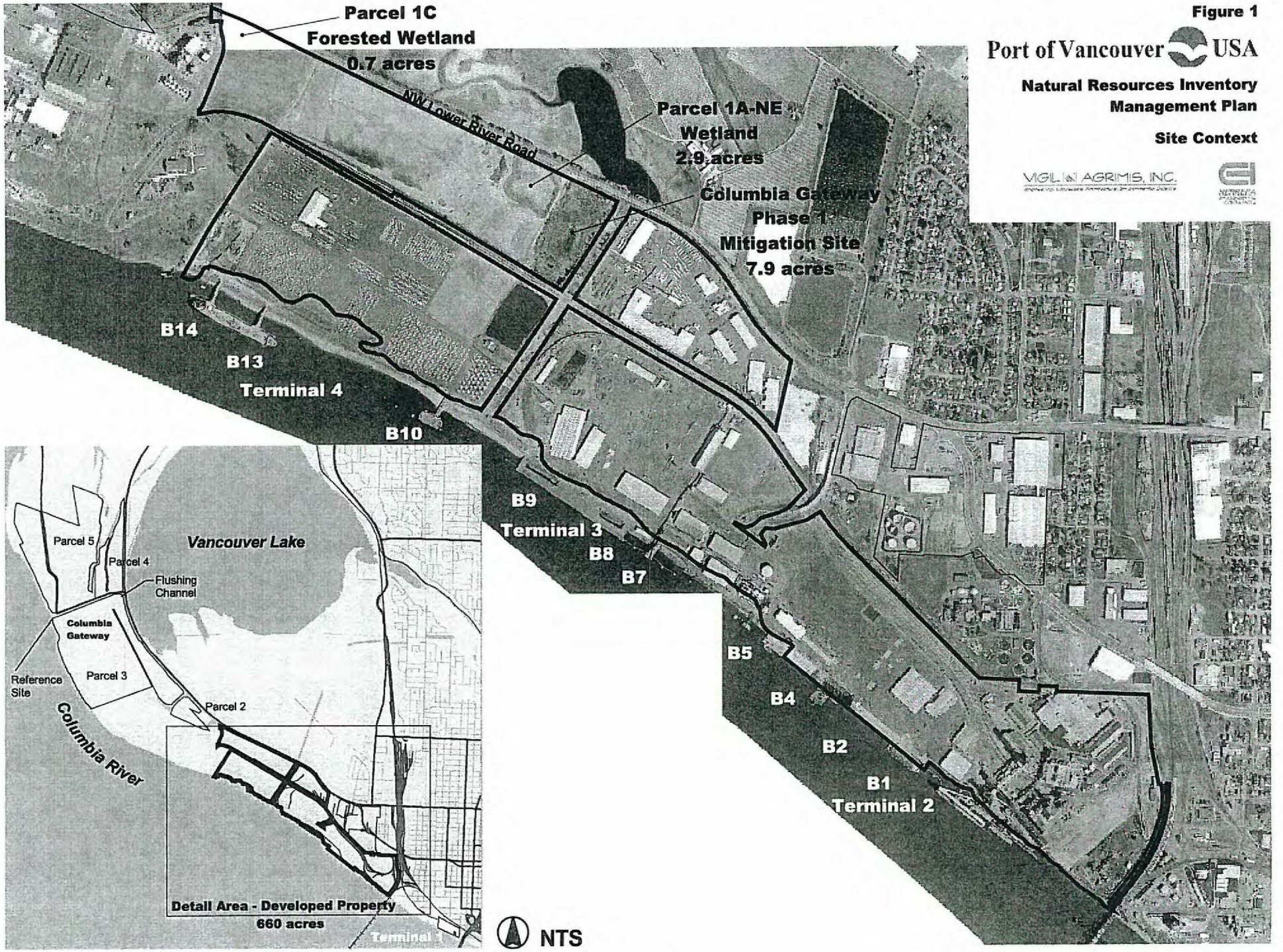

Figure 1

Port of Vancouver USA

Natural Resources Inventory
Management Plan

Site Context

VIGILIN AGRIMIS, INC.

EX-0022-000044-PCE

Providing a Flexible Planning Tool

Though it is intended for application on the Port's developed property, the NRIMP also provides the Port with a flexible tool allowing the Port to better anticipate the permitting and mitigation requirements associated with the range of development, redevelopment and maintenance choices facing the Port over the next 20 years. It provides a framework for a consistent approach to managing the Port's natural resources. The goal of the NRIMP is to evaluate the impacts of development, redevelopment and maintenance activities on water quality, hydrologic and habitat functions and provide guidance on how these impacts can be avoided, reduced and mitigated for. As such, the Plan provides a set of general principles that can be applied Port-wide.

The NRIMP will not eliminate the need for regulatory consultation or the completion of Biological Assessments (BA) on a project-by-project basis. However, the NRIMP will allow the Port to complete a significant portion of a BA for a specific project by providing information on the natural resources that are present on the Port's developed shoreline, the functions and values of those resources and how those resources are likely to be impacted by a number of common Port activities.

Taking a Proactive Approach to Regulatory Permitting

The NRIMP is intended to anticipate permit requirements for development and maintenance activities on developed Port property. A number of permits or approvals may be required for these activities given the breadth of natural resources encompassed in Port facilities. These could include compliance with federal, state and local regulations associated with the National Environmental Policy Act (NEPA), Endangered Species Act (ESA) and Section 401/404 permits of Clean Water Act.

Section 401/404 of the Clean Water Act, NEPA and ESA all require that alternatives be evaluated to illustrate that:

- Impacts are being avoided to the greatest extent practicable,
- Impacts are being reduced to the greatest extent practicable,
- Impacts that are neither avoidable nor reducible are compensated for.

Addressing the Range of Natural Resource Areas (Water – Shore – Land)

Ports with marine facilities are unique in their landscape position – encompassing water, shoreline and land areas (Figure 2). The NRIMP addresses all of these areas but to various levels because natural resources do not have the same quality of functional value across the Port's developed property. The NRIMP is focused on locations where natural resource and Port Activity values are high.

Several fish species that are federally or state listed as threatened or endangered, are candidate species for listing or are of special concern use the Columbia River in the vicinity of the Port of Vancouver. These species include Chinook salmon, chum salmon, coho salmon, steelhead trout, bull trout, coastal cutthroat and Pacific lamprey. Anadromous salmon and steelhead use the River to migrate between upstream spawning areas and the Pacific Ocean. These species utilize shallow water areas along the shoreline while migrating (Fishman Environmental Services 2002).

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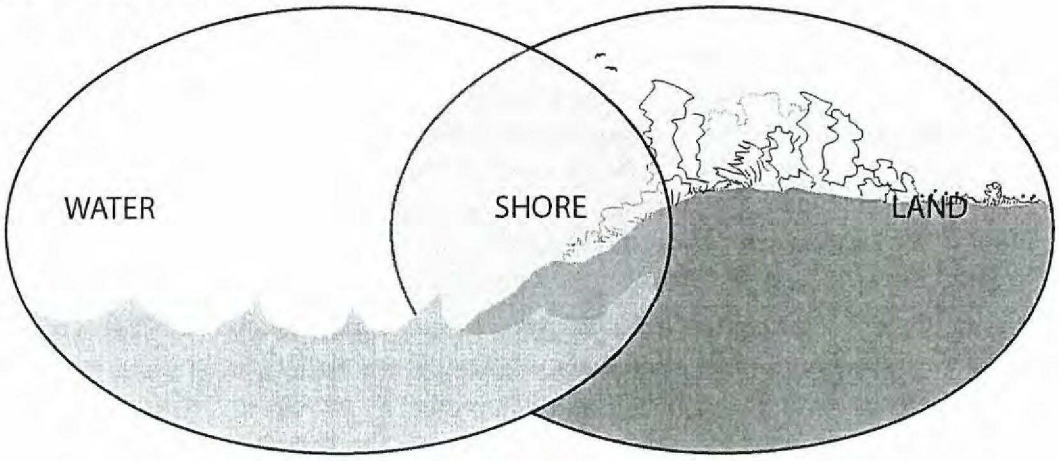
Figure 2. Conceptual Diagram, Water – Shore – Land



Scope of the Natural Resources Inventory Management Plan

The Port prepared the NRIMP for 660 acres of developed industrial property along the Columbia River. As shown in Figure 1, the developed Port extends approximately 2-miles along the north shore of the Columbia River. It is located between river mile 105.5 (the railroad bridge adjacent to the grain elevator) and river mile 103.5 (berth 14).

Columbia Gateway consists of 1,106 acres of undeveloped land west of the developed Port. It is covered generally but not explicitly in the NRIMP because it is currently proceeding through a State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS) process. Columbia Gateway includes Parcel 2 (31 acres), Parcel 3 (534 acres), Parcel 4 (111 acres) and Parcel 5 (430 acres). The area is 2 miles in length. The Subarea Plan for Columbia gateway incorporates water, heavy and light industrial uses. Under the plan Parcel 2 is a dedicated wetland mitigation site. The NRIMP does not cover the Inn at the Quay at Terminal 1.

Focusing on the Developed Shoreline

The NRIMP focuses on the developed shoreline including Terminals 2 through 4. Terminal 2 runs from river mile 105.5 to approximately to river mile 104.5 and includes the Grain Elevator and Berths 1, 4, 5, 7. Common activities on Terminal 2 are break-bulk, liquid bulk, and dry bulk. The shore in this area is generally steep and has been modified with riprap or bulkheads.

Terminal 3 extends from approximately river mile 104.5 to 104 and consists of Berths 8 and 9 which are primarily used for break-bulk. The shore in this area is also generally steep and modified with riprap or bulkheads.

Terminal 4 stretches from river mile 104 to 103.5 and features the auto roll-on/roll-off dock at Berth 10 and the lay berths 13 and 14. The shore in this area is more gradually sloped. It has been modified with riprap but a beach extends between this riprap and the water.

As shown in Figure 1, much of the aquatic, shoreline and land area within the developed port has been built. Natural resource areas within the developed Port include a combination of existing environments created or enhanced areas, and mitigated sites. These areas include shore plantings at Terminal 2 between Berth 5 and 7 and at Terminal 4 between Berth 10 and 13. Wetland and upland sites in Parcel 1 are labeled and include:

- Columbia Gateway Phase I Mitigation Site,
- Parcel 1A-NE Wetland,
- Parcel 1C Forested Wetland and

Parcels 2 – 5 which are located on the inset map in Figure 1 are included in Columbia Gateway Phase II and are covered by the current EIS. These wetland resources will be discussed in more detail later in the document.

Focusing on Critical Intersections

The locations of Port maintenance activities and natural resources were reviewed to identify areas of critical intersection. Appropriate mitigation is dependent upon the type of habitat affected, the level of impact, and the location of the resource. The NRIMP identifies critical intersections in areas where natural resources such as wetlands, riparian buffers, and deep and shallow aquatic habitats occupy the same location as development and maintenance activities. These activities include: shore stabilization, bulkhead construction and dock and dolphin construction and maintenance. The rationale behind the critical intersection locations is discussed in detail in the following section.

Methods of the Natural Resources Inventory Management Plan

The development of the NRIMP began with a review of scientific literature and BAs, wetland delineations, and mitigation monitoring reports that were previously completed for the Port. Once the nearshore habitat was identified as a significant resources a reach analysis and field reconnaissance were conducted. The reach analysis was performed to improve our understanding of the significance of the nearshore habitat on and near Port property by placing it within this larger landscape context. The fieldwork provided the basis for a natural resources inventory and functional assessment. This information was used to describe conditions along the developed shoreline and at a reference location. Two reference transects were established along the shoreline in Columbia Gateway immediately downstream of the Flushing Channel to assist development of the NRIMP. Many of the principles and mitigation activities described in this plan could be applied to redevelopment and maintenance activities in Columbia Gateway.

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FRAMEWORK

To provide a framework for the NRIMP we looked at the water, shore and land areas on the Port's developed shoreline from the point-of-view of Port activities, natural resources and permitting. This exercise identified critical intersections that enabled us to focus the field inventory and management plan recommendations on the most significant natural resources. Three basic zones were identified for this exercise:

- Aquatic Zone (including shallow and deep water areas),
- Shoreline Zone
- Land Zone

For the purposes of the NRIMP the Aquatic Zone is defined as the area below OHW. It encompasses both shallow and deep water. The Shoreline Zone extends from OHW to the top of the bank of the Columbia River (top-of-bank). Based on topographic information top-of-bank is approximately 30-feet CRD. Everything landward of the top-of-bank is the Land Zone. The Land Zone is primarily uplands but includes jurisdictional wetlands and areas that are in the 100-year floodplain of the Columbia River.

The locations of the boundaries between these zones were defined by combining Port activity areas provided by Port staff and habitat areas defined in scientific literature. These zones were spatially located along the Port's developed shoreline using bathymetry and land surface elevation data provided by the Port and water surface elevation data available thru the US Army Corps of Engineers for the staff gage at River Mile (RM) 106.5 at the I-5 Bridge.

The water surface elevation of the Columbia River changes both daily and seasonally in response to tidal flow and seasonal precipitation and dam operations. The water surface of the Columbia River also loses elevation as it passes by the Port of Vancouver. Table 1 shows the water surface elevation at two locations along the Port's shoreline for two conditions. Mean Spring Conditions occur in the spring when snow melt and rainfall combine to increase river flow. This condition is significant for outmigrating salmonids. Ordinary High Water (OHW) is a regulatory water surface elevation intended to describe the frequently wetted area of the channel. It is often associated with the 2-year flood elevation, the channel-forming flow.

Table 1. Columbia River Stage Conditions Referenced to Columbia River Datum (CRD)

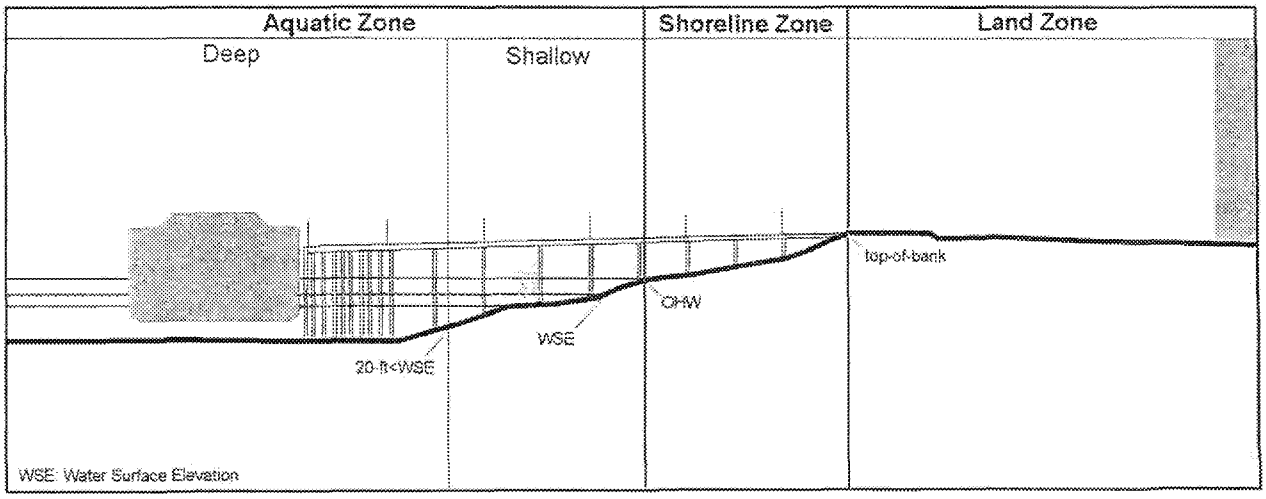
	Mean Spring Conditions	Ordinary High Water (OHW) 2-Year Flood Conditions
River Mile 104 (Terminal 3)	13.4 feet	15.4 feet
River Mile 101 (Reference Site at Flushing Channel)	13.1 feet	15.1 feet

The sections that follow briefly review port activities, natural resources and permitting within the zones described above and identify the critical intersections which serve to focus the NRIMP on a subset of Port activities and natural resources.

Port of Vancouver Activity Areas

Port facilities include: dry bulk, liquid bulk, break bulk, warehouse and other industrial uses and auto processing facilities. These loading and off-loading facilities are abutted by open and/or warehouse storage facilities on the land side and berths and docks on the water side. Figure 3 provides a general diagram of the zones and illustrates their relationship to Port activity areas. Table 2 quantifies the facilities in the developed Port by Terminal.

Figure 3. Port of Vancouver Zones – Conceptual Cross-Section Dock Facility



Aquatic Zone

The Aquatic Zone is divided into deep water and shallow water.

Deep Water - Deep water is in excess of 20-feet in depth. The primary deep water facilities located in this zone are ship berths, which take advantage of the deep water in these areas. The primary activities associated with these facilities include; pile driving, pile removal, pile replacement, sheet pile installation, dolphin installation and dredging.

Shallow Water - Shallow water extends from 20-feet in depth to OHW. Facilities in this area consist of mooring areas, such as dolphins, docks and floating docks. In some cases these facilities can extend into deep water. Ramps, which provide access to floating docks and other non-continuous docks, are also found in the shallow water area. The final element found in the shallow water area is shore protection such as riprap. The primary activities associated with these facilities include; pile driving, pile removal, pile replacement, sheet pile installation, concrete bulkhead construction, and riprap placement.

Shoreline Zone

The Shoreline Zone extends from OHW to top-of-bank. This zone is the transition from the aquatic to the land environment. Dock and ramp facilities extend from the aquatic area and are anchored to the bank in the shoreline area. Shore protection such as riprap also extends above OHW, often to top-of-bank. The primary activities associated with these facilities are the same as those in the shallow water area and include; pile driving, pile removal, pile replacement, vegetation clearing and riprap placement.

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Land Zone

The Land Zone includes everything above top-of-bank. The primary facilities located in this zone include open and warehouse storage, offices, roads and railway tracks. Typical activities associated with these facilities include placing fill material, paving and construction. Some of these fills require unavoidable impacts to jurisdictional wetlands that are regulated.

Table 2. Port Facilities by Terminal

Facility	Zones			
	Aquatic		Shoreline	Land
	Deep	Shallow		
Terminal 2 - Renovated 2002				
Open Storage (acres)				40
Covered Storage (square feet)				280,000
Riprap		Grain Terminal Dock, Grain Elevator Barge, B1, B2, B4, B5, B7	Grain Terminal Dock, Grain Elevator Barge, B1, B2, B4, B5, B7	
Dock (lineal feet) B1, B2, B4		1,740		
Dock (lineal feet) Grain Elevator Warf		715		
Dock (lineal feet) B5		400		
Dock (lineal feet) B7		800		
Sheet Pile Wall or Concrete Seawall		B1, B2, B4, B5, B7		
Dolphin(s)		Grain Terminal Dock, Grain Elevator Barge, B7		
Berths (number of)	7			
Terminal 3 - Renovated 2004				
Open Storage (acres)				50
Covered Storage (square feet)				300,000
Riprap		B8, B9	B8, B9	
Dock (lineal feet) B8, B9		1,250		
Sheet Pile Wall or Concrete Seawall		B8, B9		
Dolphin(s)		B8, B9		
Berths (number of)	2			
Terminal 4				
Open Storage (acres)				40
Covered Storage (square feet)				30,500
Riprap			B10, B13, B14	
Dock (lineal feet) B10		1,040		
Dock (lineal feet) B13, B14		1,360		
Sheet Pile Wall or Concrete Seawall				
Dolphin(s)		B10, B13, B14		
Berths (number of)	3			

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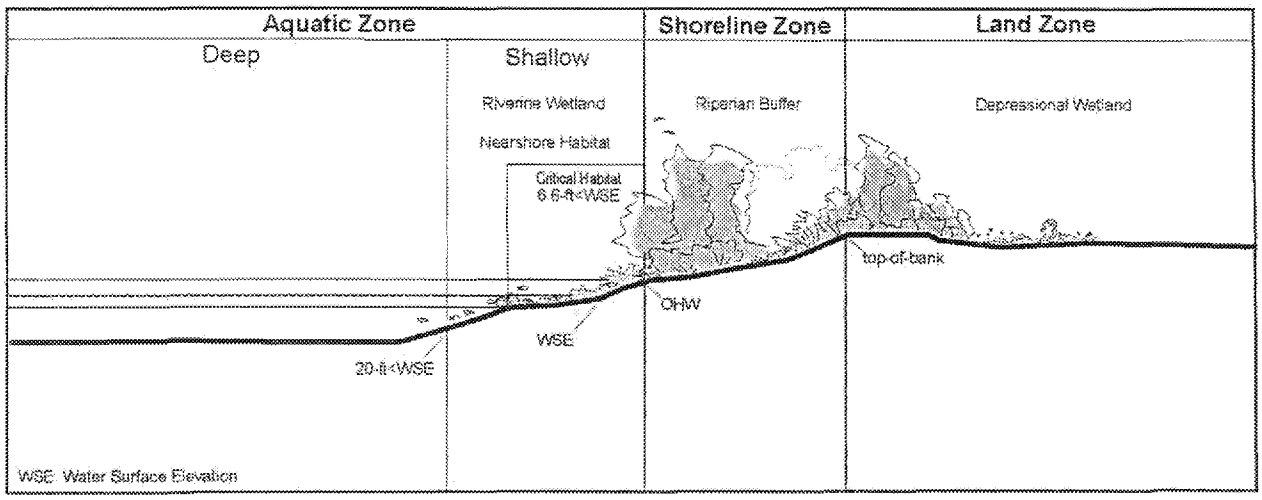
Port of Vancouver Natural Resource Areas

Port natural resources include aquatic habitat significant to salmonids, riparian areas, and wetlands. Figure 4 shows the zones and illustrates their relationship to these natural resources.

Figure 4. Port of Vancouver Zones – Conceptual Cross-Section Undeveloped Shore



Aquatic Zone

The Aquatic Zone is divided into deep water and shallow water.

Deep Water – There are no significant natural resources within the deep water area along the Port's developed shoreline.

Shallow Water - Scientific literature and resource agency staff identify nearshore habitat as being especially important to anadromous fish; particularly salmonid species. Nearshore habitat is defined in the literature as a zone within the water column that extends between the water's edge to the "photic limit" (the depth that light typically penetrates at levels that sustain photosynthesis, 20-feet deep) (May and Peterson 2003; Williams and Thom 2001). Light penetration at these shallow water depths fosters abundant plant and animal growth. For the purposes of the NRIMP, nearshore habitat occupies the same area as the shallow water area of the aquatic zone. The water's edge is referenced to OHW. Figure 4 illustrates the relationship between nearshore habitat and the aquatic zone. The zone width varies with river stage and tidal influence, and according to the shape of the channel and adjacent riverbank.

Shallow water areas that are less than 6.6 feet deep are especially important for anadromous fish (Carrasquero 1997; Bennett et al. 1992; Dauble 1989). These shallow areas with sand bottom are the preferred out migration habitats for anadromous fish. The outmigrating smolts ride the spring freshet flows facing upstream; finding food and cover in the nearshore zone. The access to potential plant and insect sources, cover from large woody debris and the ability to navigate with the aid of celestial markers are key elements that make the nearshore habitat important to anadromous salmonids. Historically, this habitat type occurred extensively on broad shoreline margins paralleling the Columbia River.

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Shoreline Zone

The shoreline zone is associated with riparian buffers that are used by bird species such as king fisher, great blue heron, osprey, bald eagle, and others. These species also utilize adjacent aquatic and land zones for feeding.

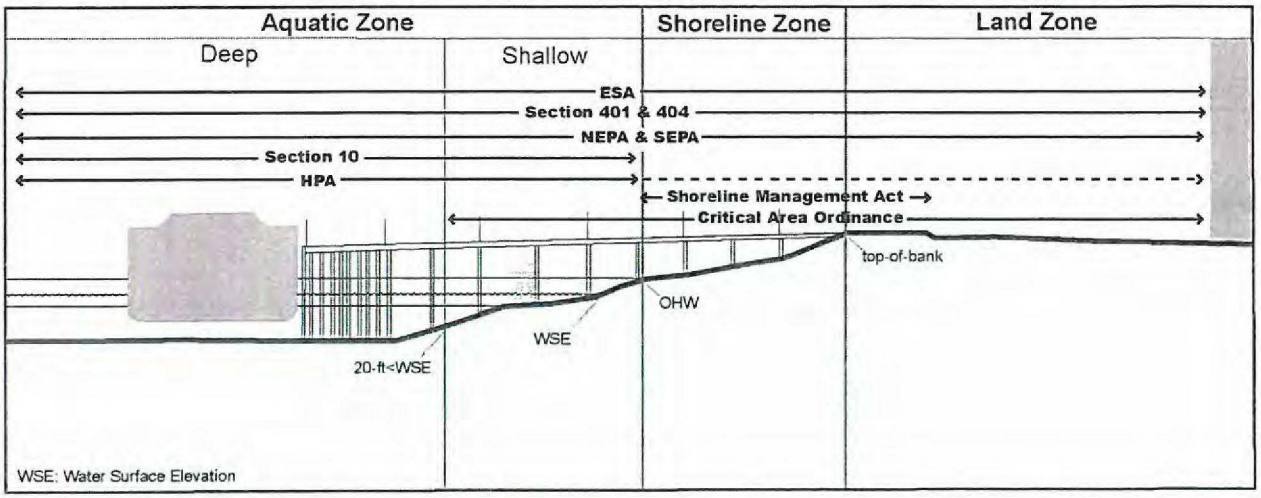
Land Zone

The land zone of the developed Port contains several jurisdictional wetlands. One is an 8-acre mitigation site for Columbia Gateway, Phase I.

Port of Vancouver Permitting

The Port routinely applies for permits for both new development and maintenance activities. These permits comply with federal, state and local regulations for water quality, habitat, and navigability. The following is a general description of typical federal, state and local permitting requirements. Figure 5 shows the zones and illustrates their relationship to federal, state and local regulations.

Figure 5. Port of Vancouver Zones – Conceptual Cross-Sections Permitting



The Federal government began regulating water quality in 1972 with the passage of the Federal Water Pollution Control Act Amendments commonly known as the Clean Water Act. This law also includes the protection of wetlands and waters of the US. In 1973 the Endangered Species Act (ESA) was passed to protect decreasing population of fish and wildlife species. As a result of these regulations, wetlands and listed species were offered protection. Any development that could potentially impact these resources requires approval from the federal government. State and Local permitting requirements meet or exceed those of the federal government.

Federal Permits

Federal permits of concern for the NRIMP include the National Environmental Policy Act (NEPA of 1969, Sections 401 and 404 of the Federal Water Pollution Control Act Amendments, commonly known as the Clean Water Act, of 1972, the Endangered Species Act (ESA) of 1973 and Section 10 of the Rivers and harbors Act of 1899. NEPA requires that projects with a federal nexus consider the environmental consequences of a proposed activity before taking action. It reviews the impacts of an action on a broad range of indicators including, habitat, water quality, hydraulics, as well as

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air quality and noise. NEPA regulates activities in Aquatic, Shoreline and Land Zones. Section 401 and 404 regulate the filling of wetlands, and the use of Best Management Practices to limit the water quality impacts from construction activities in all areas. The ESA regulates impacts to listed species and any designated critical habitat. The species of the greatest concern at the developed port are listed anadromous fish species. These species make extensive use of shallow water areas of the Columbia River. A programmatic Biological Opinion and the Magnuson-Stevens Fisheries Conservation and Management Act provide consultation for Standard Local Operating Procedures for Endangered Species (SLOPES). Many of the Port's maintenance activities fall under this umbrella. Section 10 of the Rivers and Harbors Act regulates activities in navigable waterways.

State Permits

State regulations must meet and in some cases are more stringent than Federal regulations. The State Environmental Policy Act (SEPA) of 1971 provides a framework for agencies to consider the environmental consequences of a proposed activity before taking action. It reviews the impacts of an action on a broad range of indicators including, habitat, water quality, hydraulics, as well as air quality and noise. As such SEPA regulates activities in Aquatic, Shoreline and Land Zones. The Shoreline Management Act of 1972 regulates development in shoreline areas within a 200-foot buffer extended from OHW or within the floodplain. The Washington Department of Fish and Wildlife's - Hydraulic Project Approval (HPA) primarily regulates activities, such as dredging and dock construction and maintenance, waterward of the OHW line in regards to impacts on wildlife and habitat. It can be used to regulate wetlands but generally corresponds to the Aquatic Zone.

Local Permits

The City of Vancouver is streamlining its environmental regulations while complying with the Growth Management Act. Vancouver's Critical Area Ordinance, which will be decided in early 2005, combines existing regulations of wetlands, streams, lakes, floodplains, trees, fish and wildlife habitat as well as certain types of soils and slopes into one ordinance. Like SEPA this local ordinance regulates activities in Aquatic, Shoreline and Land Zones. In terms of SEPA, the City of Vancouver often serves as the lead agency for processing SEPA checklists. Also, the Shoreline Permit is submitted to the City for local review and appeal prior to state approval.

Port of Vancouver Critical Intersections

Critical intersections occur where project activities, natural resources, and regulatory requirements overlap. Limited activities where natural resources functions are low or regulatory requirements are very limited or non-applicable will require little if any mitigation. Some activities may require considerable permitting and mitigation.

As described in the Introduction of this document, the NRIMP focuses on redevelopment and maintenance activities on the Port's developed property. The amount and quality of natural resources on the developed property varies. The NRIMP puts greater emphasis on the protection and mitigation for higher functioning resources that were found to be at the greatest risk of impact. The NRIMP assumes that appropriate BMPs will be used during redevelopment and maintenance activities and focuses on recommending a series of mitigation options for impacts to water quality, hydrologic and habitat functions cause by structural changes to the landscape.

A majority of the maintenance activities will take place in the shoreline zone and the shallow aquatic zone (Figure 6). To a lesser extent activities will take place in the deepwater aquatic zone.

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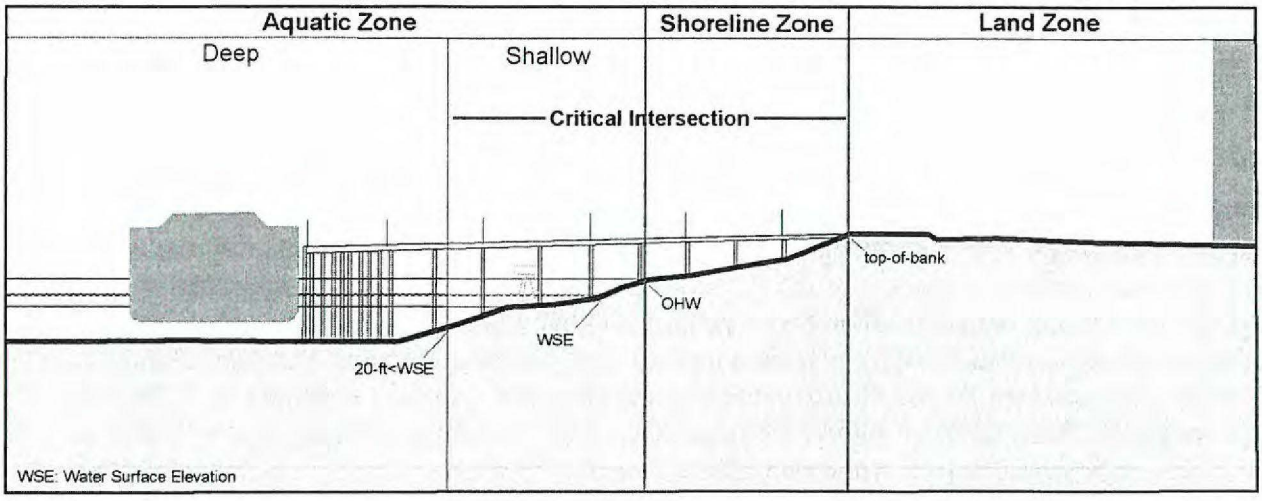
Common activities include: removal and repair of treated and untreated wood piles and driving of replacement steel piles; rip rap placement; vegetation removal; and dock repair.

Figure 6. Port of Vancouver Zones – Conceptual Cross-Section Critical Intersection



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NATURAL RESOURCES INVENTORY, MAPPING AND FUNCTIONAL ASSESSMENT

The critical intersections discussion in the Framework section of this document identifies the shallow water area of the aquatic zone and the shoreline area as the most critical locations addressed by the NRIMP. An inventory of these natural resources along the Port's developed shoreline was conducted in order to better understand the extent and quality of the critical habitats. This inventory and assessment is the foundation of a meaningful habitat management plan. The inventory examines nearshore habitat at the landscape level along the Columbia River from the Sandy River Delta to Sauvie Island to improve our understanding of the significance of the nearshore habitat on and near Port property by placing it within this larger landscape context. It then focuses on the Port's developed shoreline. At this scale, natural resources are inventoried and mapped. An assessment of the water quality, hydrologic and habitat and food web functions is provided for habitat areas along the developed shoreline.

Terrestrial habitat extents and functions in the shoreline and land zones were not inventoried because of the limited extent of riparian vegetation and wetlands in this management area. Existing reports describing these resources were reviewed to provide an understanding of the existing wetland and upland resources in the area. Much of the existing riparian vegetation, where it exists at all, is non-native Himalayan blackberry. Control of the Himalayan blackberry and conversion to native riparian tree, shrub, and forb species, where practical and compatible with Port operations, would provide riparian continuity and provide better bird and small mammal habitats. The existing wetlands are located along River Road – away from a majority of the Port maintenance activities. Many of these wetlands are mitigation sites.

Landscape Level Natural Resource Examination

Nearshore habitat was initially examined at a landscape level. The extent of nearshore habitat at this scale was estimated for the area between Sandy River Delta and Sauvie Island and is shown in Figure 7. This region includes two major tributaries to the Lower Columbia River: the Sandy River and the Willamette River. This examination was conducted to improve our understanding of the significance of the nearshore habitat on and near Port property by placing it within this larger landscape context.

The examination was performed by compiling 100-year floodplain data layers from Clark County Department of Assessment and GIS and Metro's Regional Land Information System with National Wetland Inventory data. Nearshore habitat was assumed to be approximated by wetland habitat mapped by the National Wetlands Inventory (Cowardin classes) that is within the 100-year floodplain.

Figure 7 illustrates the extent to which urbanization and shoreline development have reduced the spatial extent of both wetland vegetation and of land inundated by flooding. With the clear exception of areas such as the Sandy River Delta, Lady Island and Camas Slough area, Government Island, and Hayden Island, little wetland habitat remains within the shorelines. Notably, the reference site, just downstream of the Flushing Channel, is a small wetland discernable on Figure 8.

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Natural Resources Inventory on the Port's Developed Property

The extent of nearshore habitat and the ecological functions provided on the Port's developed property were assessed using river depth and substrate data collected in the field, topographic mapping, aerial photo interpretation, and recent fisheries, wetland, and riparian habitat assessment literature. Figure 8 shows Port's developed shoreline and the areas where data were collected for the inventory. Analysis of the nearshore habitat is based on key Columbia River hydrologic events and shoreline geomorphology. The inventory characterizes ecological functions that are being provided on Port property, particularly regarding fish habitat.

Methods

Ten transect locations were selected using Port supplied bathymetry and aerial photos (Figure 8) to provide adequate coverage to represent the full range of shoreline conditions along approximately 6,000 linear feet of developed shoreline. In addition, two transect locations were selected at a reference site at an undeveloped location immediately west of Parcel 5, just downstream of the Flushing Channel (Figure 8). This site was chosen because it includes a full range of habitats including deep and shallow aquatic, shoreline and upland areas including a hardwood riparian forest. This undeveloped shoreline likely represents historic shoreline conditions. Ecological functions were assessed at the reference site to provide a base of comparison for the developed shoreline.

Data was collected at the ten 150-foot long transects on September 11, 2003. A 13-foot research boat equipped with GPS and a laser range finder was used to locate sampling points at 30-foot intervals along each transect. The US Army Corps of Engineers (Corps) recording gage (VANW1) at the Interstate 5 Bridges was used to determine water surface elevation and to correct for tidal impacts. An acoustic depth finder was used to determine depth at every sampling point. We observed substrate materials and aquatic vegetation using a wide-angle underwater viewer. Photos were taken at the ten pre-selected transects showing the shoreline with upstream and downstream views. Photos taken at these transects are shown in Appendix A.

Mean Spring Condition and Ordinary High Water Condition were compared to land surface elevations to determine the availability of nearshore habitat along the developed shoreline. The Mean Spring Condition and the Ordinary High Water Condition defined in Table 1. Mean Spring Condition, the mean of maximum monthly spring stage from March through June, was used to define the lower boundary of habitat access. This water surface elevation is important because it reasonably describes conditions during the peak salmonid outmigration season. Ordinary High Water (OHW) was used to define the upper boundary for two reasons. First it closely approximates the 2-Year Flood which is a channel-maintaining event from a geomorphic standpoint. Second it has a long history of regulatory use. Corps OHW is approved for regulatory functions, i.e. JARPA and HPA permits.

Nearshore habitat volumes were quantified using a computer-aided drafting (CAD) program to compare the shoreline transect cross-sections with the Mean Spring and Ordinary High Water surface elevations. This comparison provides a spatial representation in cross-section and plan view of the data analysis results. The condition and quantity of nearshore habitat was identified for areas less than 20 feet in depth and areas less than 6.6-feet in depth – the high quality habitat area within the shallow water area. The areas less than 6.6-feet deep were highlighted because juvenile salmon, particularly Chinook salmon, prefer these areas (Carrasquero 1997; Bennett et al. 1992; Dauble

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1989). In addition to water depth, several studies indicate that in eastern Washington, juvenile Chinook salmon prefer habitats that exhibit the following characteristics (Bennett et al. 1992; Curet 1993; Garland and Tiffan 1999):

- Shallow nearshore habitats with sandy bottom and no aquatic vegetation,
- Nearshore shallow water with a low gradient in free-flowing areas,
- Littoral shore habitat with low water velocities.

Findings

The data collected in the field was used to break the Port's developed shoreline up into meaningful slope categories. These areas were then quantified, evaluated qualitatively and mapped. Figure 9 shows four cross-sections (T3, T5, T6 and T8) which were selected as representative of the range of shoreline conditions from the 10 transects along the developed shoreline. A fifth cross section is an overlay of transects T3, T5, T6, and T8 that compares general shoreline slopes observed on the Port's developed property. This figure shows the range of nearshore habitat at Mean Spring Conditions. Figure 10 shows nearshore habitat the same four representative sections for the Ordinary High Water Condition.

There are three shoreline conditions based on slope evident in the cross-section comparisons: steep (S), moderate (M) and gradual (G). A statistical assessment of these breaks in slope is provided in Appendix B. As expressed as a ratio of horizontal to vertical change,

- Steep shorelines were approximately 1.5:1 to 3:1,
- Moderate shorelines were approximately 5:1 to 10:1, and
- Gradual shorelines were approximately 12:1 to 100:1.

Steep Shorelines – Steep shorelines are found at transects T3 and T5 at Berth 1 and Berth 8 at Terminals 2 and 3. Slopes at these locations rang from about 1.2:1 to about 2.5:1 where slopes armored with riprap, rubble, debris, or scattered rock separate the river from its former floodplain. Generally, the steep shoreline areas of the Port property had little to no beach areas at the flow conditions observed during the field inventory.

Moderate Shorelines – Moderate shorelines are found at transects T6 and T8 at Berth 9 and Berth 13 at Terminals 3 and 4. Slopes range from about 4:1 to 8:1.

Gradual Shorelines – Figure 11 shows transects R1 and R2 and describes the nearshore habitat at the reference site for the Mean Spring condition. Figure 12 shows the same transects for the Ordinary High Water condition. These gradual slopes, 8:1 and flatter, provide longer beach and back beach areas than those observed within the Port property. Because of their higher elevation, these back beach areas provide more suitable conditions for longer-term recruitment of large woody debris than the conditions at beach areas within the Port property, even those areas with moderate shorelines (i.e., transects T6 and T8).

Quantity and Quality of Nearshore Habitat – Tables 3 and 4 summarize field observations of conditions at the transect locations to provide a quantitative and qualitative assessment of the areas. The tables include observations of substrate, structures, bank conditions and vegetation and quantify the width of nearshore habitat and quality nearshore habitat along the developed shoreline.

Table 3 is a summary of nearshore bed and bank conditions at the transect locations. A sand substrate was found offshore at all developed area transects. Three of the ten transects (between the railroad bridge and Berth 1) have riprap visible at the shoreline at the water levels

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present during the fieldwork. Six of the ten transects have riprap on the bank above the shoreline (railroad bridge to Berth 7). Vegetation was generally sparse, and where present, often includes Himalayan blackberry. Cottonwoods and willows have colonized within the riprap in some areas.

Table 3. Summary of Transect Nearshore Bed and Bank Conditions

Sta.	Location	Substrate 30 ft. from Shore	Substrate at Shoreline	Nearshore Structures	Bank Above Shoreline	Vegetation
T1	RR Bridge	Sand	Riprap	Old Wood Piles	Riprap	Mostly barren, some Himalayan blackberry and other weeds with small trees on top of bank
T2	Grain Elevator	Sand	Riprap	Old Wood Dock	Riprap	Mostly barren, some Himalayan blackberry and small willows
T3	Berth 1	Sand	Riprap	Steel Piles and Dolphins	Riprap	Himalayan blackberry with bare spots
T4	Berth 6	Sand with Gravel	Sand with Gravel	Old Wood Pier	Riprap	Willows and Himalayan blackberries established in Riprap
T5	Berth 8	Sand	Riprap and Sand	Concrete Piles for Dock	Riprap	Mostly barren with some blackberries and other weeds
T5A	Berth 7	Sand	Sand	Steel Piles	Riprap	Mostly barren with some blackberries and willows
T6	Berth 9	Sand	Gravel	Concrete Piles	Sand and gravel on beach with Riprap on far bank	Some rooted aquatics 30 ft from shore. Small willows and cottonwoods have colonized portions of the Riprap bank
T7	Berth 10	Sand	Sand	Steel Piles	Sand and gravel on beach with rock on far bank.	Small willows and cottonwoods have colonized portions of the Riprap bank.
T8	Berth 13	Sand	Sand	None	Sand and gravel on beach with rock on far bank.	Willows and cottonwoods have colonized portions of the Riprap bank.
T9	Berth 14	Sand	Sand	Steel Piles	Sand and gravel on beach with rock on far bank	Willows and cottonwoods have colonized portions of the Riprap bank.

Table 3 shows that there is marked variation in substrate materials and bank vegetation along the developed Port shoreline. This variation is found along the shoreline from B1 to B4 and includes riprap banks, vegetated riprap banks, and sandy shores; and across the shoreline from top of bank to the channel. Typically there is a distinct edge between the riprap armoring, which has coarsened the substrate at the shoreward side, and the sandy substrate that predominates in the river channel.

In-water and over-water structures are present in the immediate vicinity of the surveyed transects and are found across the Port waterfront properties. In-water structures consist of steel, wood, or

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concrete piles and dolphins. Over-water structures consist of wood or concrete docks and piers. Most of the shoreline within the Port property is armored with riprap. The exception is Terminal 4 from Berth 10 to berth 14 where the banks are sand with scattered rock (Coleman 2004. pers. comm.).

The results of the habitat access assessment that was based on the analysis of cross-section data is presented in Table 4. Table 4 presents the width of near shore habitat during Mean Spring and Ordinary High Water Condition and evaluates these shorelines by type (i.e. steep, moderate and gradual). Spatially describing the varied width of the nearshore habitat is instructive for identifying existing constraints and potential future opportunities. It is noteworthy that the habitat quantity varies substantially between steep, moderate, and gradual shoreline types. The mean widths of the nearshore habitat for Mean Spring and Ordinary High Water Conditions are approximately 24 feet, 92 feet, and 820 feet by shoreline type respectively. The difference for high quality habitat (<6.6 feet depth) is dramatic. The mean widths are approximately 6 feet, 25 feet, and 520 feet by shoreline type respectively. Only approximately 27 percent of the steep and moderate shoreline types are high quality habitat according to the depth criteria. Approximately 63 percent of the gradual shoreline type, found at the reference site, is high quality habitat according to the depth criteria. This means that there is potentially two orders of magnitude greater amount of habitat along the gradual shoreline type (520 feet) versus the steep shoreline type (6.5 feet).

Mapping – Nearshore habitat areas are constantly shifting with river stage fluctuations. It is important to understand that habitat needs vary seasonally during these fluctuations, and that the spring outmigration is a key season. This season is important ecologically because of the high transport rates of water, sediment, nutrients, chemicals, and fish and wildlife species. Table 4 shows that available habitat area doesn't necessarily increase during the Ordinary High Water event, and because the Ordinary High Water event is typically a very short duration event of hours or days occurring in the November to March window, this habitat availability is temporally constrained. The Mean Spring event is a long duration event of many weeks occurring during March through June window. The in-water work window restrictions that apply below OHW occur through spring is recognition of the importance of the high hydrologic and biologic transport that occurs.

Figure 13 shows the approximate extent of nearshore habitat for the developed shoreline and along the reference shoreline. The width of nearshore habitat shown is the graphic depiction of the data in Table 4 mapped using available bathymetric and topographic information. Nearshore habitat on this figure combines nearshore habitat at the Ordinary High Water and Mean Spring water elevations to depict the total area of potential nearshore habitat. The upper limit of the nearshore habitat is approximated by the 16-foot CRD contour, the upper end of the Ordinary High Water nearshore habitat extent. The lower limit of the nearshore habitat is approximated by the –6-foot CRD contour, the lower end of the Mean Spring nearshore habitat extent.

EX-0022-000059-PCE

Table 4. Nearshore Habitat Quantities

Shoreline Type	Location	Mean Spring Width (Feet)	OHW Width (Feet)	Mean Spring High Quality Width (Feet)	OHW High Quality Width (Feet)	Comments
S	Transect 3	18	18	5	6	These Steep shorelines have narrow nearshore habitat bands (just 3 percent of the Uniformly Shallow habitat width.
	Transect 5	31	30	8	9	
	Mean	**24.5**	**24.0**	**6.5**	**7.5**	
M	Transect 6	102	96	16	13	These Moderate shorelines have almost four times the available habitat when compared to Steep shoreline types.
	Transect 8	85	88	34	33	
	Mean	**93.5**	**92.0**	**25.0**	**23.0**	
G	Reference 1	830	800	600	495	These Gradual shorelines have almost two orders of magnitude more available high quality habitat when compared to Steep shoreline types.
	Reference 2	780	870	435	500	
	Mean	**805**	**835**	**518**	**498**	

S – Steep
M – Moderate
G – Gradual

EX-0022-000060-PCE

Functional Assessment of Water Quality, Hydrology, and Food Webs and Habitat

The assessment of ecological functions is focused on nearshore habitat. As described earlier, habitat availability was assessed based on the locations and dimensions of nearshore habitat under Mean Spring and Ordinary High Water conditions. Tables 5, 6 and 7 provide a generalized assessment of water quality, hydrologic, and food web and habitat functions respectively based on Sheldon, et al (2003). These tables compare riverine wetland functions for the mean characteristics of transects 3 and 5 and transects 6 and 8 to the reference transects. As in Figures 9 to 11, data has been lumped based on similar shoreline slope characteristics of steep, moderate, and gradual.

Tables 5, 6, and 7 show that water quality, hydrologic and habitat functions are generally performed at low to nonexistent levels in the moderate and steep shoreline areas but perform fully at the Reference Site which has gradual shorelines. The following section highlights key portions of the generalized assessment presented in Tables 5, 6, and 7.

Water Quality Function (Table 5)

Low slopes, sandy substrates, and limited woody vegetation along the moderate and gradual shorelines provide some removal of nutrients and fine sediment. This function cannot be performed where riprap is found along steep shorelines. The reference site has gradual slopping, sandy shorelines. In addition it has stands of trees and herbaceous plant with depressions of various sizes to help trap and then hold fine sediment, and bind nutrients in plants and sediment.

Hydrologic Function (Table 6)

The steep and moderate shoreline types cannot provide the reducing peak flows function because there is little or no floodplain area to dissipate higher flows. The channel at these locations is essentially all active channel; there is little or no access to overbank areas where flows can spread, and where fish can find refuge during peak events.

Similarly, the steep and moderate shoreline types cannot provide the lateral hyporheic flows function. Hyporheic flows are by definition saturated subsurface and surface sheet flows moving within and across floodplains to and from channels. These flows are often rich in chemical and biological materials. These flows cannot occur without floodplains.

Food Webs and Habitat Function (Table 7)

Habitat complexity does not exist at the steep shoreline type, and is limited along the moderate shoreline type due to lack of overbank areas, lack of structure in terms of in-channel wood and rock, and lack of riparian vegetation.

The gradual shoreline has woody plants and debris that provide habitat partitioning, and structure that is not present in the steep and moderate shorelines. Habitat partitioning allows greater numbers of fish to use a nearshore habitat area.

One function of key interest is habitat for anadromous fish. This function is provided throughout the shoreline but with considerable variation in terms of how well the function is provided. The moderate shoreline provides this function, while the steep shoreline does not provide this function at any significant level.

EX-0022-000061-PCE

Table 5. Generalized Assessment of Water Quality Functions

Riverine Wetland Functions	Steep	Moderate	Gradual	Comments
Improving Water Quality				
Removing Nutrients	N	NS	P	**T 3&5:** Steep shoreline with riprap does not provide nutrient recycling **T 6&8:** Moderate shoreline with vegetation provides low level nutrient recycling. **Reference:** Gradual shoreline with extensive herbatious vegetation provides moderate level nutrient recycling.
Removing Fine Sediment	N	NS	P	**T 3&5:** Too steep to remove fine sediment. **T 6&8:** Moderate slope beach development shows that in general, sediment is retained. **Reference:** Gradual shoreline with extensive herbatious and woody vegetation provides moderate to high level sediment retention.
Removing Metals/Toxic Organics	N	NS	P	**T 3&5:** Riprap surfaces do not support this function. **T 6&8:** Moderate shoreline with woody debris and vegetation provides low level metals and toxics removal. **Reference:** Gradual shoreline with vegetation provides moderate level removal.
Moderating Water Temperature	NS	NS	P	**T 3&5:** Provides limited moderation of temperature due to offsetting inputs of shade and heat transfer from structures. **T 6&8:** Provides limited moderation of temperature due to offsetting inputs of shade and heat transfer from structures. **Reference:** This backwater slough can provide water temperature moderation with extensive shade but may also export warm water seasonally.
Key to Table abbreviations: P=Performed NS=Probably Not Performed at Any Significant Levels N=Not Performed				

EX-0022-000062-PCE

Table 6. Generalized Assessment of Hydrologic Functions

Riverine Wetland Functions	Steep	Moderate	Gradual	Comments
Hydrologic				
Reducing Peak Flows	N	N	P	**T 3&5:** Location in or adjacent to channel does not provide this function. **T 6&8:** Location in or adjacent to channel does not provide this function. **Reference:** This backwater slough does provide flow reduction through off-channel storage.
Decreasing Downstream Erosion/Dissipating Erosive Forces	N	NS	P	**T 3&5:** Riprap may protect shoreline from erosive forces by deflecting flows, but shoreline is not deformable and little erosive force dissipation occurs. **T 6&8:** Willow and cottonwood recruitment and shallow sloping sandy beach provides deformable friction to reduce erosion downstream. **Reference:** Extensive woody vegetation provides anchoring and stability.
Recharging Groundwater	N	N	N	This function is not performed except at high stage levels in the Columbia River at any of the sites.
Lateral Hyporheic Flows	N	N	P	**T 3&5:** Location in or adjacent to channel does not provide this function. **T 6&8:** Active channel position does not provide this function. **Reference:** Lateral hyporheic flows occur within the slough area.
Floodplain Storage	N	N	P	**T 3&5:** Location in or adjacent to channel does not provide this function. **T 6&8:** Location in or adjacent to channel does not provide this function. **Reference:** This backwater slough does provide floodplain storage.
Key to Table abbreviations: P=Performed NS=Probably Not Performed at Any Significant Levels N=Not Performed				

EX-0022-000063-PCE

Table 7. Generalized Assessment of Food Web and Habitat Functions

Riverine Wetland Functions	Steep	Moderate	Gradual	Comments
Food Webs and Habitat				
General Habitat	N	NS	P	**T 3&5:** Some large woody debris trapped by steel and concrete piles provides very limited cover and possible insect drop. Anadromous fish transport is probably a primary function. **T 6&8:** Large woody debris gets stranded on the shallow sand and gravel beach temporarily between flood events. Steel and concrete piles trap some large woody debris. Catkin and insect drop from Riparian trees provides some food for aquatic species. Transport and protection from predatory fish probably are the primary functions provided to anadromous fish. **Reference:** Riparian trees and LWD provide leaf litter, insect drop and habitat at various river stages.
Habitat Complexity*	N	N	P	**T 3&5:** Location in or adjacent to channel does not provide this function. **T 6&8:** Location in or adjacent to channel does not provide this function. **Reference:** The back beach area associated with this site recruits large woody debris and support riparian vegetation that increases habitat complexity and thereby its ability to support aquatic species.
Habitat Partitioning*	N	N	P	**T 3&5:** Location in or adjacent to channel does not provide this function. **T 6&8:** Location in or adjacent to channel does not provide this function. **Reference:** The back beach area associated with this site recruits large woody debris which partitions the aquatic habitat during high flow events thus providing increased functional habitat volume and opportunity for different species to coexist.

EX-0022-000064-PCE

Table 7. – Continued

Riverine Wetland Functions	Steep	Moderate	Gradual	Comments
Food Webs and Habitat				
Off-channel Habitat Forming Process*	N	N	P	**T 3&5:** Location in or adjacent to channel does not provide this function. **T 6&8:** Location in or adjacent to channel does not provide this function. **Reference:** The backwater slough provides opportunity for flood flows to form and maintain habitat.
Off-Channel Habitat Areas*	N	N	P	**T 3&5:** Location in or adjacent to channel does not provide this function. **T 6&8:** Location in or adjacent to channel does not provide this function. **Reference:** The backwater slough provides salmonid rearing habitat and refugia during peak and high flow conditions.
Habitat for Invertebrates	N	NS	P	**T 3&5:** Very limited wood retention means that this function probably does not occur and any substantial level. **T 6&8:** Temporarily stranded and trapped large wood provides surfaces for invertebrates. **Reference:** Ample large wood and smaller debris provide many surfaces for invertebrates.
Habitat for Amphibians	N	N	P	**T 3&5:** Lack of food sources and cover with high-energy flows mean no amphibian usage. **T 6&8:** Too high-energy environment for meaningful amphibian usage. **Reference:** floodplain pools and slough provide amphibian habitat.
Habitat for Anadromous Fish	NS	P	P	**T 3&5:** Steep beach armored with riprap does not provide ideal habitat for salmonid fish. **T 6&8:** Shallow sandy beach provides good migration route and potential protection against predatory fish. Adjacent native trees provide some opportunity for insect drop and other potential food sources. **Reference:** Excellent off channel habitat and high floe refuge.

EX-0022-000065-PCE

Table 7. – Continued

Riverine Wetland Functions	Steep	Moderate	Gradual	Comments
Food Webs and Habitat				
Underwater Light Environment	N	P	P	**T 3&5:** The design of the Port structures located between Transect 1 and 5 do not allow light penetration beneath the over-water structures. **T 6&8:** The design of the existing Port over-water structures allows light penetration. **Reference:** Generally good light penetration.
Habitat for Wetland-Associated Birds	NS	NS	P	**T 3&5:** Very limited willows provide some bird habitat. **T 6&8:** Willow and cottonwood recruitment provides some perching, and possible food sources for seed, fruit, and sap eaters. **Reference:** Riparian forest provides habitat for a range of species.
Habitat for Wetland-Associated Mammals	N	NS	P	**T 3&5:** Too little cover and food for mammal usage, except for rats, nutria, and an occasional raccoon. **T 6&8:** Willow and cottonwood recruitment provides some perching, and possible food sources for seed, fruit, and sap eaters. **Reference:** Riparian forest provides habitat for large and small mammals.
Plant Richness	N	NS	P	**T 3&5:** Very limited willow recruitment and extensive Himalayan blackberry patches and other weeds provide essential no plant richness. **T 6&8:** Willow and cottonwood recruitment provides fragment of native riparian vegetation, but a low level compared to reference site. **Reference:** Canopy, shrubs and ground layer coverage is good and invasives are limited.
Support for Food Webs	N	NS	P	**T 3&5:** No meaningful food web support. **T 6&8:** Willow and cottonwood recruitment provides some perching, and possible food sources for seed, fruit, and sap eaters. **Reference:** Good food web support.
Key to Table abbreviations: P=Performed NS=Probably Not Performed at Any Significant Levels N=Not Performed				*** Functions shown with asterisk are supplementary functions to those developed by Sheldon, et al.**

EX-0022-000066-PCE

Improving Functions in Aquatic and Shoreline Zones

Numerous ecological functions are performed within the nearshore habitat and adjacent areas along the Port's developed shoreline to varying degrees as shown in Tables 5, 6, and 7. Key functions include:

1. Nutrient removal,
2. Sediment removal,
3. Reducing peak flows,
4. Lateral hyporheic flows,
5. Habitat complexity,
6. Habitat portioning, and
7. Anadromous fish habitat.

Generally the higher functioning areas, such as gradual and moderately sloped areas, perform most of these functions, and other functions, at moderate or better levels. The low functioning areas, including steep slopes, do not provide some of these functions or provide them at insignificant levels.

These functions are based on numerous physical and process components in the Lower Columbia River landscape. Several key features that appear to be associated with areas that perform more functions and perform them at higher levels are:

1. Presence of low gradient slopes and shallow water areas (in active channels and on floodplains),
2. Presence of sandy substrates,
3. Presence of overbank areas,
4. Presence of woody and herbaceous vegetation,
5. Presence of woody and other debris.

Nearshore habitat also includes the physical, chemical, and biological processes in the environment that supports salmonids and other species. These key features and processes influence flows of water, sediment, chemicals, and nutrients; the gain or loss of materials and features shaping shorelines; the opportunity for small plants and invertebrates to establish and maintain populations that can support fish, birds, and mammals. The lack or alteration of any of these components is likely to become a limiting factor to salmonid and other species populations.

This study has emphasized the spatial aspects of ecological functions and the physical and process components that build those functions. The connections, strong to weak, between areas that provide ecological functions in the landscape are important to maintaining and improving fish and wildlife populations. Spatially describing the varied width of the nearshore habitat is instructive for identifying existing constraints and potential future opportunities. The variations, or deficiencies, in ecological functions that currently exist along the Port's developed shoreline present potential opportunities to improve those functions where modifications can be made that are cost effective and compatible with operations.

The following are potential opportunities to modify existing conditions to add or increase features that support key ecological functions according to the broad function areas used in the analysis. Including physical components that support ecological functions with future Port developments may be very cost effective in some situations, especially when mitigation costs are fully considered.

EX-0022-000067-PCE

Improving Water Quality Functions

Flatten slopes with sandy substrates where opportunities exist to create or extend shallow benches and shelves into the active channel. Shallow bench creation may be applicable to specific projects that impact shallow water habitat such as new barge slips or sheetpile walls. These potential features will need further analysis to assure that these features will be compatible with Port operations. Where appropriate, add woody and herbaceous vegetation to trap sediments that typically carry nutrients and chemicals

Improving Hydrologic Functions

There is probably little opportunity to reduce peak flows at any significant level. Adding floodplain storage is likely impractical and not cost effective. However, there appears to be opportunity to include overbank areas within the existing active channel by adding floodplain benches at approximately 15.4 feet CRD where compatible with Port operations. Historic flow patterns have likely been disturbed to the extent that hyporheic flows cannot be restored.

Improving Food Webs and Habitat Functions

There appear to be good opportunities to add habitat complexity along the Port shoreline. There would be overlap with features described previously, such as the shallow slopes and overbank areas. Key additions would be woody debris, artificial woody debris as concrete features, rock, woody vegetation, and herbaceous vegetation where compatible with Port operations. Adding these elements increases boundary roughness and hydraulic refugia for fish, habitat partitioning, cover, and food production. Adding woody vegetation contributes to woody debris recruitment to the channel. Opportunities also appear to exist for minor alterations of riprap slope protection to add small pockets of riparian hardwoods.

There may also be opportunities to modify existing in-water and over-water structures, and to add newer structures incorporating features that increase light penetration to the water column and thereby extending nearshore habitat. Where practical, these structures could alter predator–prey relationships favorably for anadromous fish.

Future Port development that can maintain, support, or enhance habitat components will streamline environmental permitting, avoid project delays, improve management of Port environmental assets, avoid piece-meal mitigation planning and assist with project budgeting.. Future shoreline development proposals that incorporate shallow slopes, sandy substrate materials, sediment and nutrient exchanges, woody debris, riparian vegetation, and allows light penetration and ecosystem interactions will help maintain and enhance fish and wildlife populations. The Port can continue its role as an economic engine and provide environmental stewardship by investigating opportunities to develop and modify its shoreline by including these habitat features.

EX-0022-000068-PCE

Figure 7

Port of Vancouver USA

Natural Resources Inventory Management Plan

Landscape Level Examination

VIGIL AGRIMIS, INC.

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Legend

- Port of Vancouver
- Floodplain

Wetland: Cowardin Class

- L1: Lacustrine Limnetic
- L2: Lacustrine Littoral
- PAB: Palustrine Aquatic Bed
- PEM: Palustrine Emergent
- PFO: Palustrine Forested
- PSS: Palustrine Scrub/Shrub
- PUB: Palustrine Unconsolidated Bottom
- PUS: Palustrine Unconsolidated Shore
- R1: Riverine Tidal
- R2: Riverine Lower Parennial
- R3: Riverine Upper Perennial

The wetland coverage was created by merging and dissolving seven digital NWI coverages including: Camas, Linnton, Mt. Tabor, Portland, Sauvie Island, Vancouver, and Washougal.

The Floodplain coverage was derived by reprojecting RLIS Lite and ClarkView coverages.

2000 DOQs are from Oregon Geospatial Data Clearinghouse. http://www.gis.state.or.us/data/DOQ_NAPP_2.html

4 0 4 8 12 Miles

N

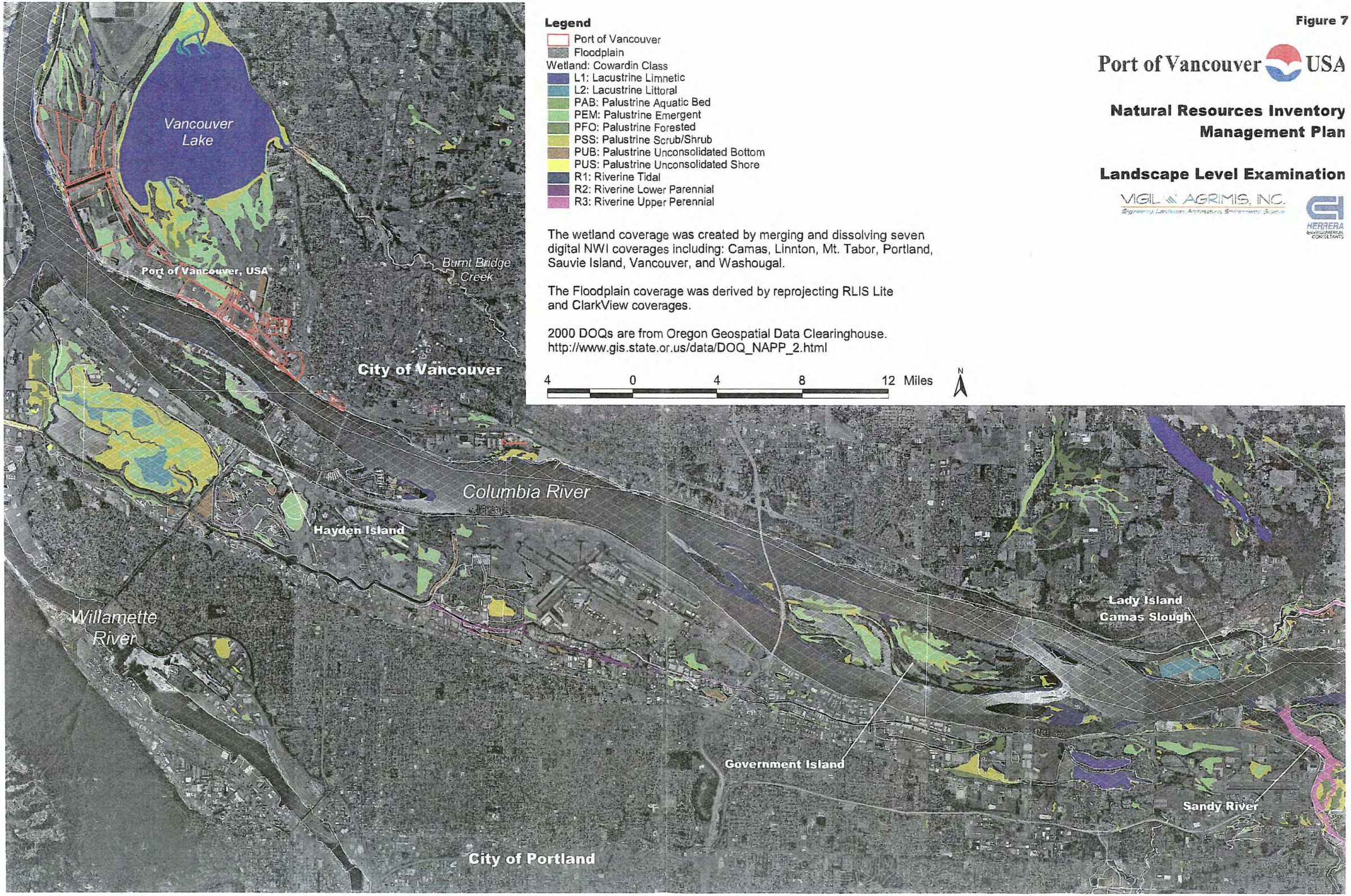

Figure 8

Port of Vancouver USA

Natural Resources Inventory Management Plan

Transect Locations

VGL AGRIMIS, INC.

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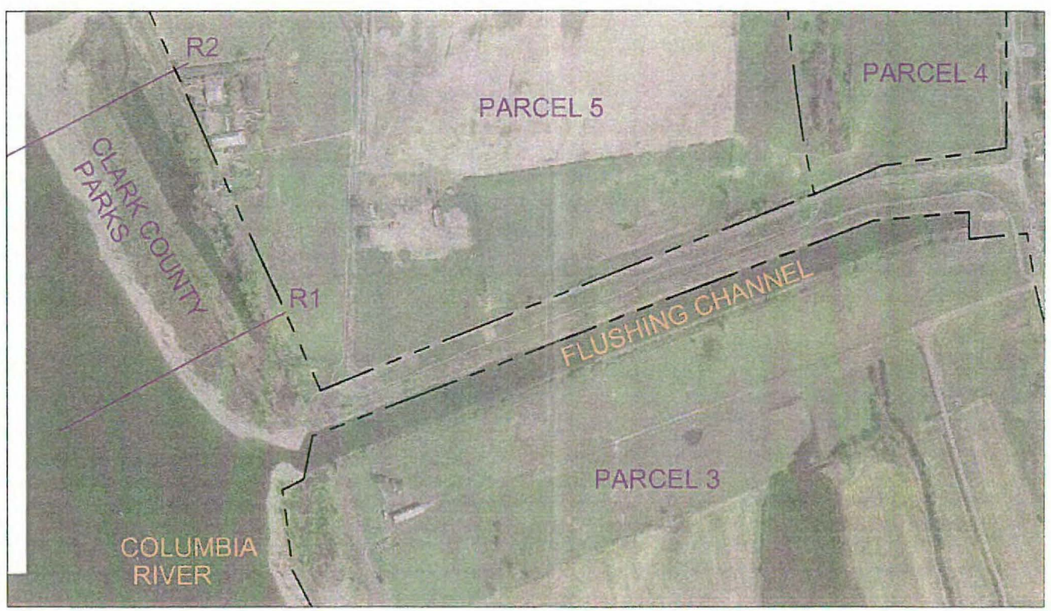
LEGEND

T5 TRANSECT LOCATIONS

PROPERTY LINE



COLUMBIA RIVER NEARSHORE HABITAT REFERENCE TRANSECTS
NORTH OF THE FLUSHING CHANNEL

NORTH

0 200 400 800 1600 SCALE: 1" = 800'

PORT OF VANCOUVER DEVELOPED PROPERTIES
COLUMBIA RIVER NEARSHORE HABITAT TRANSECTS

NORTH

0 200 400 800 1600 SCALE: 1" = 800'

Figure 9

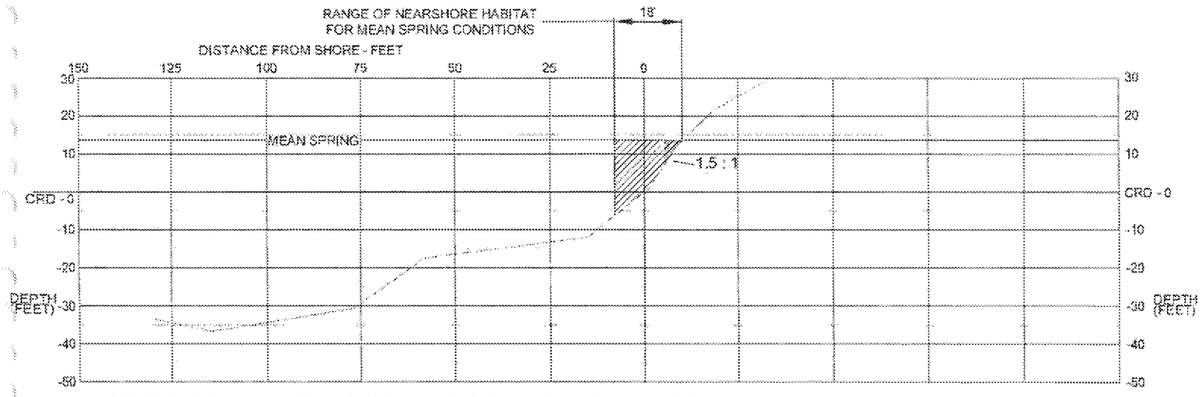
Port of Vancouver USA

Natural Resources Inventory Management Plan

Transect Cross-Sections Mean Spring Conditions

VIGIL AGRIMIS, INC.

HERRERA



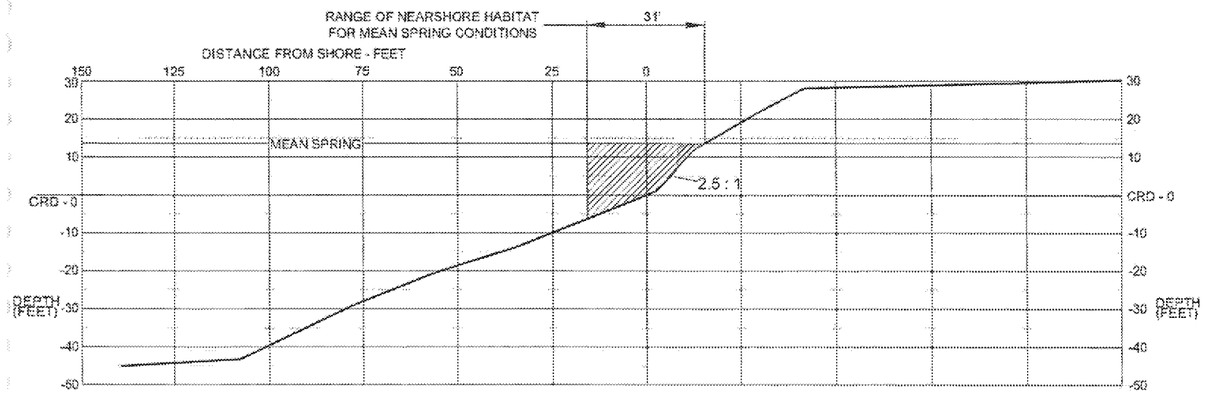
CROSS SECTION T3 - DOWNSTREAM END OF GRAIN ELEVATOR

HORIZONTAL & VERTICAL SCALE: 1" = 40'

LEGEND

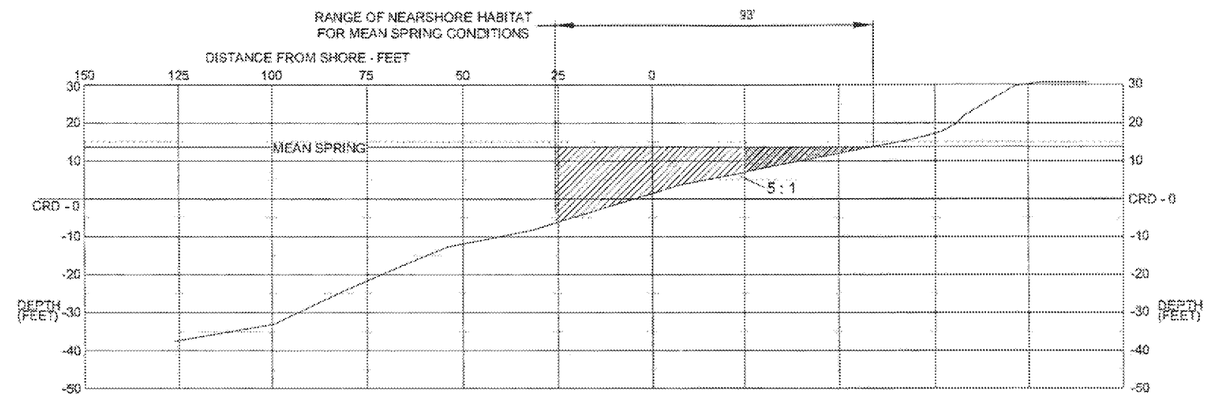
NEARSHORE HABITAT (<20 FT DEPTH) DURING MEAN SPRING CONDITIONS

HIGH QUALITY NEARSHORE HABITAT (<6.6 FT DEPTH) DURING MEAN SPRING CONDITIONS



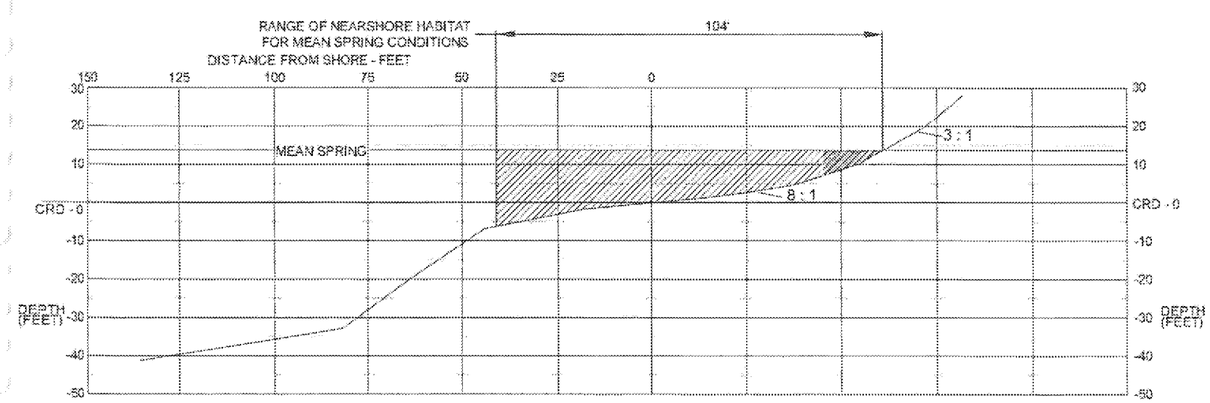
CROSS SECTION T5 - NEAR BERTH 8 AT TERMINAL 3

HORIZONTAL & VERTICAL SCALE: 1" = 40'



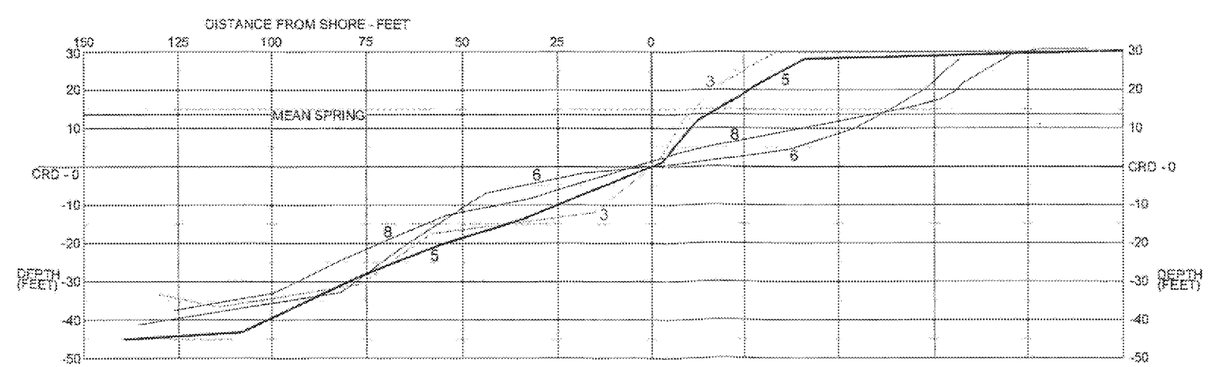
CROSS SECTION T8 - NEAR BERTH 13 AT TERMINAL 4

HORIZONTAL & VERTICAL SCALE: 1" = 40'



CROSS SECTION T6 - NEAR BERTH 9 AT TERMINAL 3

HORIZONTAL & VERTICAL SCALE: 1" = 40'



CROSS SECTIONS (T3, T5, T6, T8) - COMPARATIVE PLOTS

HORIZONTAL & VERTICAL SCALE: 1" = 40'

Figure 10

Port of Vancouver USA

Natural Resources Inventory Management Plan

Transect Cross-Sections Ordinary High Water Conditions

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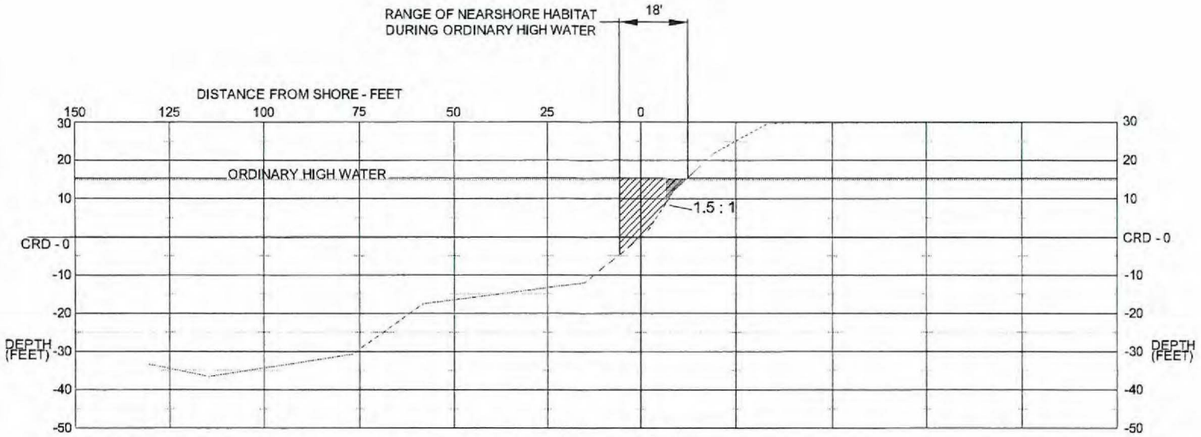


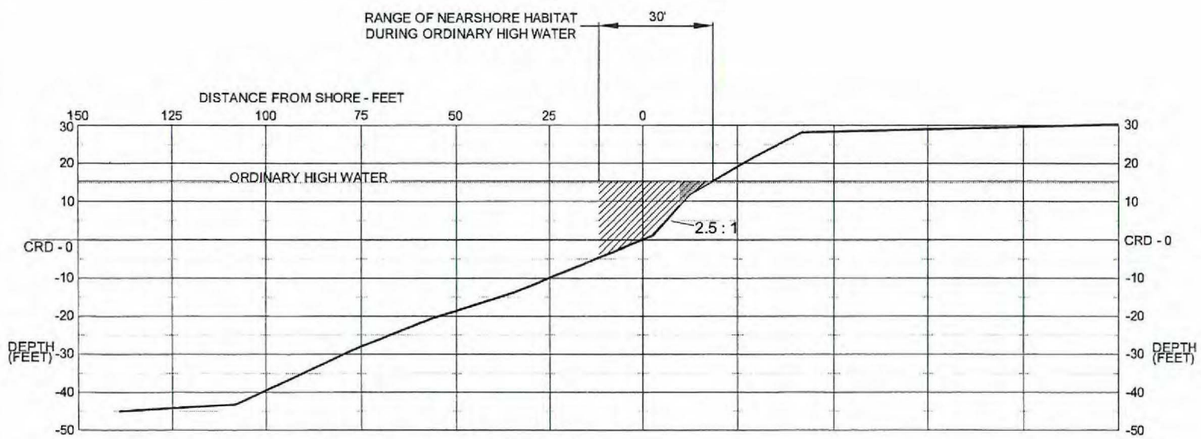
CROSS SECTION T3 - DOWNSTREAM END OF GRAIN ELEVATOR

HORIZONTAL & VERTICAL SCALE: 1" = 40'

LEGEND

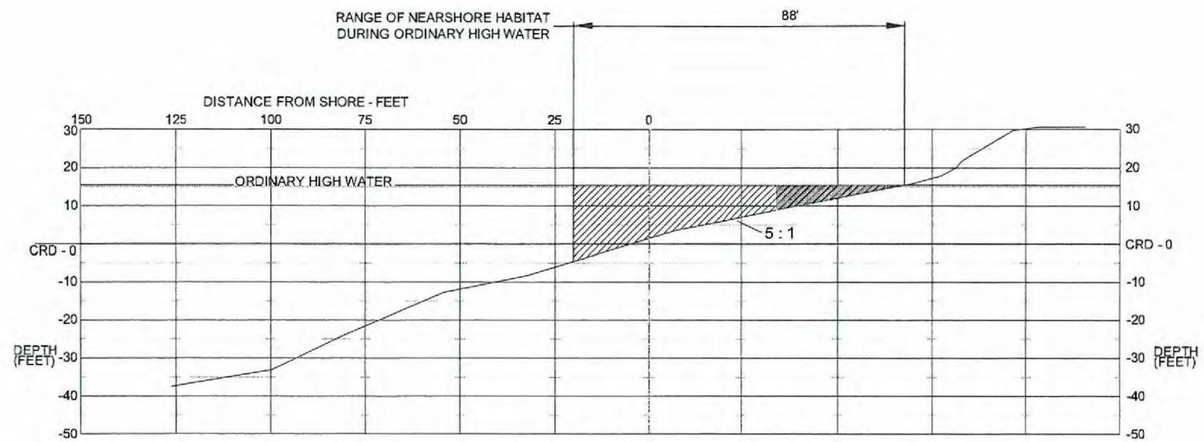
NEARSHORE HABITAT (<20 FT DEPTH) DURING ORDINARY HIGH WATER

HIGH QUALITY NEARSHORE HABITAT (<6.6 FT DEPTH) DURING ORDINARY HIGH WATER



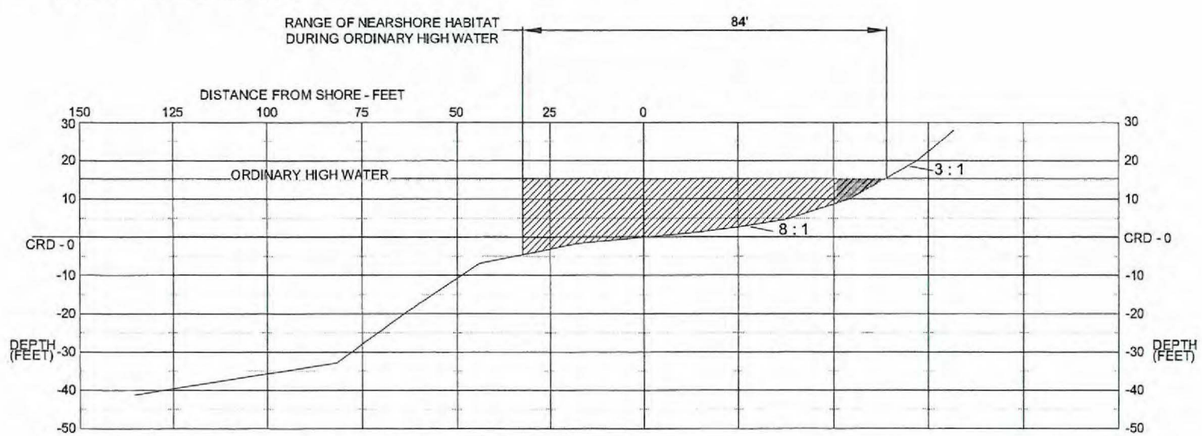
CROSS SECTION T5 - NEAR BERTH 8 AT TERMINAL 3

HORIZONTAL & VERTICAL SCALE: 1" = 40'



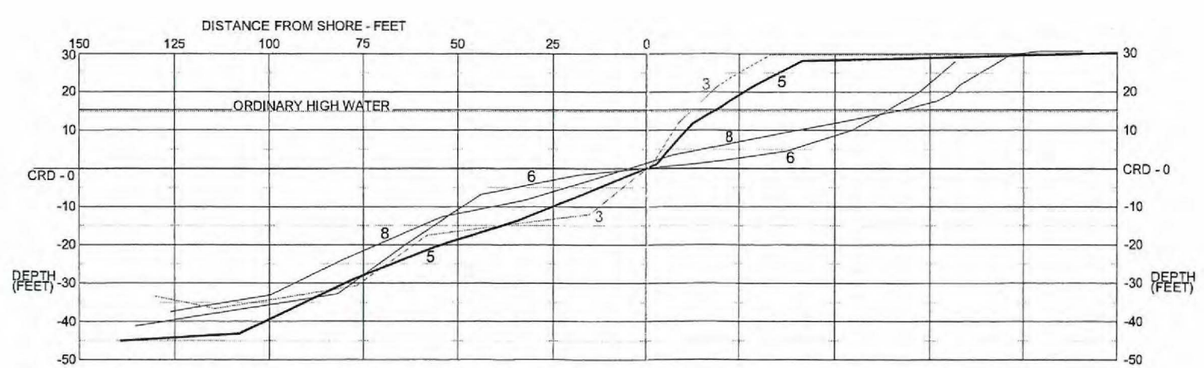
CROSS SECTION T8 - NEAR BERTH 13 AT TERMINAL 4

HORIZONTAL & VERTICAL SCALE: 1" = 40'



CROSS SECTION T6 - NEAR BERTH 9 AT TERMINAL 3

HORIZONTAL & VERTICAL SCALE: 1" = 40'



CROSS SECTIONS (T3, T5, T6, T8) - COMPARATIVE PLOTS

HORIZONTAL & VERTICAL SCALE: 1" = 40'

Figure 11

Port of Vancouver USA

Natural Resources Inventory Management Plan

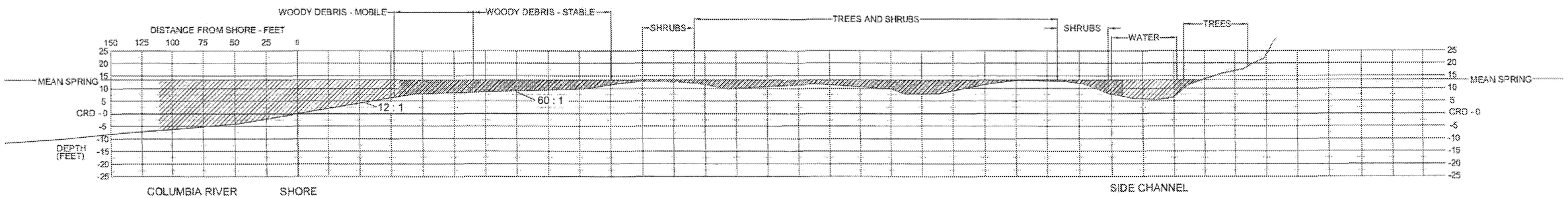
Reference Cross-Sections Mean Spring Conditions

VIGIL AGRIMIS, INC.

LEGEND

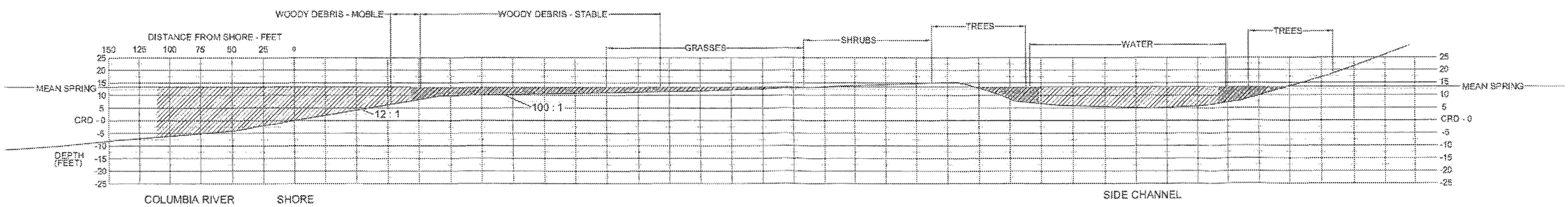
NEARSHORE HABITAT (<20 FT DEPTH) DURING MEAN SPRING CONDITIONS

HIGH QUALITY NEARSHORE HABITAT (<6.6 FT DEPTH) DURING MEAN SPRING CONDITIONS



REFERENCE CROSS SECTION R1 - REFERENCE SITE

HORIZONTAL SCALE: 1" = 80'
VERTICAL SCALE: 1" = 40'



REFERENCE CROSS SECTION R2 - REFERENCE SITE

HORIZONTAL SCALE: 1" = 80'
VERTICAL SCALE: 1" = 40'

Figure 12

Port of Vancouver USA

Natural Resources Inventory Management Plan

Reference Cross-Sections Ordinary High Water Conditions

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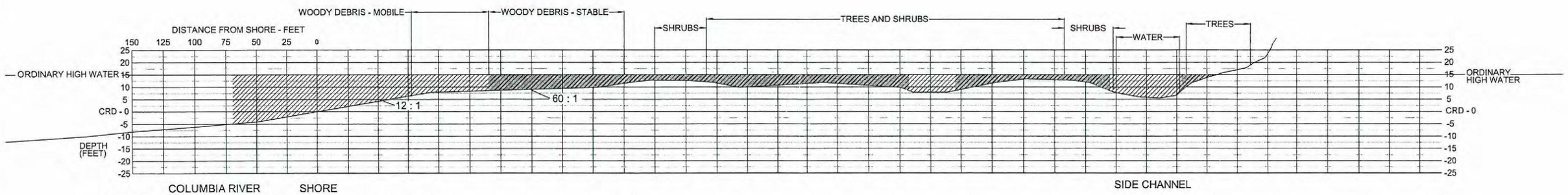
Engineering, Landscape Architecture, Environmental Science

HERRERA ENVIRONMENTAL CONSULTANTS

LEGEND

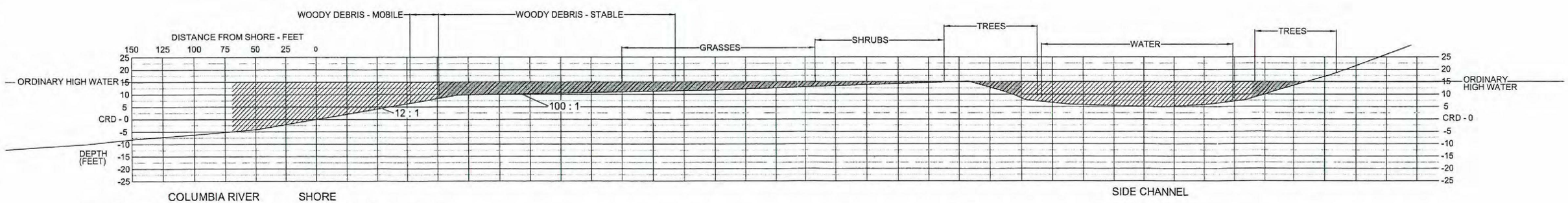
NEARSHORE HABITAT (<20 FT DEPTH) DURING ORDINARY HIGH WATER

HIGH QUALITY NEARSHORE HABITAT (<6.6 FT DEPTH) DURING ORDINARY HIGH WATER



REFERENCE CROSS SECTION R1 - REFERENCE SITE

HORIZONTAL SCALE: 1" = 80'
VERTICAL SCALE: 1" = 40'



REFERENCE CROSS SECTION R2 - REFERENCE SITE

HORIZONTAL SCALE: 1" = 80'
VERTICAL SCALE: 1" = 40'

Figure 13

Port of Vancouver USA

Natural Resources Inventory Management Plan

Approximate Extent of Nearshore Habitat

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Legend

Port of Vancouver

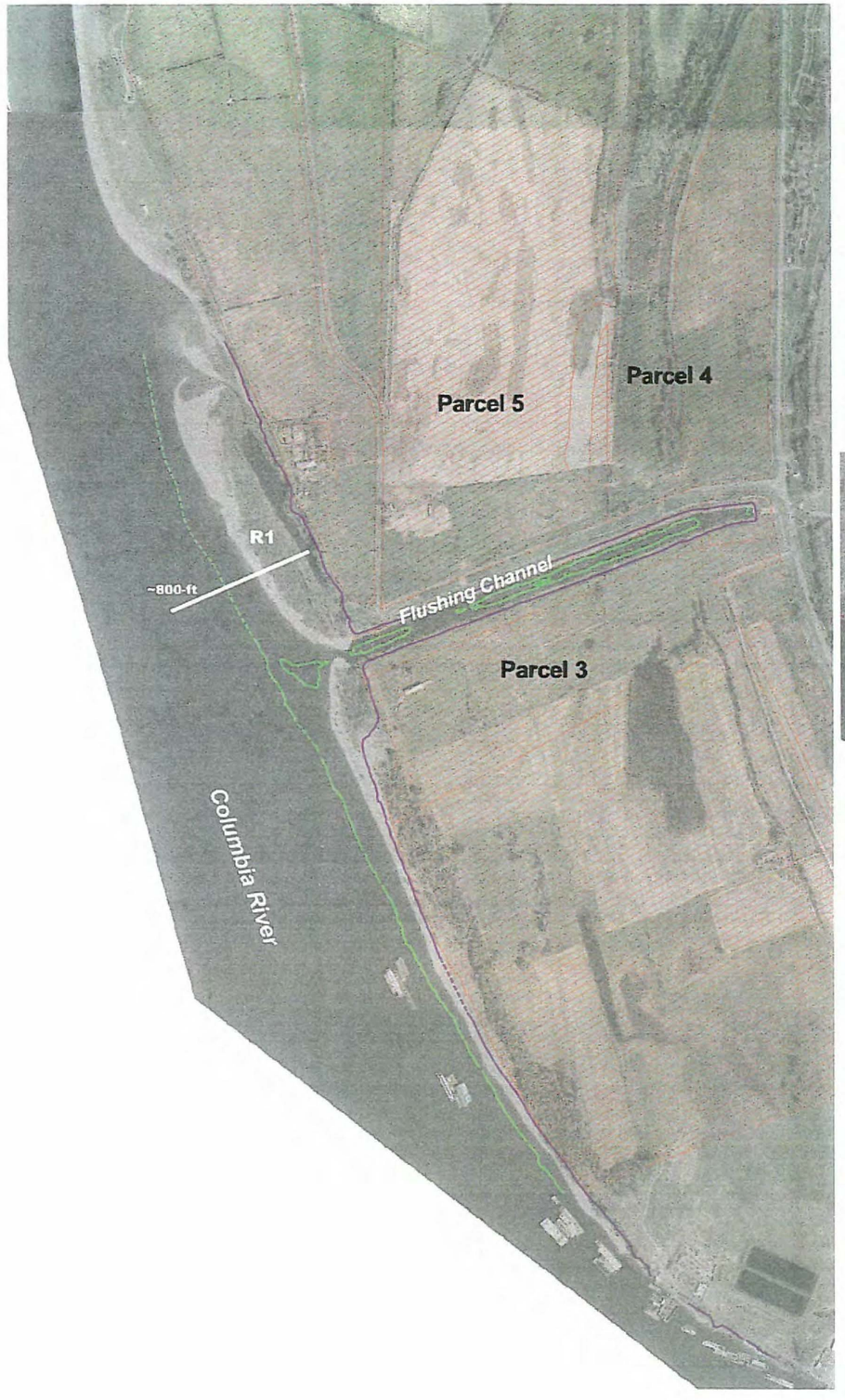
Range of Nearshore Habitat

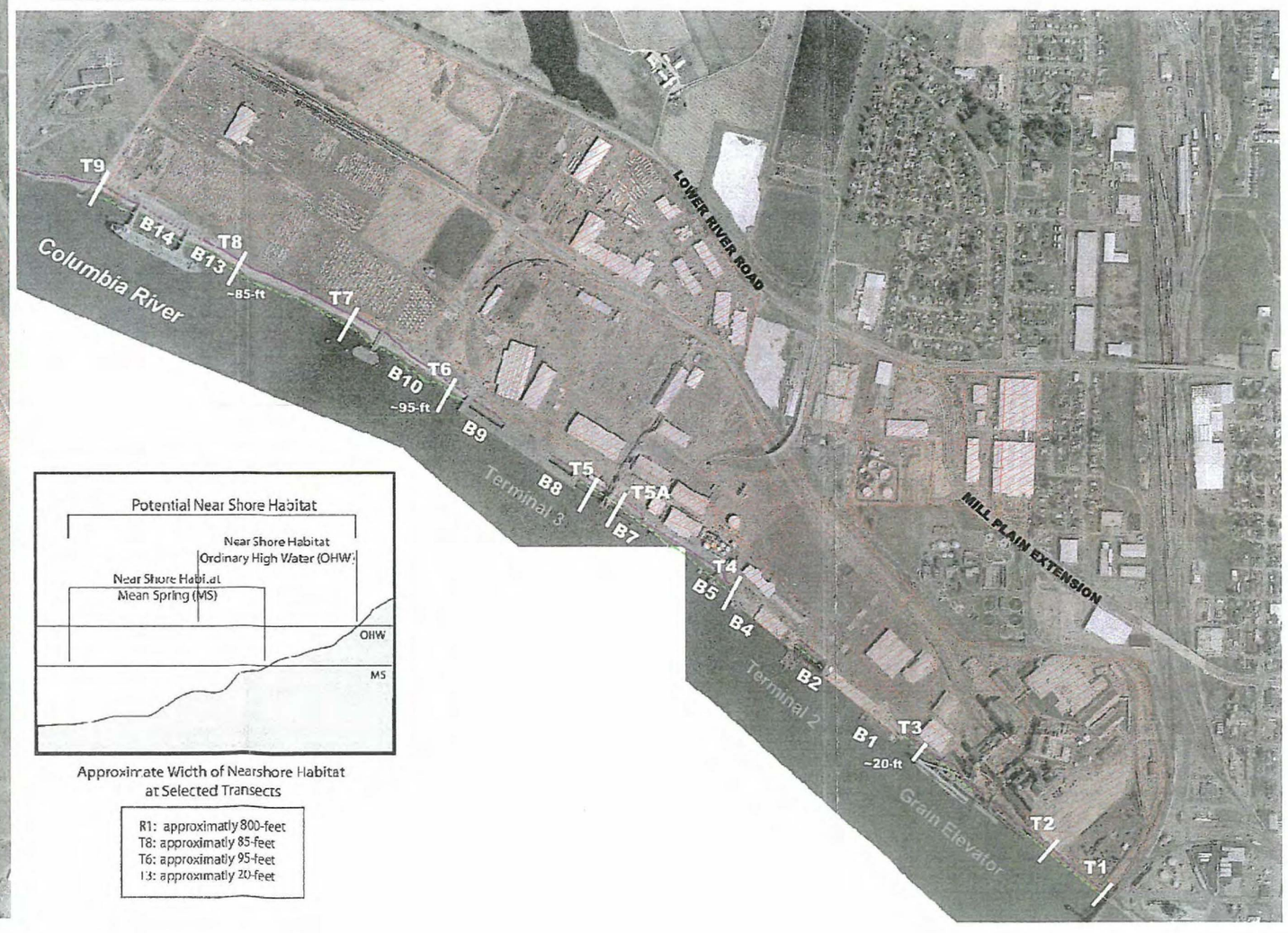
- Ordinary High Water: 16ft CRD
- Ordinary High Water: 16ft CRD (approximated)
- Mean Spring: -6ft CRD
- Mean Spring: -6ft CRD (approximated)

The -6-ft contour was approximated using bathymetry data provided by the Port in the Columbia River datum (CRD). The 16-ft contour was approximated using 2-ft contour interval data from ClarkView GIS. The vertical datum for these data is NGVD. The conversion between CRD and NGVD is 1.8-ft. To create this map product, land surface elevation was adjusted up 2-ft.
Air photo: 2002

1000 0 1000 2000 Feet

N





Approximate Width of Nearshore Habitat at Selected Transects

R1: approximatly 800-feet
T8: approximatly 85-feet
T6: approximatly 95-feet
T3: approximatly 20-feet

HABITAT MANAGEMENT PLAN

The habitat management plan provides a means to accommodate needed Port actions while managing Port environmental assets. This section applies location specific practices and treatments to minimize impacts and provide appropriate compensation for unavoidable impacts.

Development and Maintenance Activities and Natural Resources

Unavoidable impacts may be required for certain development projects or maintenance activities. These activities occur in the Aquatic, Shoreline and Land Zones. Activities that occur in the Land Zone are typically associated with structures and fills placed for to store materials associated with loading, offloading and other industrial activities. Activities that occur in the Shoreline and Aquatic Zone typically associated with development projects or maintenance activities include the construction of the structures and the implementation of related construction activities listed in Table 8.

Natural resources at the Port that could be impacted by development and redevelopment include nearshore habitat, riparian areas and wetlands. Figure 14 shows the zones and their relationship to the critical intersection areas and existing natural resources along the Port's developed shoreline.

Aquatic Zone

The Aquatic Zone includes both deepwater and shallow water areas. Aquatic areas that are greater than 20-feet deep are less important to salmonids. The shallow water area is equivalent in spatial extent to nearshore habitat. Areas within the shallow water areas that are less than 6.6-feet deep are especially valuable to juvenile salmonids.

The 1987 Corps of Engineers Wetlands Delineation Manual requires concurrent achievement of saturation, hydric soils, and hydrophytic vegetation criteria to meet the jurisdictional determination. Riparian wetlands, which are dominated by river flows below OHW, could be found in shallow water areas, such as the reference area downstream of the Flushing Channel.

Shoreline Zone

The Shoreline Zone is between OHW and top-of-bank. Riparian buffers are those streambank areas associated with the Columbia River that contribute woody debris, leaf litter, and insect drop directly to the river from trees and shrubs.

Land Zone

The Land Zone includes all land above top-of-bank. Some undeveloped areas remain. Based on the 1987 Corps of Engineers Wetlands Delineation Manual requirement, depressional wetlands may be found in the Land Zone. There are three existing wetlands on the Port's developed property (Table 9).

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Table 8. Development and Maintenance Activities and Locations

Development/Maintenance Activity	Development/Maintenance Activity Location(s)			
	Aquatic		Shoreline	Land
	Deep	Shallow		
Shore Stabilization				
Bio-Engineering **or**		X	X	
Riprap		X	X	
Bulkheads				
Sheet Pile Wall **or**	X	X	X	
Concrete Seawall	X	X	X	
Dock Construction				
Pile Driving **and**	X	X	X	X
Decking Construction	X	X	X	X
T-Dock Construction				
Pile Driving **and**	X	X	X	
Decking Construction	X	X	X	
Dolphin Construction				
Pile Driving **and**	X	X		
Decking Construction	X	X		
Roll-on/Roll-off Dock Construction				
Pile Driving **and**	X	X		
Floating Dock				
Dock and Dolphin Maintenance				
Decking Removal **or**	X	X	X	
Decking Repair **or**	X	X	X	
Pile Removal **or**	X	X	X	
Pile Repair	X	X	X	
Berths				
Dredging **and**	X	X		
Dredge Material Placement				X
Infrastructure				
Roads and Rail Lines				X
Buildings and Storage				X

EX-0022-000084-PCF

Figure 14. Developed Shoreline – Conceptual Cross-Section Existing Conditions

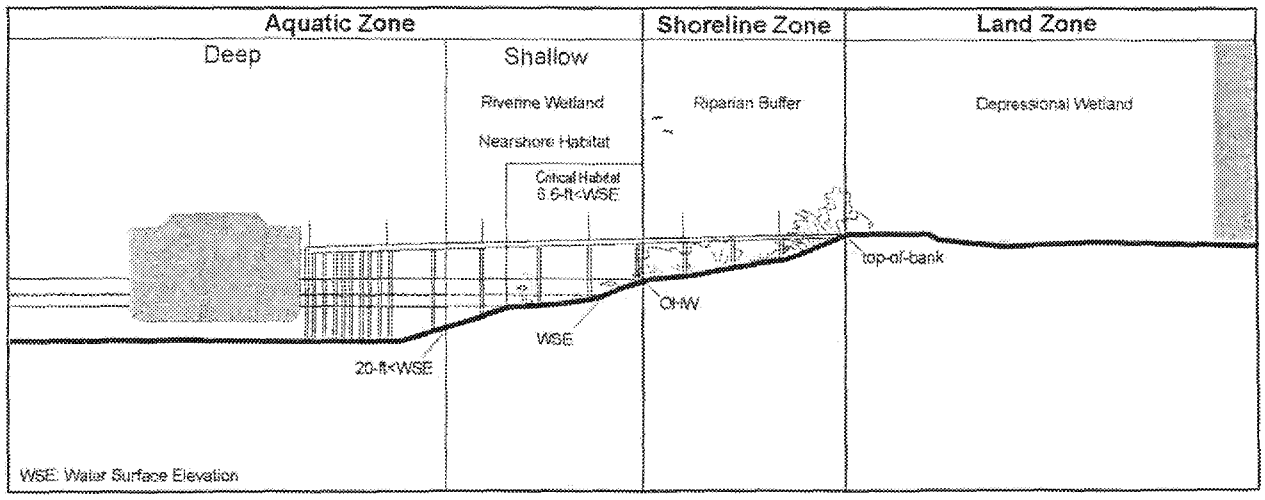


Table 9. Existing Wetland Locations

Wetland	Size (acres)	Vegetation	Category	Buffer	Type
Parcel 1A-NE	2.9	PEM	5	None Required	Natural Wetland
Parcel 1C	0.7	PFO	3	100-foot	Natural Wetland
Columbia Gateway Phase I	7.9	PFO, PSS, PEM	Replacement of 4	35-feet	Mitigation Site

Avoiding and Minimizing Impacts

Section 401/404, ESA and SEPA all require that alternatives be evaluated to illustrate that:

- Impacts are being avoided to the greatest extent practicable,
- Impacts are being reduced to the greatest extent practicable,
- Impacts that are neither avoidable nor reducible are compensated for.

Avoiding Impacts

Impacts can be avoided by:

- Changing the design footprint to avoid an impact.
- Not proceeding with a project.
- Proceeding with the project in a different location.

For impacts associated with construction activity, the timing or duration of the activity could be altered to avoid the impact.

Minimizing Impacts

Federal regulations require that a minimization effort be undertaken when impacts can not be avoided outright. General guidance for minimizing impacts exists through a Programmatic Biological Opinion and Magnuson-Stevens Act Essential Fish Habitat Consultation for SLOPES. This guidance is provided by the Corps of Engineers and NOAA Fisheries for certain activities requiring Department of the Army permits. For the purpose of the NRIMP, proposed development and redevelopment impacts and mitigation are assumed to be generally consistent with the SLOPES agreement.

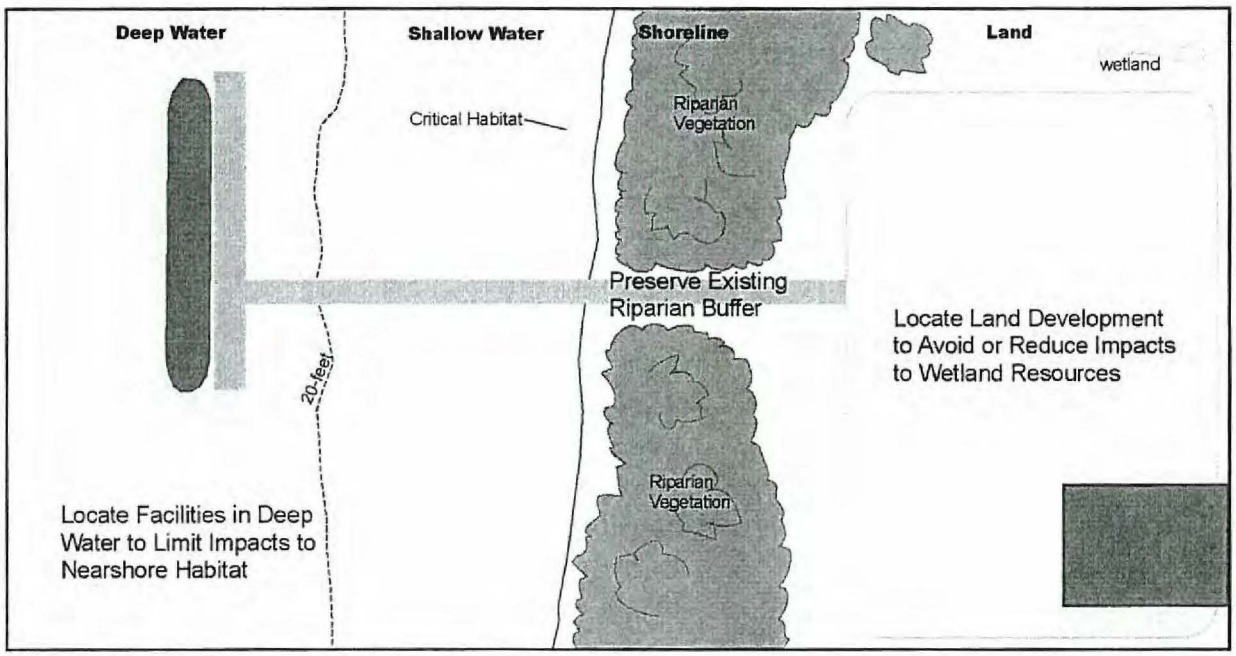
EX-0022-000085-PCE

Options for minimizing impacts include changing the design of the project to reduce the project foot-print. Considering alternative design and construction methods to change the timing or limit the duration of the activity to minimize the impact. Typical strategies for minimizing impacts in ports include the use of clamshell dredging instead of vacuum dredging, using a bubble curtain to protect aquatic life from acoustic impacts associated with pile driving and adhering to established in-water-work windows.

The basic strategies for avoiding and minimizing impacts from Port development activities are conceptually diagrammed in Figure 15. Here the basic strategies include:

- Locating land development to avoid wetland resources.
- Minimizing impacts to riparian vegetation.
- Developing in deepwater instead of shallow water areas.

Figure 15. Strategies for Avoiding and Minimizing Impacts



Mitigating for Unavoidable Impacts

Unavoidable impacts to nearshore, wetland, and riparian resources require mitigation that is approved by federal, state, and local agencies. Following are 12 mitigation templates:

1. Adding riparian trees in groups,
2. Adding riparian shrubs in masses and managing invasive vegetation as needed,
3. Adding engineered wood as individuals or small groups.
4. Building engineering wood/concrete cribs for grade control and to accrete sand being transported along the shore,
5. Creating a floodplain bench behind engineered wood/concrete structures,
6. Using dredge sand fill to create gradual to moderate shorelines behind engineered wood/concrete structures,
7. Driving piles with steel lagging to establish grade control at or near the low water point,
8. Using the piles to add lagging (wood or steel channels) to create nearshore habitat,

EX-0022-000086-PCE

9. Using dredge sand fill to create gradual to moderate shorelines behind engineered wood/concrete structures,
10. Providing light wells/steel grating over nearshore habitat created under structures,
11. Providing purple martin and/or bat boxes on piles.
12. Removing piles to below the level of existing substrate (2 feet) to reduce habitat used by predator species.

Wetlands

The replacement of wetland resources will be determined on a case-by-case basis depending of Department of Ecology guidance and City regulations.

Nearshore Habitat

Providing high quality function – either on-site in-kind or on-site/off-site out-of-kind – is the bottom line. The following section describes possible treatments for impacts to nearshore habitats.

Gradual Shorelines – Figure 16 describes three treatments (1, 2 and 3) that can be applied as mitigation for wetland, bank and in-water impacts in gradual shorelines. These treatment templates can be performed where gradual shorelines (12:1 and flatter slopes) are available for enhancement. Though gradual shoreline conditions do not exist at the developed Port these treatments can be used for off-site mitigation.

Vegetation selection will be subject to restrictions in terms of height, flowering characteristics, or other criteria due to adjacent Port uses and activities. New security requirements, mandated in the Marine and Transportation Security Act of 2002 and codified in 33 CFR Section 105, require facilities, including Ports to maintain clear zones of visibility around their entire boundary. The waterside boundary is of particular concern for potential terrorist activity.

Future mitigation projects within the developed Port, will need to consider security and operational requirements with respect to the installation of shrubs or tall vegetation along the shorelines or perimeter. In some cases there may be opportunities to install aquatic vegetation or groundcover if appropriate. For example, for a barge slip that requires shallow water habitat creation, aquatic vegetation might be planted within created shallow benched areas.

Moderate Shorelines – Figure 17 describes components of treatments (4, 5, 6 and 7) that can be applied as mitigation for wetland and riparian impacts in moderate shorelines where gradual slopes are not available or very limited for mitigation. In this case, shorelines are manipulated with structures to create habitat opportunities to compensate for proposed loss of existing nearshore and associated habitats. These treatment templates can be performed on moderate and steep shorelines to provide and enhance nearshore habitat for salmonids. A schematic crib detail is included in Appendix C.

Steep Shorelines – Figure 18 describes treatments (8, 9, 10 and 11) that can be applied as mitigation for aquatic and riparian impacts in steep shorelines associated with dock and pile construction using wide pile spacing.

Figure 19, a variation on the treatment in Figure 18, describes treatments (2, 8, 9 and 11) that can be applied as mitigation for aquatic and riparian impacts in moderate and steep shorelines associated with dock and pile construction using wide pile spacing. This example includes open water landward of the dock.

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Figure 20, a variation on the treatment in Figure 18, describes treatments (8, 9, 10 and 11) that can be applied as mitigation for aquatic and riparian impacts in moderate and steep shorelines associated with dock and pile construction using dense pile spacing.

Figure 21 describes a treatment (12) that can be applied as out-of-kind mitigation for aquatic and riparian impacts in gradual, moderate and steep shorelines associated with a variety of construction impacts.

Figure 22, a variation on the treatment in Figure 21, describes a treatment (8, 9 and 12) that can be applied as a mitigation for aquatic and riparian impacts in gradual, moderate and steep shorelines associated with a variety of construction impacts.

Additional Details are included in Appendix C.

Spatial Distribution of Mitigation Treatments

The mitigation treatments discussed above were conceptually designed to fit into the three basic shoreline slope conditions found on Port property. Figure 23 illustrates the location of:

- Gradually sloped shoreline,
- Moderately sloped shoreline,
- Steeply sloped shoreline.

The steeply sloped areas are located on the southeastern shoreline between which is developed for deep draft ships. The moderately sloped shoreline extends northwest of this area to the end of the Alcoa facility. The gradually sloped area is further to the northwest, extending beyond the Flushing Channel, and currently includes Columbia Gateway Phase II.

A boat survey was completed by Port staff on May 10, 2004. This survey resulted in the identification of a number of locations for mitigation. Photographs from this survey are included in Appendix D. The results of this survey were combined with observations from the field work done to assess ecological functions and used to locate potential mitigation treatments on Port property.

Figures 24, 25 and 26 are a set of concept level maps that locate the mitigation treatments discussed in the previous section. Each map is focused on a different shoreline slope condition. These maps illustrate the potential areas available for the treatments. For example, creating nearshore habitat with piles (Figure 18) is possible only at an existing dock or where a new dock is to be built.

Figure 27 takes this one step further and identifies 17 specific locations for potential mitigation actions along the developed shoreline. These locations include: areas where invasive vegetation and debris can be removed, areas where old wooden piles can be removed or replaces, and areas where infrastructure can be relocated or removed. Any mitigation actions will need agency approval.

Mitigation Analysis

To the extent possible, mitigation treatment elements should address the water quality, hydrology, and habitat functions impacted by unavoidable impacts. Out-of-kind mitigation can be used to compensate for project impacts, but is not the approach generally preferred by regulatory agencies. However, there are instances when there are few if any alternatives.

Table 10 is a comparison of shoreline activities in the nearshore and deepwater area. The table describes anticipated impacts and proposed mitigation treatment templates to be used.

EX-0022-000088-PCE

Table 11 is a generalized comparison of mitigation elements and relative cost and functionality for mitigation.

Cost information is presented in Appendix E. Costs vary greatly for the various mitigation treatments. Cost information, performance and extent to which a treatment has been tried must be considered when making decisions about appropriate impacts and compensatory mitigation.

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Table 10. Functional Impacts of Activities and Mitigation Options

Activity	Affect on Functions			
	Water Quality Functions	Hydrology Functions	Habitat Functions	Mitigation Template
Shore Stabilization Construction				
Bio-Engineering or	May alter groundwater discharge patterns and thereby groundwater functions (e.g. water temperature moderation).	May reduce floodplain storage capacity by disconnecting the active channel form its floodplain Possible impairment of shoreline's ability to reduce downstream erosion (reduction in deformable friction elements from sandy beach and willow recruitment)	It may reduce floodplain connectivity and floodplain storage capacity by disconnecting the active channel from its floodplain. May degrade salmonid habitat, reducing food sources as well as habitat complexity and partitioning in areas where trees/vegetation are removed. Removal of shoreline trees/vegetation may also reduce potential habitat/food sources for birds and mammals. Reduced woody debris accumulation may also eliminate invertebrate habitat.	#s 1, 2, 3, 4, 5, 6
Riprap (new)	May alter groundwater discharge patterns and thereby groundwater functions (e.g. water temperature moderation).	May reduce floodplain storage capacity by disconnecting the active channel form its floodplain Possible impairment of shoreline's ability to reduce downstream erosion (reduction in deformable friction elements from sandy beach and willow recruitment)	It may reduce floodplain connectivity and floodplain storage capacity by disconnecting the active channel from its floodplain. May degrade salmonid habitat, reducing food sources as well as habitat complexity and partitioning in areas where trees/vegetation are removed. Removal of shoreline trees/vegetation may also reduce potential habitat/food sources for birds and mammals. Reduced woody debris accumulation may also eliminate invertebrate habitat. Will likely disrupt normal stream flows thus creating hydraulic shadows where predatory fish may prey upon juvenile salmonids.	#s 1, 2, 3, 4, 5, 6, 7
Riprap (maintenance)	Same as above	Continues impairment of shoreline's ability to reduce downstream erosion	Continues loss of riparian trees and reduced woody debris accumulation	
Bulkhead Construction				
Sheet Pile Wall or Concrete Seawall	Potential temporary water quality degradation if the proper conservation measures and BMPs are not implemented.	**Shallow Only** No Significant Adverse Impact. **Deep Only** May disrupt normal stream flows thus creating hydraulic shadows, providing an advantage to predatory fish.	May degrade anadromous fish habitat, reducing food sources and the effect of habitat partitioning in areas where trees/vegetation are removed. Light reduction to the underwater environment may also result, potentially providing an advantage to predators of anadromous fish. Effects would be limited to the immediate area of the sheet pile installation. Short-term impacts could include construction noise and light reduction from increased turbidity, both of which may provide an advantage to predatory fish. May degrade anadromous fish habitat, reducing food sources and the effect of habitat partitioning in areas where trees/vegetation are removed.	#s 1 - 10
Dock Construction				
Pile Driving and Decking Construction	**Shallow Only** May interfere with the removal of nutrients, metals, and toxic organics from the water column, especially in areas where removal of vegetation or woody debris occurs.	**Shallow and Deep** Piles associated with dock structures can disrupt the normal stream flows thus creating hydraulic shadows where predatory fish (i.e. Northern pike minnow) prey upon juvenile salmonids. **Shallow Only** If vegetation removed, may affect the ability of the shoreline to reduce downstream erosion.	**Shoreline Only** Removal of shoreline trees/vegetation may also reduce potential habitat/food sources for birds and mammals. Reduced woody debris accumulation may also eliminate invertebrate habitat. **Shallow Only** May degrade anadromous fish habitat, reducing food sources and the effect of habitat partitioning in areas where trees/vegetation are removed. **Shallow and Deep** Also may create hydraulic shadow and reduce light penetration to the underwater environment, creating a potential advantage for predators of anadromous fish.	#s 1, 2, 3, 9, 10, 12

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Table 10. Functional Impacts of Activities and Mitigation Options - Continued

Activity	Affect on Functions			
	Water Quality Functions	Hydrology Functions	Habitat Functions	Mitigation Template
T-Dock Construction				
Pile Driving **and** Decking Construction	No Significant Adverse Impact.	May disrupt normal stream flows thus creating hydraulic shadows where predatory fish may prey upon juvenile salmonids.	**Shoreline Only** Removal of shoreline trees/vegetation may also reduce potential habitat/food sources for birds and mammals. Reduced woody debris accumulation may also eliminate invertebrate habitat. **Shallow Only** May degrade anadromous fish habitat, reducing food sources and the effect of habitat partitioning in areas where trees/vegetation are removed. **Shallow and Deep** May create eddies and reduce light penetration to the underwater environment, creating a potential advantage for predators of anadromous fish.	#s 10, 11, 12
Dolphin Construction				
Pile Driving **and** Decking Construction	No Significant Adverse Impact.	May disrupt normal stream flows thus creating eddies where predatory fish may prey upon juvenile salmonids.	May create eddies and reduce light penetration to the underwater environment, creating a potential advantage for predators of anadromous fish.	#s 10, 11, 12
Roll-on/Roll-off Dock Construction				
Pile Driving **and** Floating Dock	No Significant Adverse Impact.	May disrupt normal stream flows thus creating eddies where predatory fish may prey upon juvenile salmonids.	May create eddies and reduce light penetration to the underwater environment, creating a potential advantage for predators of anadromous fish.	
Dock and Dolphin Maintenance				
Decking Removal **or**	Potential temporary water quality degradation if the proper conservation measures and BMPs are not implemented. May reduce the presence of metals/toxic organics from the water column with removal of treated wood piles.	No Significant Adverse Impact.	May reduce the presence of woody debris (trapped by piles), thus impacting fish habitat by reducing cover from predatory fish. Reduction in woody debris may also eliminate invertebrate habitat.	#s 3, 4, 12
Decking Repair **or**	No Significant Adverse Impact.	No Significant Adverse Impact.	No Significant Adverse Impact.	
Pile Removal **or**	No Significant Adverse Impact.	No Significant Adverse Impact.	Short-term impacts could include construction noise and light reduction from increased turbidity, both of which may provide an advantage to predatory fish.	
Pile Repair	No Significant Adverse Impact.	No Significant Adverse Impact.	Short-term impacts could include construction noise and light reduction from increased turbidity, both of which may provide an advantage to predatory fish. May disrupt normal stream flows thus creating eddies, providing an advantage to predatory fish.	
Berths				
Dredging **and**	Potential temporary water quality degradation if the proper conservation measures and BMPs are not implemented.	No Significant Adverse Impact.	Short-term turbidity increases will reduce light penetration to the underwater environment, potentially providing an advantage to predatory fish.	
Dredge Material Placement	Potential temporary water quality degradation if the proper conservation measures and BMPs are not implemented.	May disrupt normal stream flows creating eddies where predatory fish may prey upon juvenile salmonids.	Same as above	#s 2, 3, 4, 5, 6, 7, 8, 9

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Table 11. Preliminary Cost Estimate

#	Mitigation Element	Cost	Functionality
1	Add riparian hardwoods in clusters of 3-9	$5k -$10k	Tried and True
2	Add riparian shrubs in drifts/masses of 20-50	$5k -$15k	Tried and True
3	Add engineered wood individually or in small groups at approximately 200-foot on-center	$10k -$60k	Tried and True
4	Add engineered wood/concrete debris grade control	$60k -$600k	Modification of Tried and True
5	Create floodplain bench, adding riparian hardwoods, shrubs, and/or engineered wood as appropriate	$40k - $100k	Tried and True
6	Use dredge sand fill (applied to gradual/steep slopes)	$10k - $20k	Tried and True
7	Use piles or batter wall to create shallow water aquatic habitat	$100k - $200k	Modification of Tried and True
8	Add steel lagging to create shallow water aquatic habitat	$100k - $200k	Experimental
9	Add dredge sand fill (pier areas)	$10k - $20k	Modification of Tried and True
10	Provide light wells	$10k - $40k	Modification of Tried and True/ Experimental
11	Provide bird and bat boxes	$1k<	Tried and True
12	Remove piles	$40k - $400k	Tried and True

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DISCUSSION AND CONCLUSIONS

The purpose of the NRIMP is to provide the Port with a flexible planning tool focused on the developed shoreline. The NRIMP addresses the full range of redevelopment and maintenance activities in aquatic, shoreline and land areas. The NRIMP focuses on critical intersections between natural resources and Port activities to provide a toolbox for the Port to use in adopting a proactive approach to regulatory permitting. This approach will:

- Streamline the environmental permitting process,
- Avoid project delays by identifying appropriate mitigation/conservation options early in the project development process,
- Improve management of Port environmental assets,
- Avoid piece-meal mitigation planning,
- Assist with budget process for facility improvements by providing cost estimates to implement mitigation options,
- Meet or exceed local, state and federal agency requirements for comprehensive resource protection.

The NRIMP reviewed Port activities, and natural resources within three zones: Aquatic, Shoreline and Land. The NRIMP concluded that likely redevelopment and maintenance activities within the Port's developed shoreline could include:

- Shore stabilization,
- Bulkhead construction,
- Dock and dolphin construction and maintenance,
- Construction activities associated with open and warehouse storage facilities and
- Dredging.

Natural resources within the Port's developed shoreline include:

- Riparian buffers and
- Nearshore salmonid habitat.

The shallow-water aquatic area and shoreline were identified as the areas of greatest conflict between activities and resources.

An inventory was conducted to determine the extent, quality, functions and values of the natural resources within the developed Port. The shoreline was broken down into three slope categories (gradual, moderate and steep) based on the data collected in the field. The categories were based on the slope because this variable is directly related to the amount of nearshore habitat available to salmonids as well as the frequency and duration of its availability. Functional assessment of water quality, hydrologic and food webs and habitat was highest on the gradually sloping shoreline and lowest on the steeply sloping shoreline. The grain elevator and Berth 2 (Terminal 2) fall into the Steep category. Berths 4 to 14 (Terminals 2, 3 and 4) fall into the Moderate category. There are no areas in the developed shoreline in the Gradual category.

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Section 401/404, ESA, and NEPA all require that alternatives be evaluated as part of the permitting process to illustrate that:

- Impacts are being avoided to the greatest extent practicable,
- Impacts are being reduced to the greatest extent practicable,
- Impacts that are neither avoidable nor reducible are compensated for.

Federal regulations require that a minimization effort be undertaken when impacts can not be avoided outright. For the purpose of the NRIMP, proposed development and redevelopment impacts and mitigation are assumed to be generally consistent with the SLOPES agreement which provides general guidance for minimizing impacts exists through a Programmatic Biological Opinion and Magnuson-Stevens Act Essential Fish Habitat Consultation.

The NRIMP provides a mitigation template for use when impacts are unavoidable. The mitigation template is a tool for assisting project managers assess project impacts and for determining appropriate mitigation. It must not be viewed as a "cookbook", but rather as a guide to facilitate project development that supports vital economic development with least impact to natural resources.

Site constraints make it challenging to always match impacts to functions with equivalent mitigation. In some instances, on-site in-kind mitigation can be achieved. In others, multiple treatment elements could potentially be used for on-site/off-site out-of-kind mitigation. Regardless of the approach, improving the quality of existing habitat is the driver. Habitat quality can be improved by enhancing existing functions or by adding functions that are not currently provided.

The NRIMP presents numerous opportunities to provide mitigation treatments for unavoidable impacts to natural resources in nearshore and shoreline areas. These range form low-cost tried and true treatment elements to high-cost and sometimes experimental treatment elements. They include:

- Adding riparian hardwoods in clusters,
- Adding riparian shrubs in drifts/masses,
- Adding engineered wood individually or in small groups,
- Adding engineered wood/concrete debris grade control,
- Creating floodplain benches,
- Using dredge sand fill to enhance shoreline areas,
- Using sheet pile or batter wall to create shallow water aquatic habitat,
- Adding steel lagging to create shallow water aquatic habitat,
- Adding dredge sand fill to pier areas,
- Providing light wells in dock structures,
- Providing bird and bat boxes,
- Removing pilings and debris,
- Removing invasive vegetation.

Many of these elements can be incorporated into a redevelopment project at the design phase, in essence making the project self-mitigating. To ease the permitting process project design should attempt to include mitigating elements when possible. Examples of self-mitigating projects include the docks and piers shown in Figures 18 and 19. There may be impacts

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where shorelines can be modified by treatments as shown in Figures 16, 17, and 18 as self-mitigating projects.

By first understanding potential impacts associated with redevelopment and maintenance activities, measures can then be taken to avoid, reduce and finally compensate for natural resources impacts. Integrating infrastructure design, permitting and mitigation design from project inception can be effective in increasing cost effectiveness and conserving important natural resources. The NRIMP facilitates this approach to integrated design.

EX-0022-000098-PCE

Figure 16

Port of Vancouver USA

Natural Resources Inventory Management Plan

Gradually Sloping Shoreline Treatments

VIGIL AGRIMIS, INC.

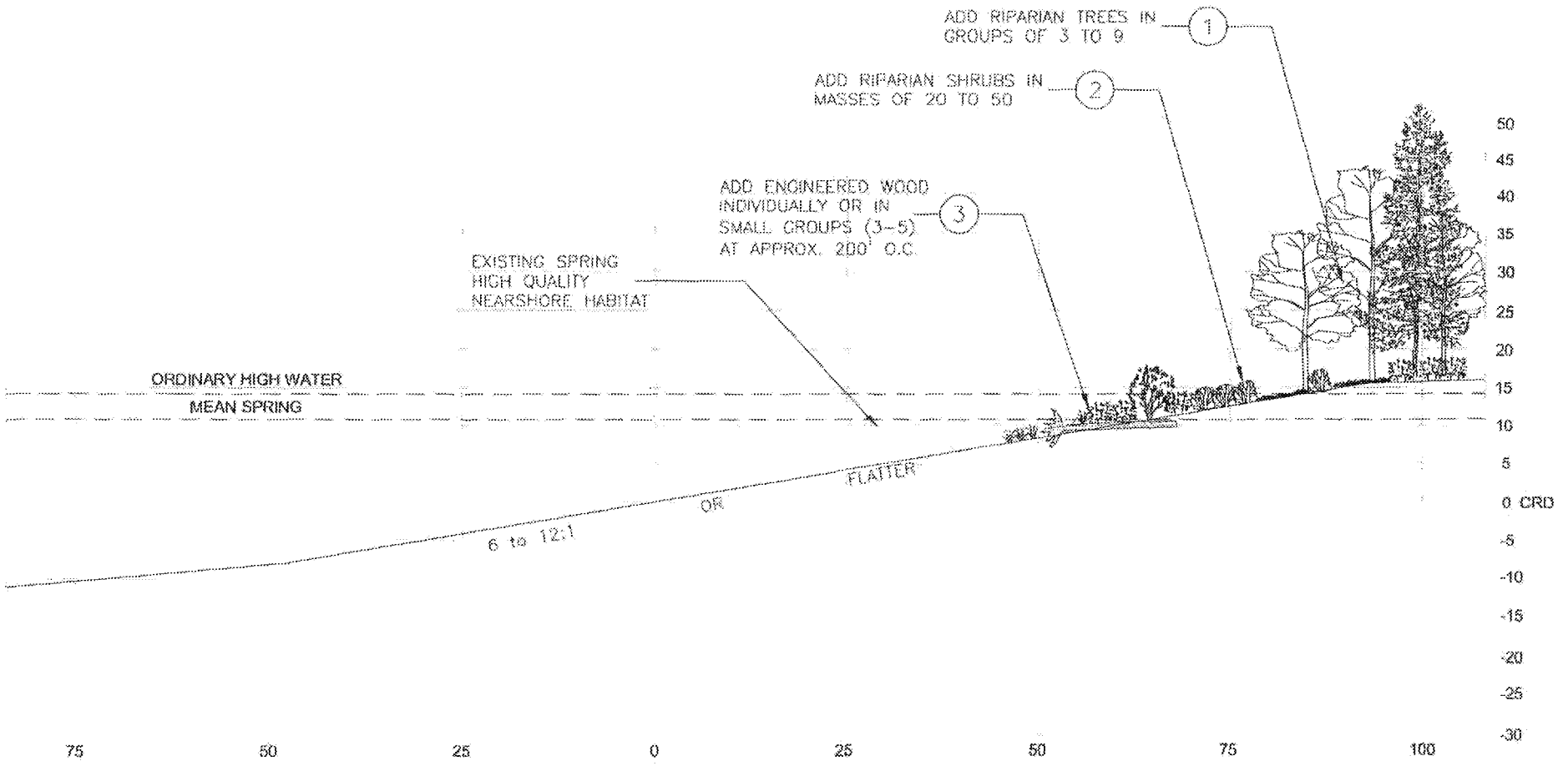

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Figure 17

Port of Vancouver USA

Natural Resources Inventory Management Plan

Moderately Sloping Shoreline Treatments

VIGIL AGRIMIS, INC.
Engineering, Landscape Architecture, Environmental Science

HERRERA

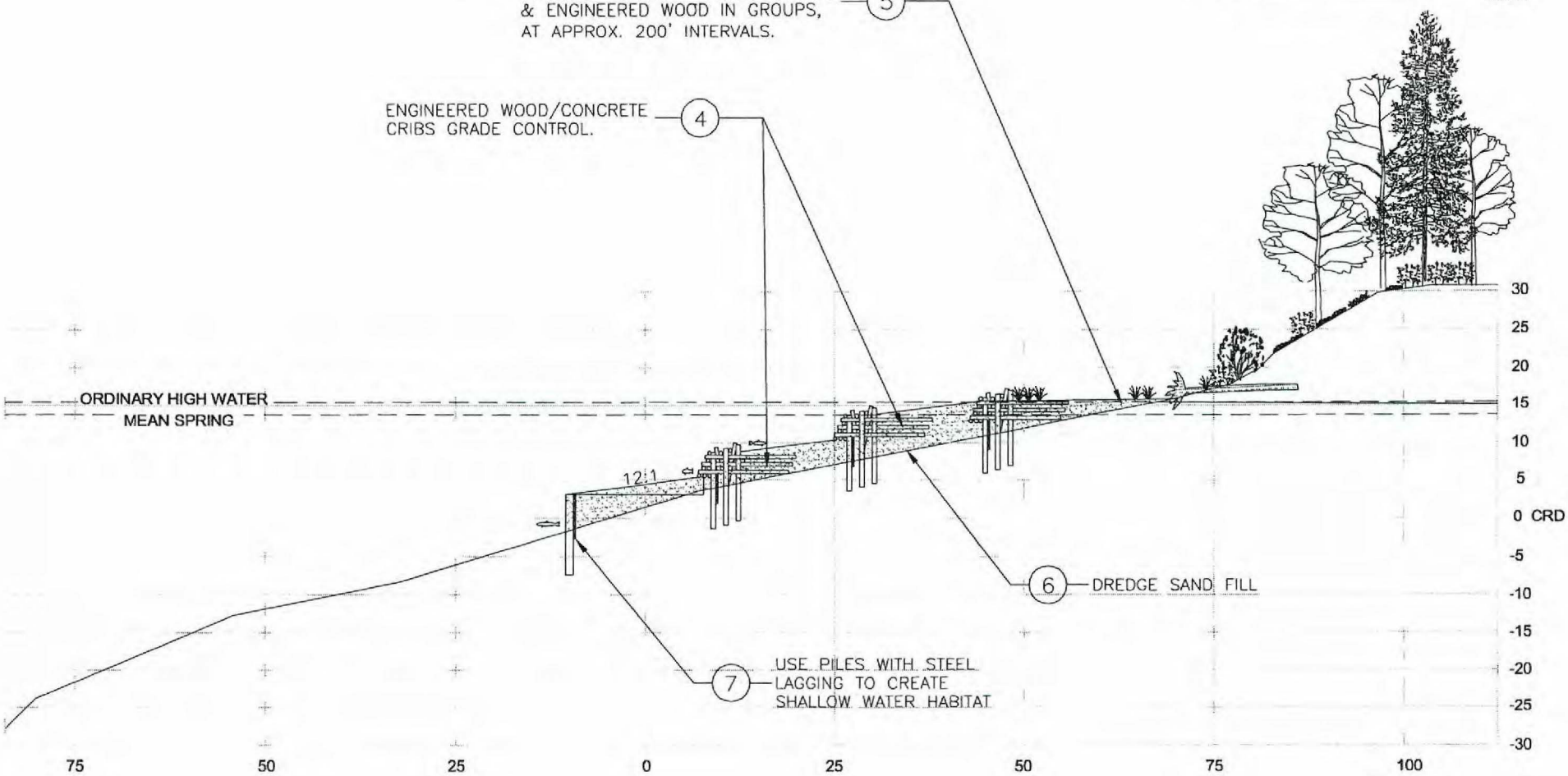

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Figure 18

Port of Vancouver USA

Natural Resources Inventory Management Plan

Steeply Sloping Shoreline Treatments with Piles

VIGIL AGRIMIS, INC.

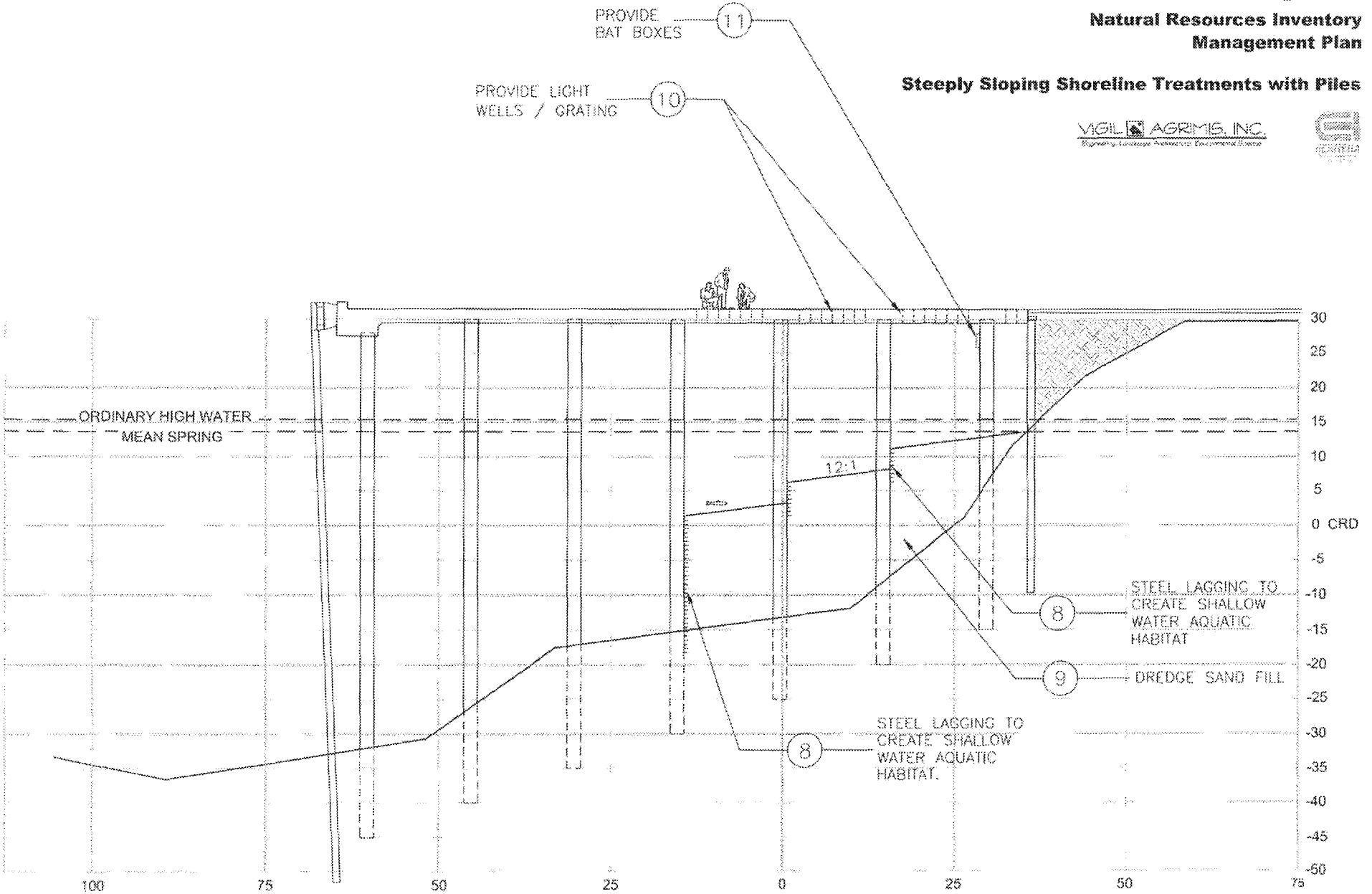

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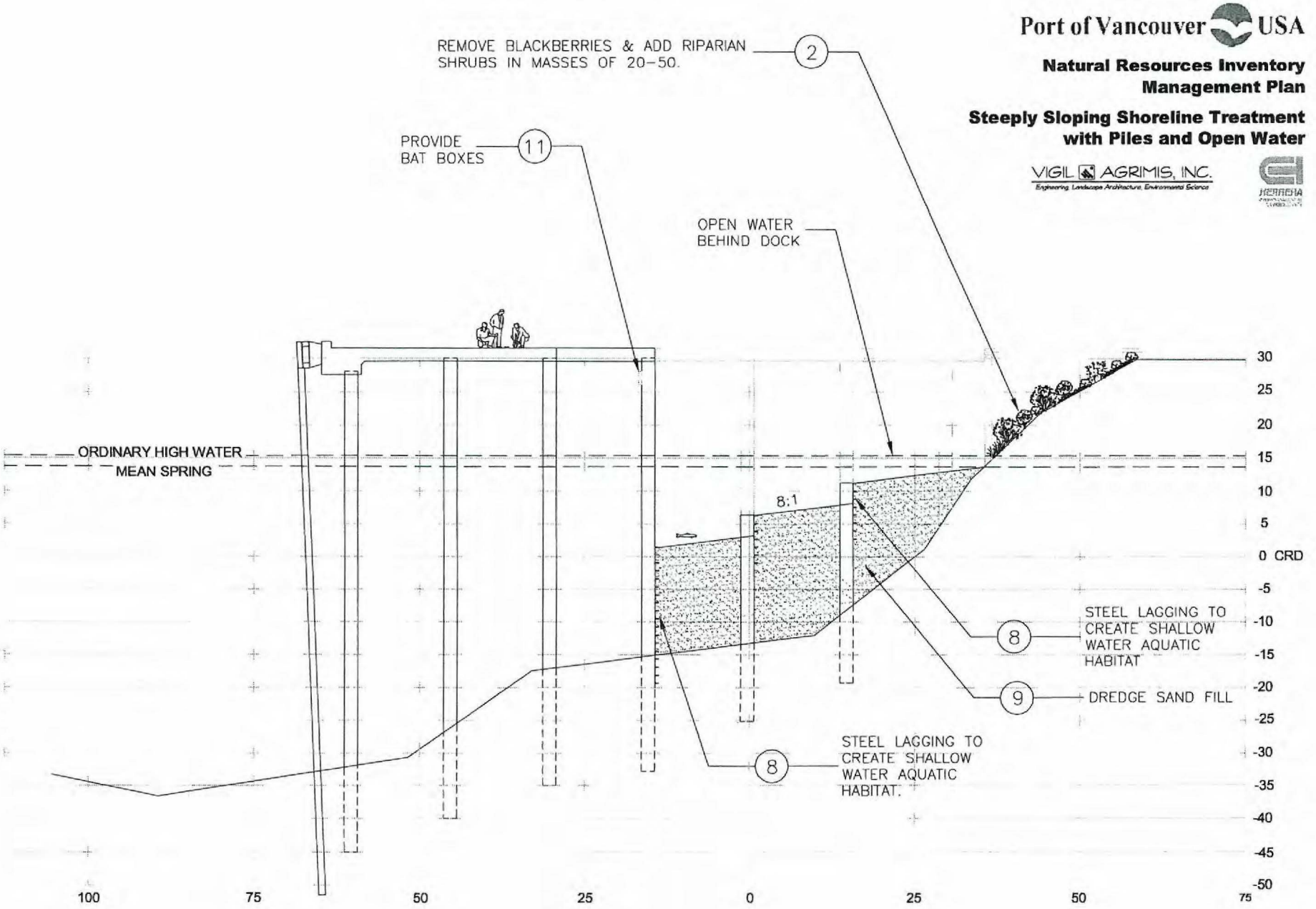
Figure 19

Port of Vancouver USA

Natural Resources Inventory Management Plan

Steeply Sloping Shoreline Treatment with Piles and Open Water

VIGIL AGRIMIS, INC.
Engineering, Landscape Architecture, Environmental Science



EX-0022-000102-PCE

Figure 20

Port of Vancouver USA

Natural Resources Inventory Management Plan

Steeply Sloping Shoreline Treatments with Dense Piles

VIGIL AGRIMIS, INC.

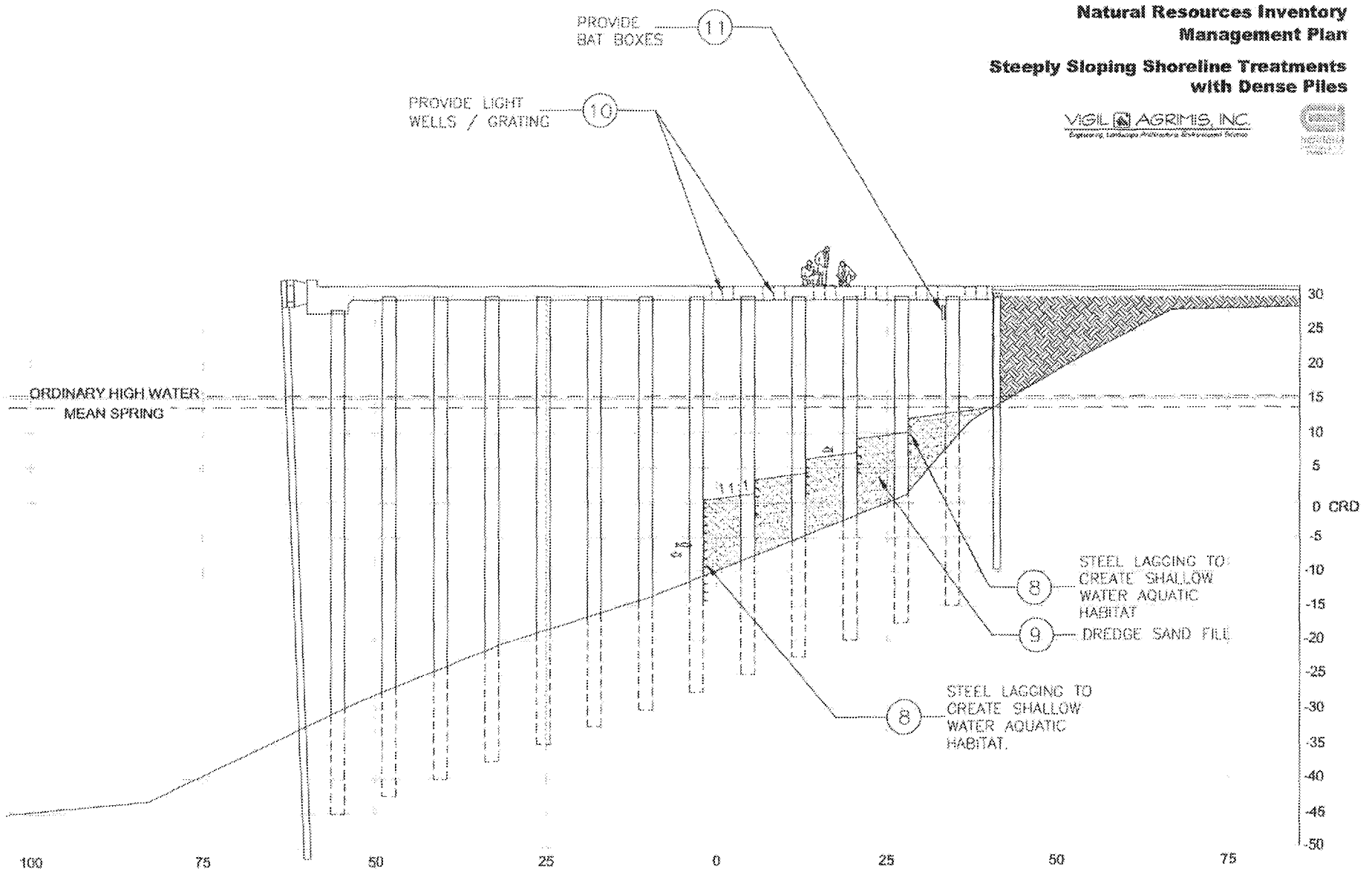


Figure 21

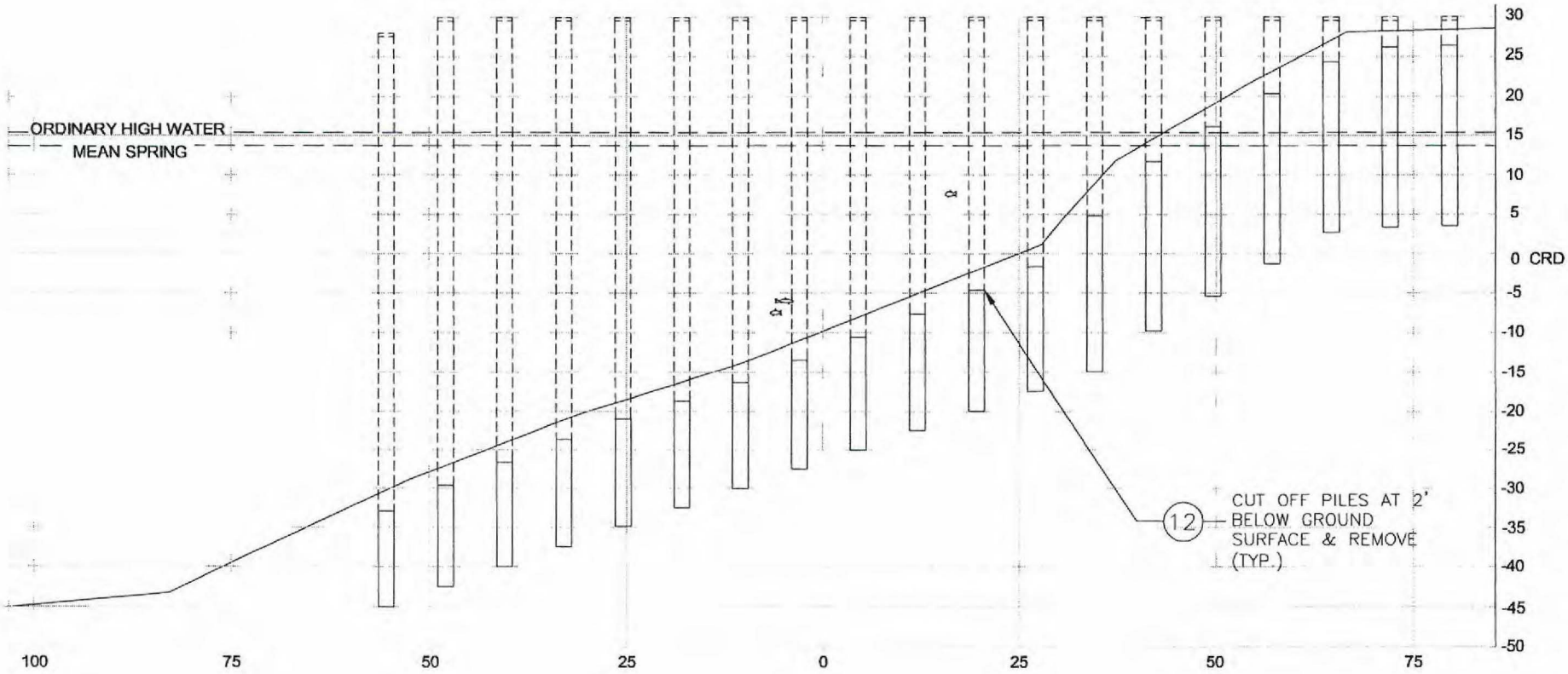
Port of Vancouver USA

Natural Resources Inventory Management Plan

Steeply Sloping Shorelines Treatments with Pile Removal

VIGIL AGRIMIS, INC.
Engineering, Landscape Architecture, Environmental Science

HERRERA



EX-0022-000104-PCE

Figure 22

Port of Vancouver USA

Natural Resources Inventory Management Plan

Steeply Sloping Shoreline Treatments with Partial Pile Removal

VIGIL AGRIMIS, INC.

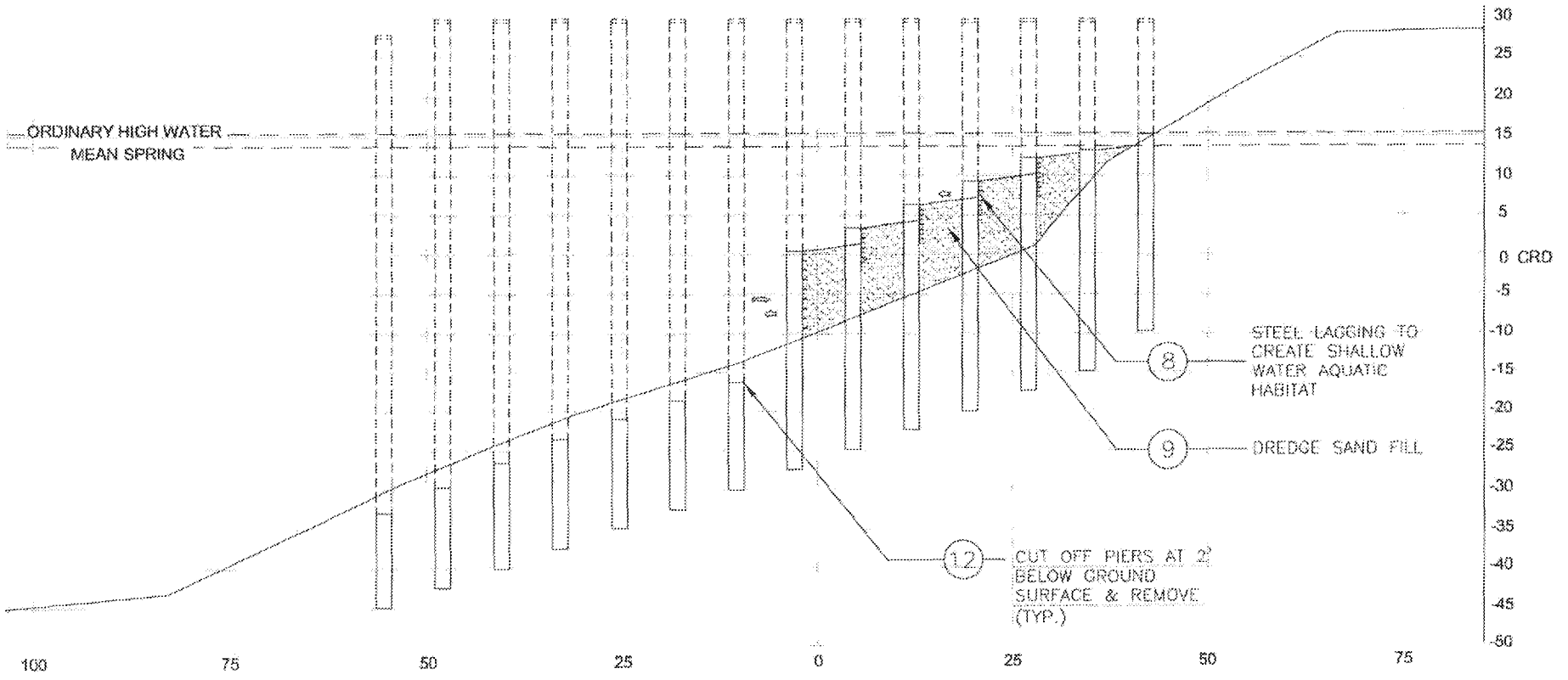


Figure 23

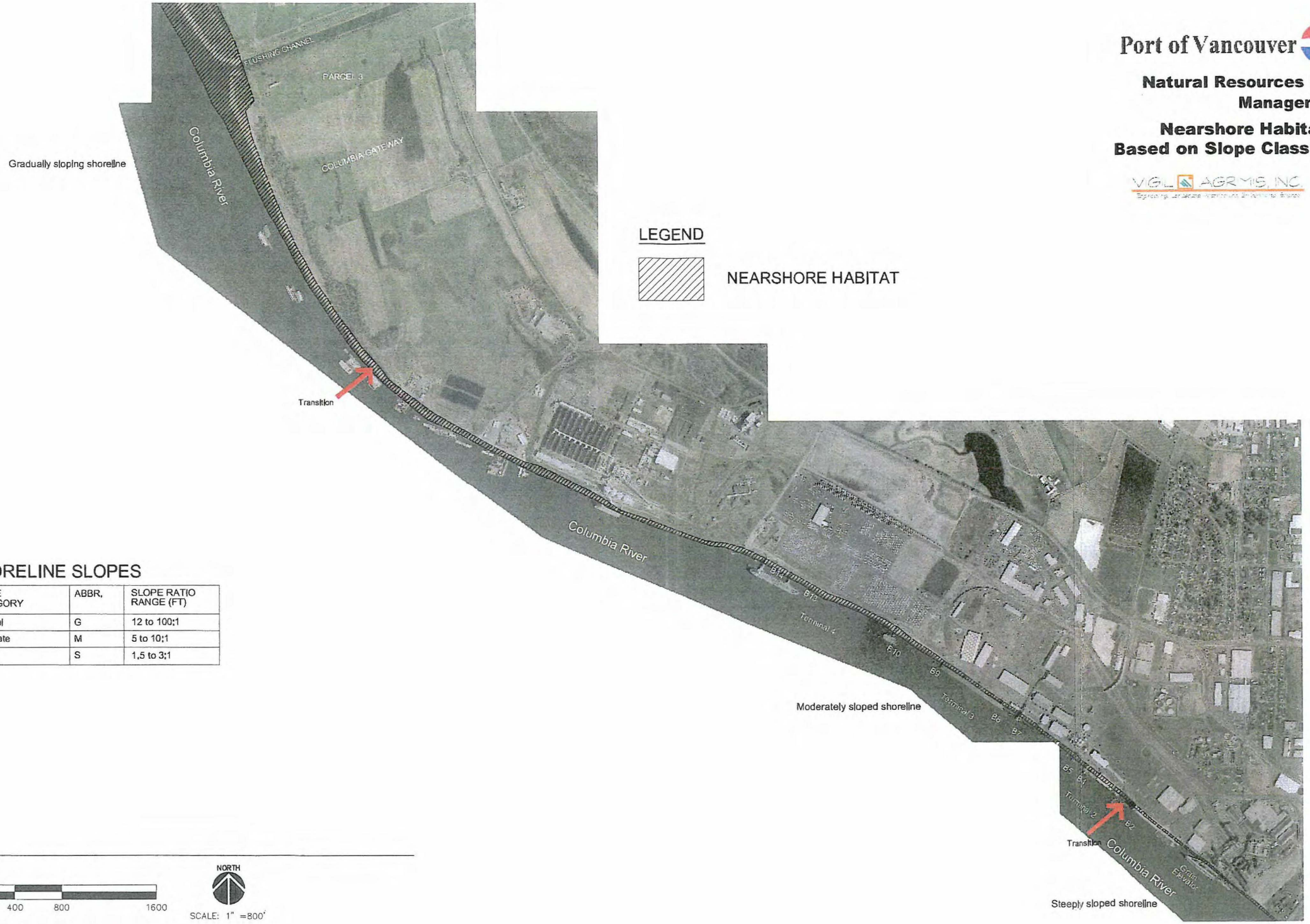
Port of Vancouver USA

Natural Resources Inventory Management Plan

Nearshore Habitat Extent Based on Slope Classifications

VGL AGRMIS, INC.

HERRERA ENVIRONMENTAL CONSULTANTS



SHORELINE SLOPES

SLOPE CATEGORY	ABBR.	SLOPE RATIO RANGE (FT)
Gradual	G	12 to 100:1
Moderate	M	5 to 10:1
Steep	S	1.5 to 3:1

0 200 400 800 1600

NORTH

SCALE: 1" =800'

Figure 24

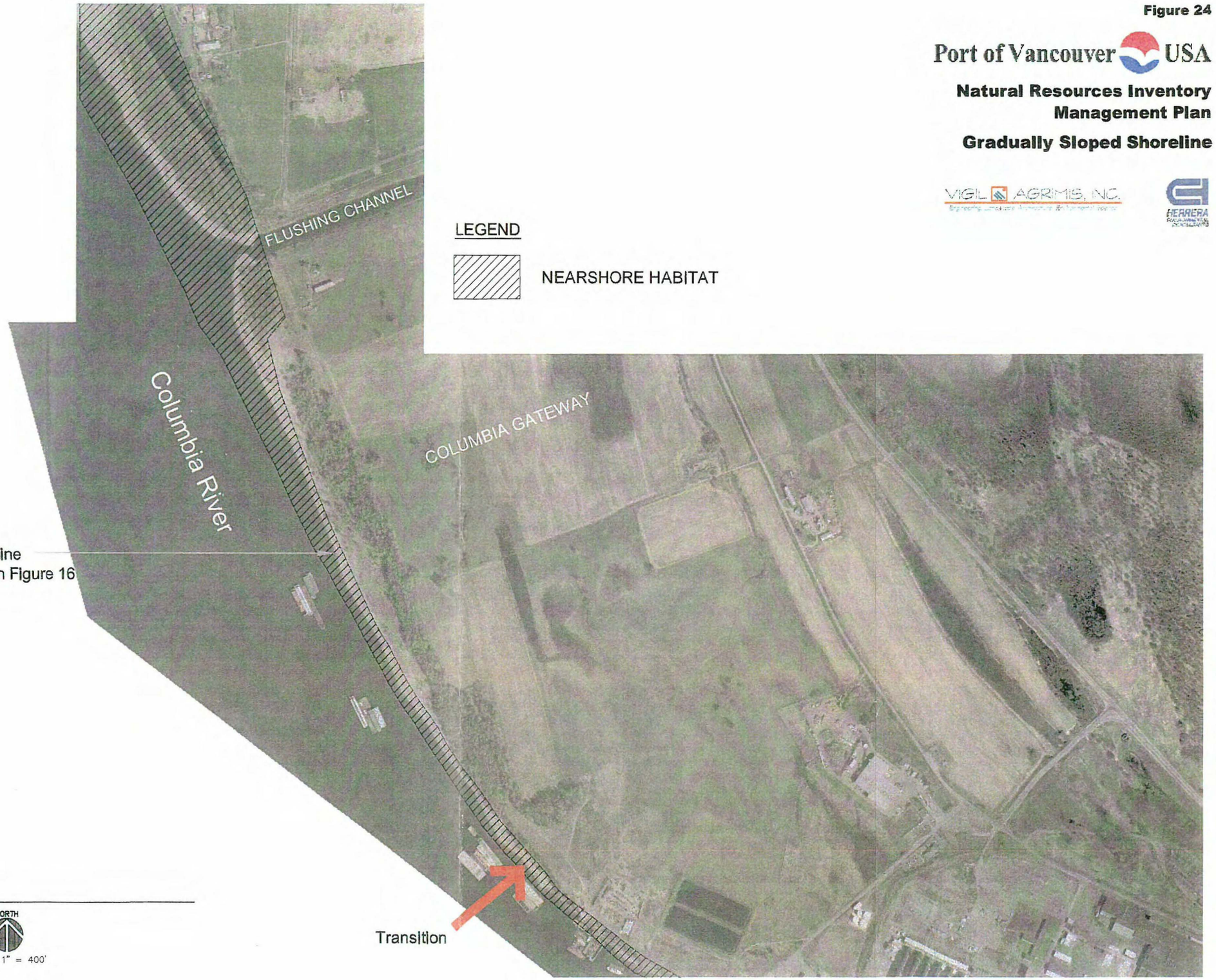
Port of Vancouver USA

Natural Resources Inventory Management Plan

Gradually Sloped Shoreline

VIGIL AGRIMIS, INC.

HERRERA



0 100 200 400 800

NORTH

SCALE: 1" = 400'

Figure 25

Port of Vancouver USA

Natural Resources Inventory Management Plan

Moderately Sloped Shoreline

VIGIL AGRIMS, INC.

HERRERA

LEGEND

NEARSHORE HABITAT

Columbia River

Moderately sloped shoreline treatment illustrated in Figure 17.

B14

B13

Terminal 4

Moderately sloped shoreline treatment illustrated in Figure 17.

B10

B9

Moderately sloped shoreline treatment illustrated in Figure 20.

Terminal 3

B8

B7

Moderately sloped shoreline treatment illustrated in Figure 23.

B5

B4

Terminal

Moderately sloped shoreline treatment illustrated in Figure 17.

0 100 200 400 800

NORTH

SCALE: 1" = 400'

Figure 26

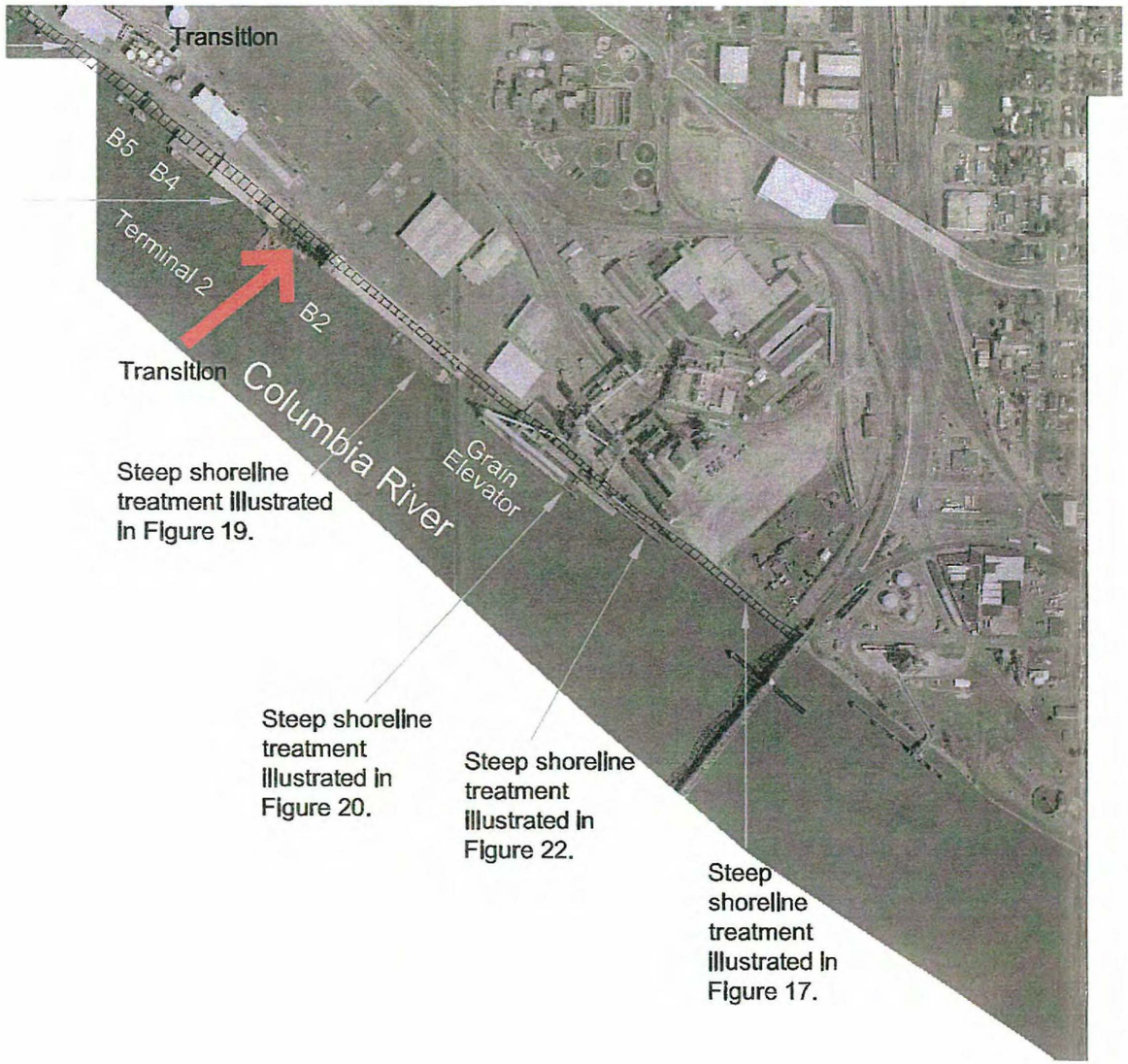
Port of Vancouver USA

Natural Resources Inventory Management Plan

Steeply Sloped Shoreline

VGL AGRIMS, INC

HERRERA



LEGEND

NEARSHORE HABITAT

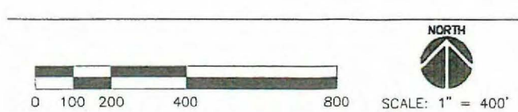
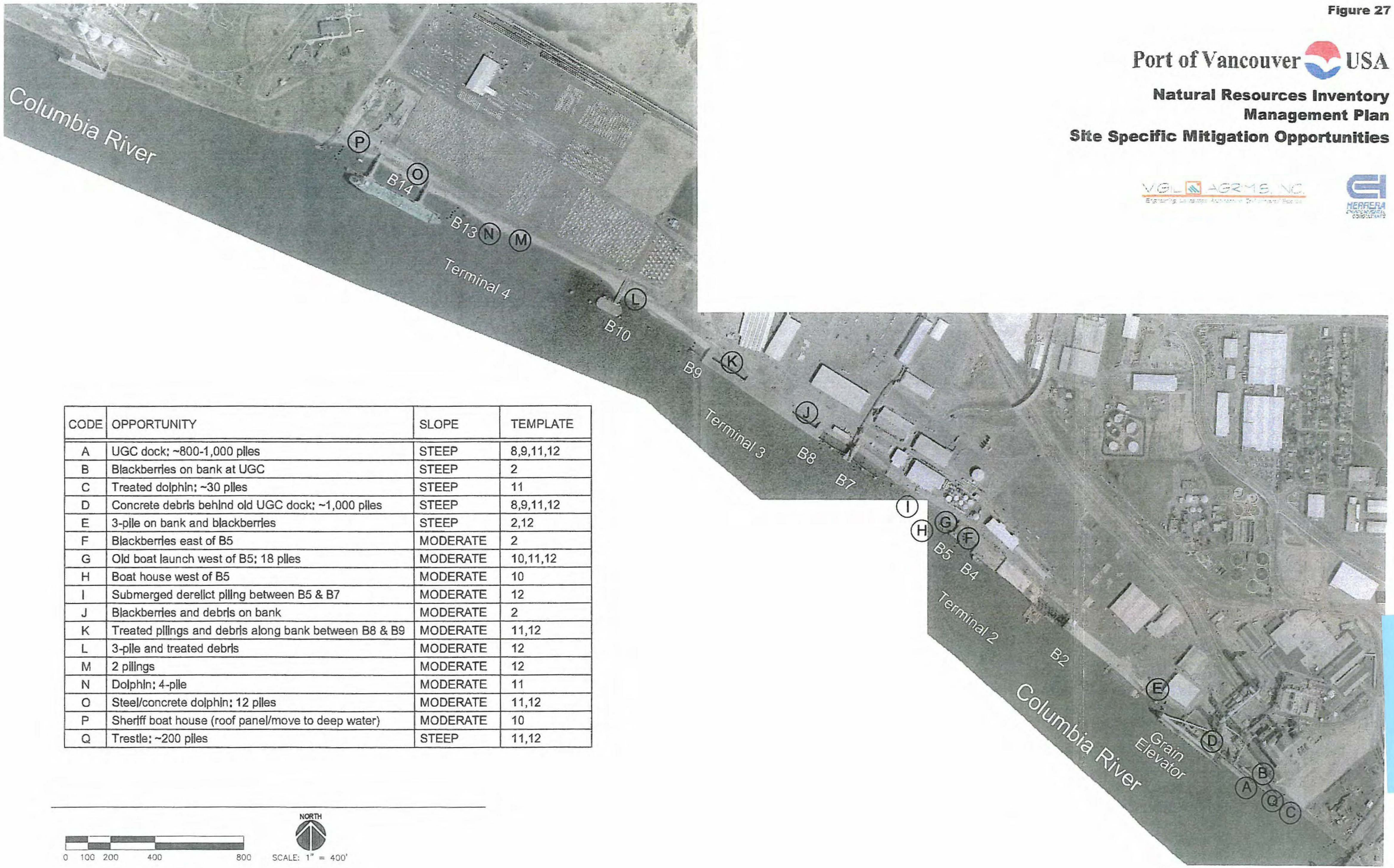


Figure 27

Port of Vancouver USA

Natural Resources Inventory Management Plan

Site Specific Mitigation Opportunities



CODE	OPPORTUNITY	SLOPE	TEMPLATE
A	UGC dock; ~800-1,000 piles	STEEP	8,9,11,12
B	Blackberries on bank at UGC	STEEP	2
C	Treated dolphin; ~30 piles	STEEP	11
D	Concrete debris behind old UGC dock; ~1,000 piles	STEEP	8,9,11,12
E	3-pile on bank and blackberries	STEEP	2,12
F	Blackberries east of B5	MODERATE	2
G	Old boat launch west of B5; 18 piles	MODERATE	10,11,12
H	Boat house west of B5	MODERATE	10
I	Submerged derelict piling between B5 & B7	MODERATE	12
J	Blackberries and debris on bank	MODERATE	2
K	Treated pilings and debris along bank between B8 & B9	MODERATE	11,12
L	3-pile and treated debris	MODERATE	12
M	2 pilings	MODERATE	12
N	Dolphin; 4-pile	MODERATE	11
O	Steel/concrete dolphin; 12 piles	MODERATE	11,12
P	Sheriff boat house (roof panel/move to deep water)	MODERATE	10
Q	Trestle; ~200 piles	STEEP	11,12

NORTH

0 100 200 400 800

SCALE: 1" = 400'

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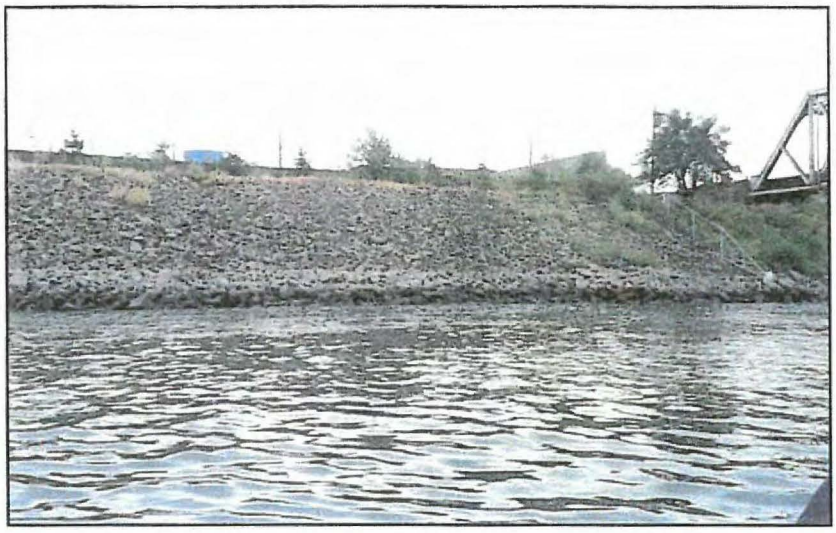
Appendix A: Field Inventory Photographs

Transect No. 1



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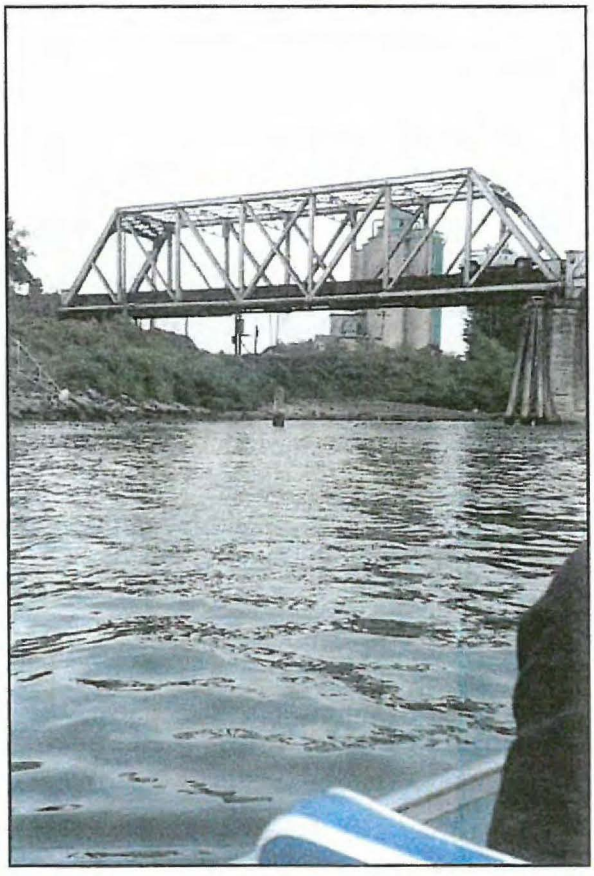

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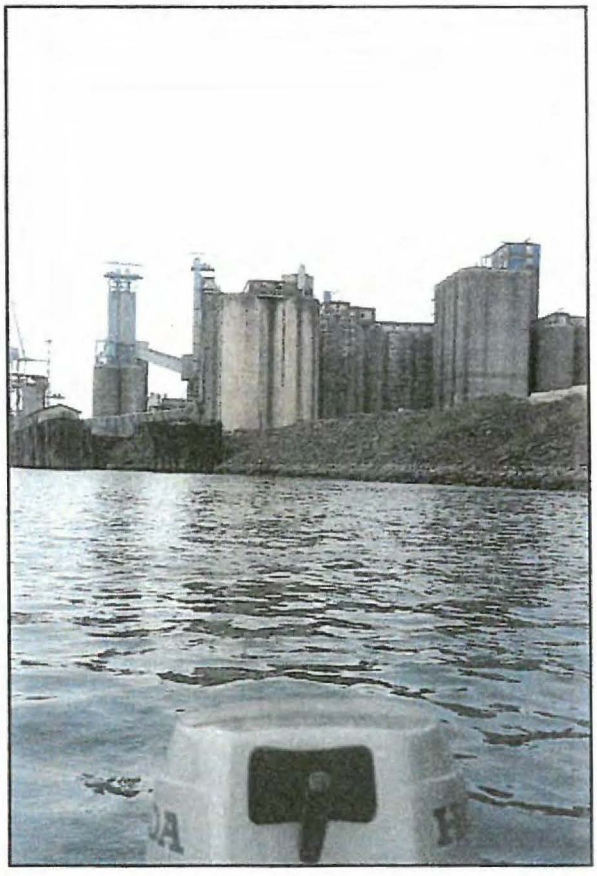

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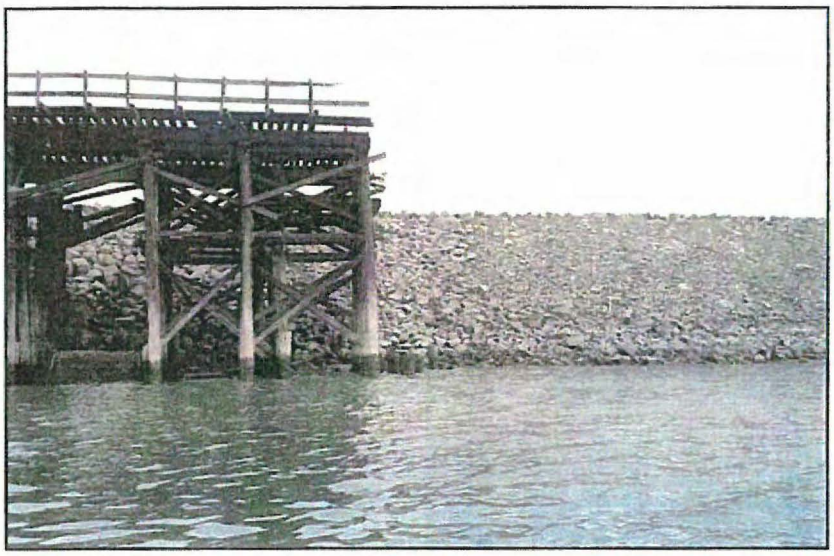

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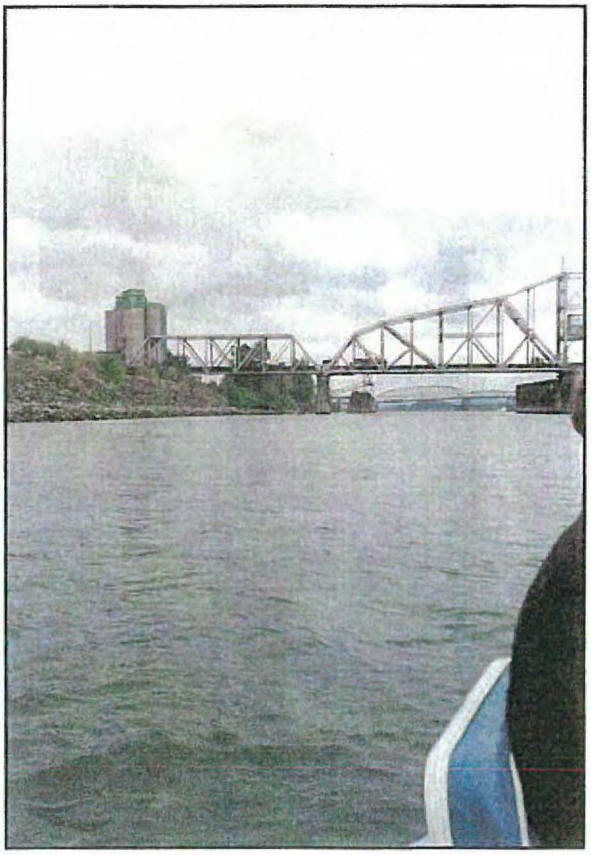
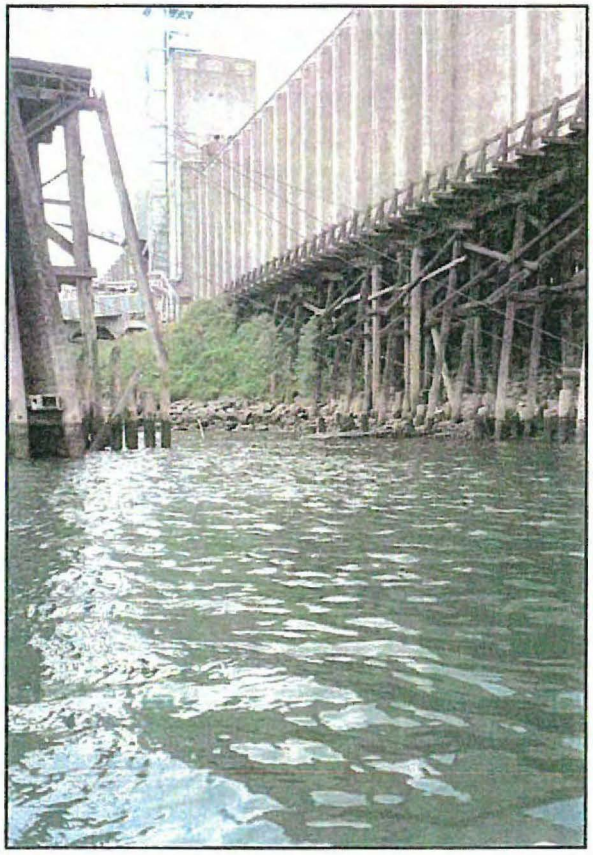


Upstream View



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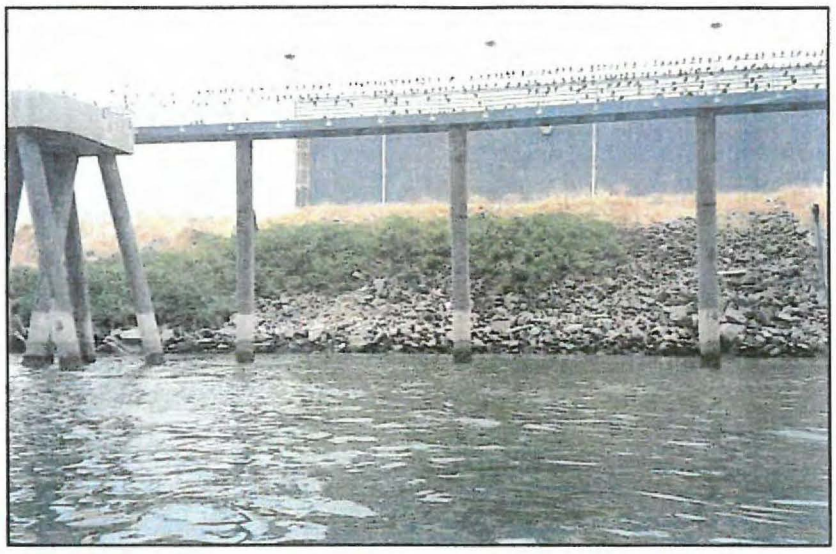

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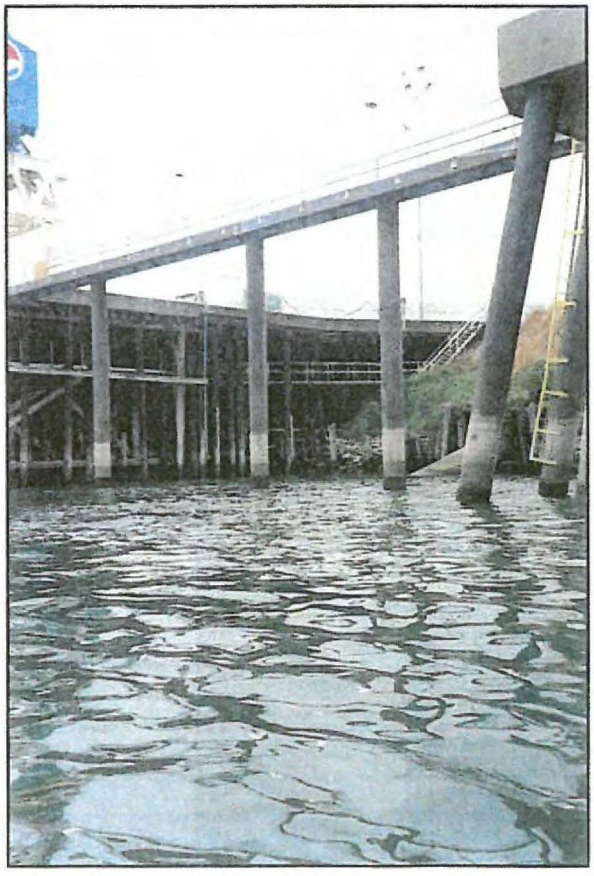
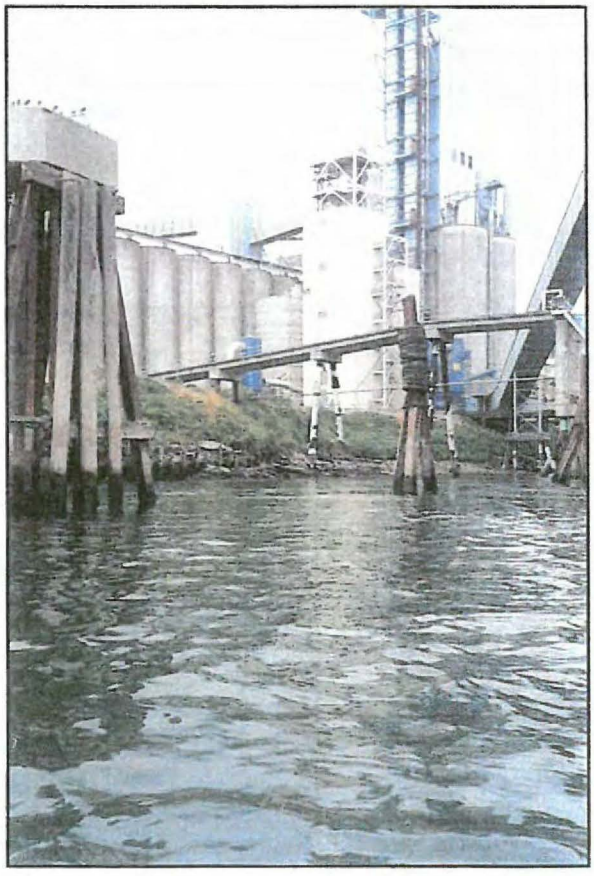


Upstream View



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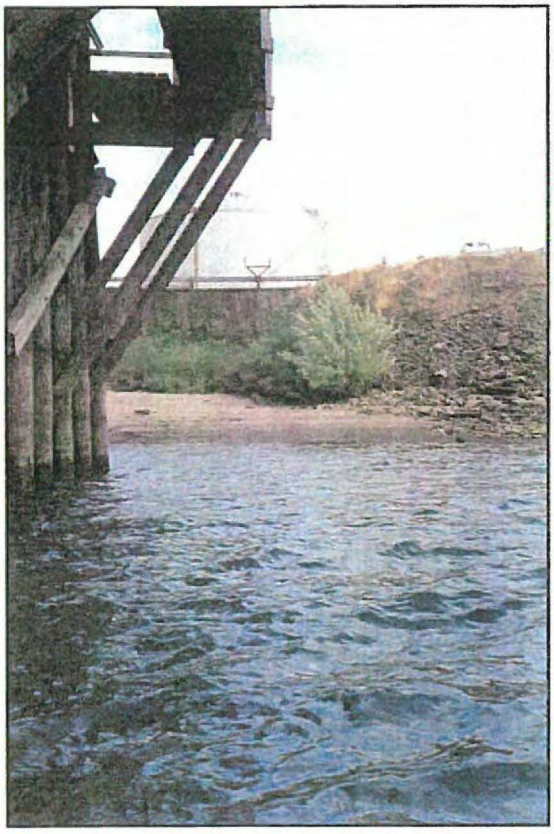

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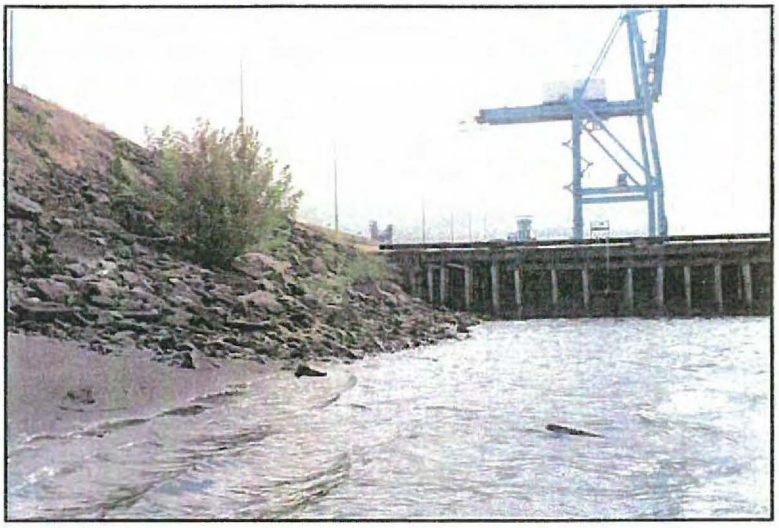

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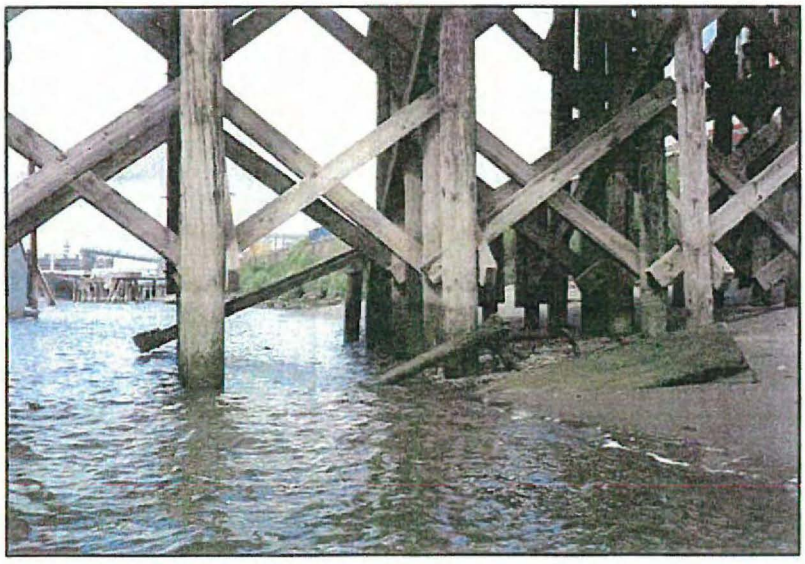

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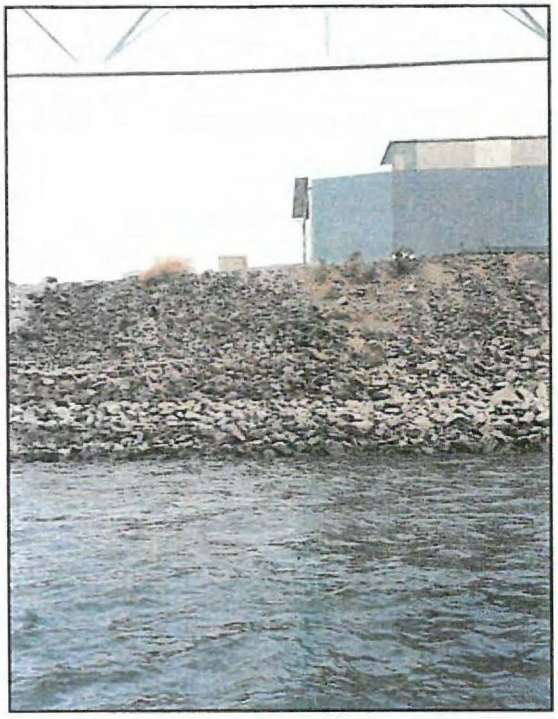

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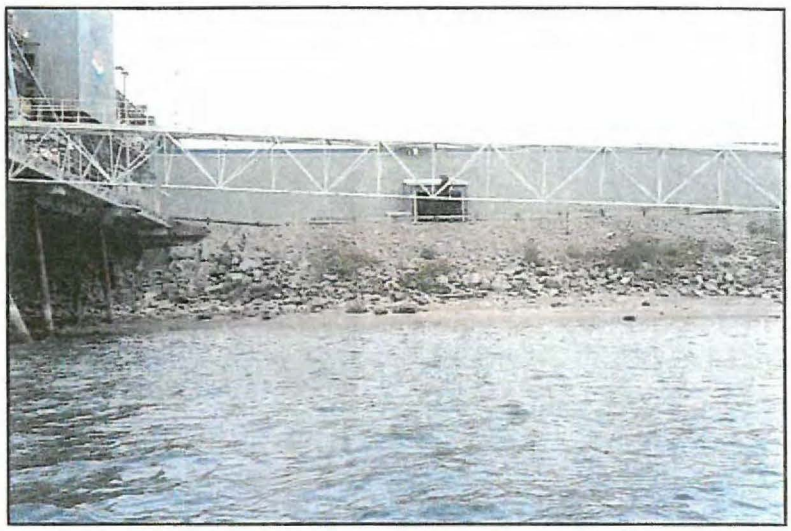

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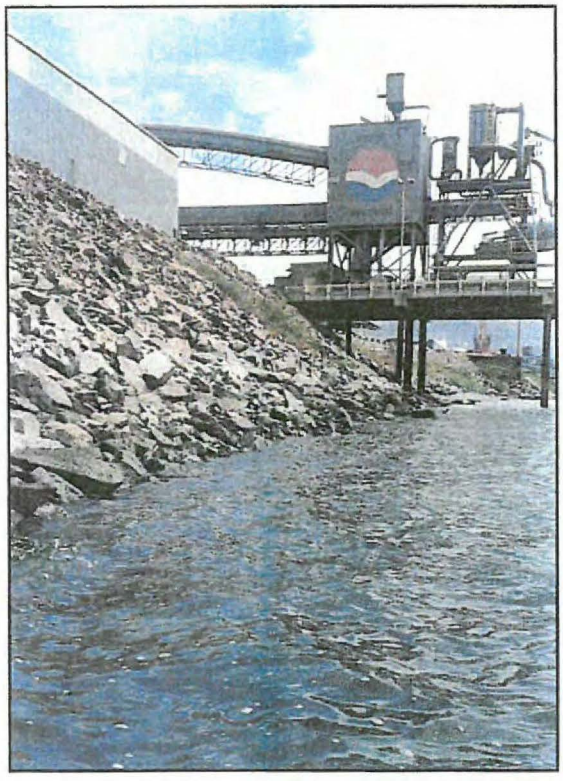
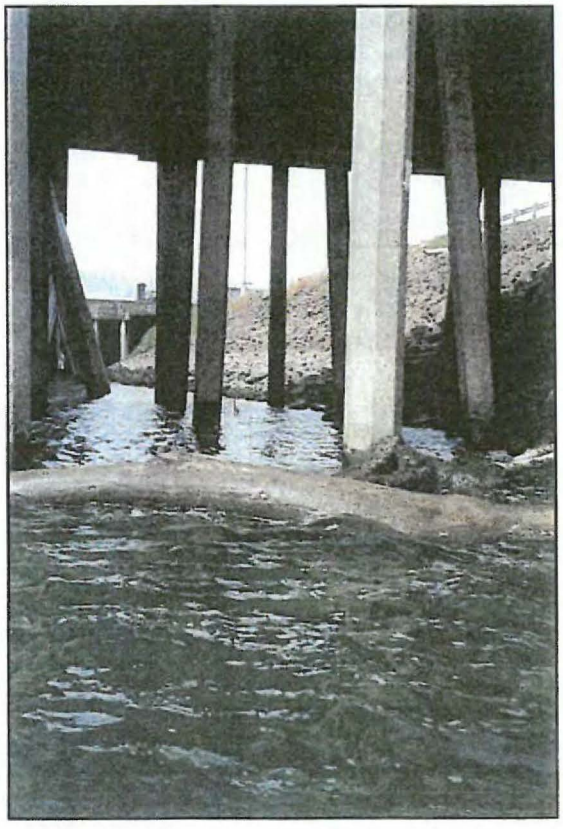


Upstream View



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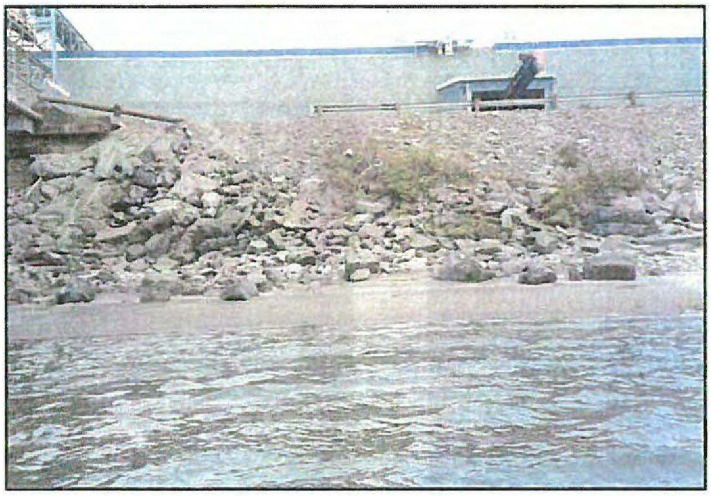

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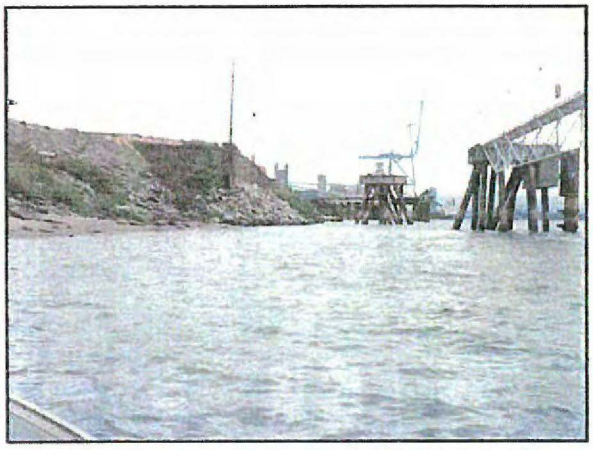

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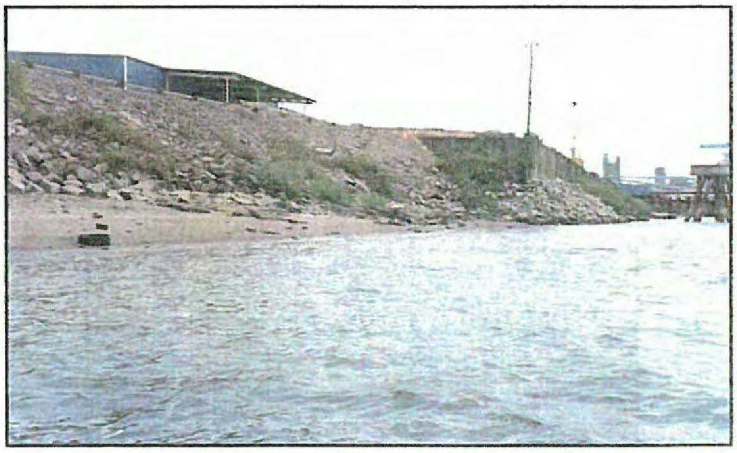

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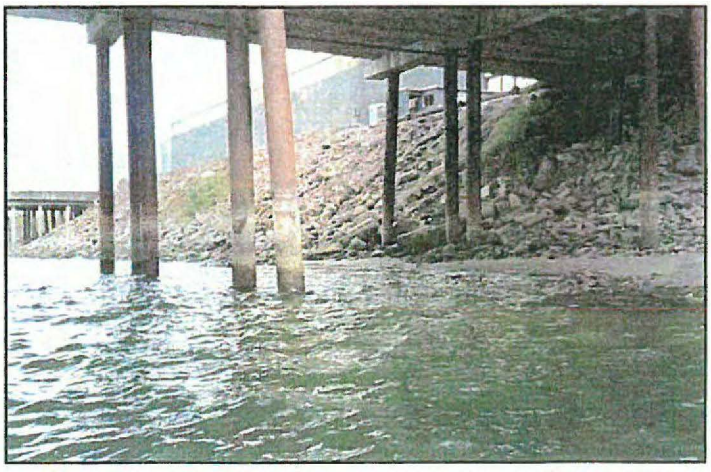

Downstream View

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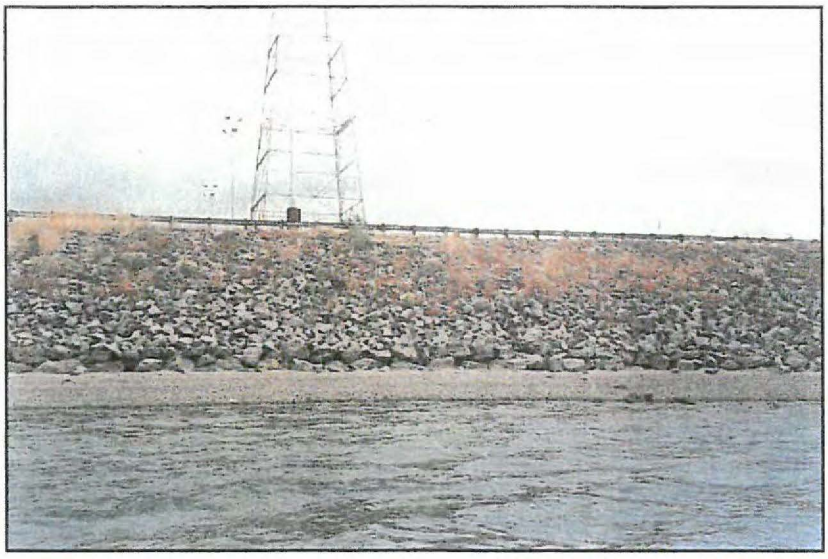

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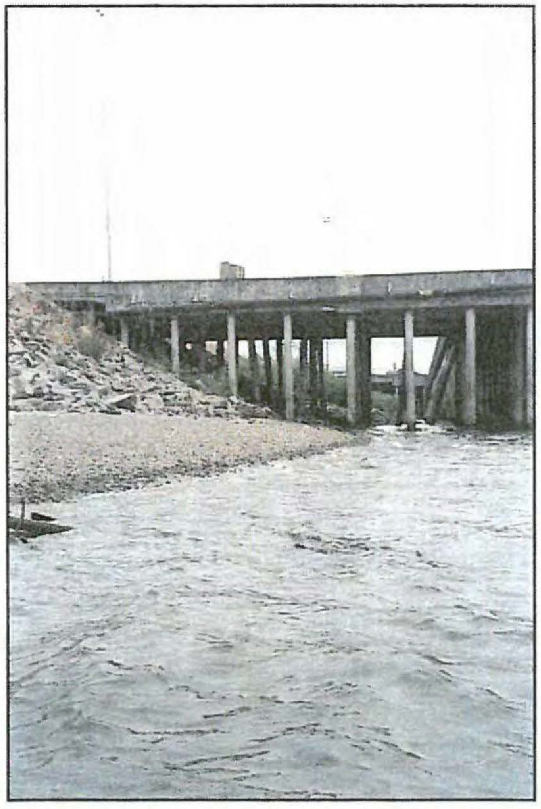

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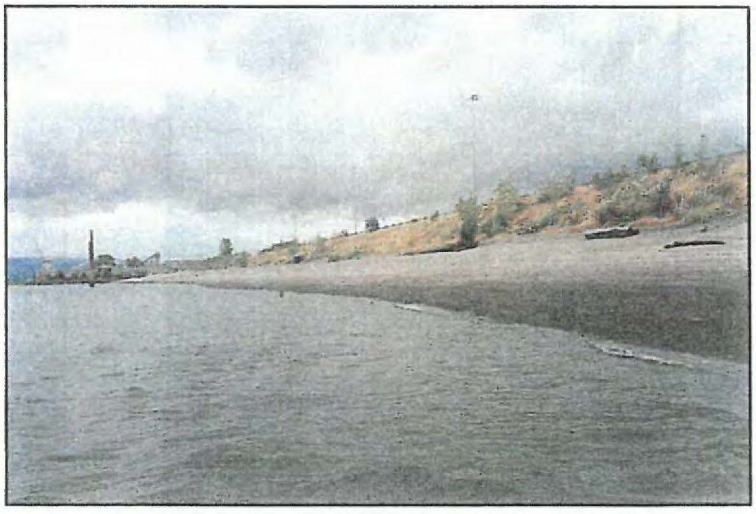

Downstream View

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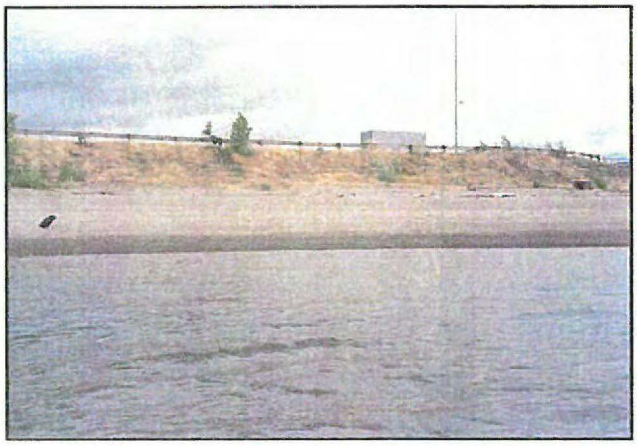

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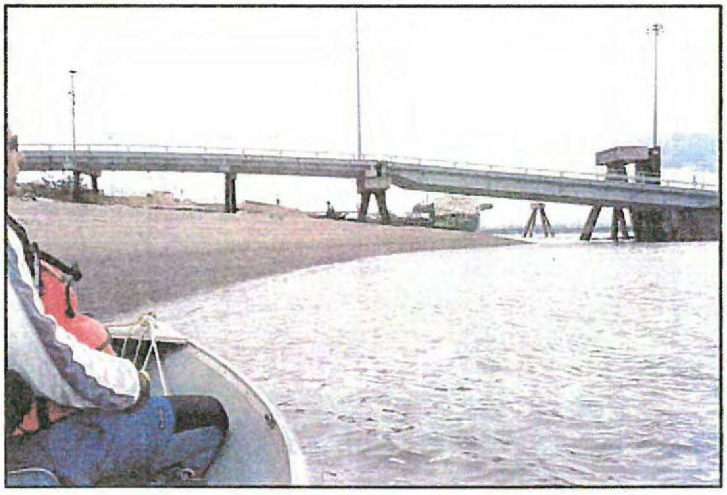

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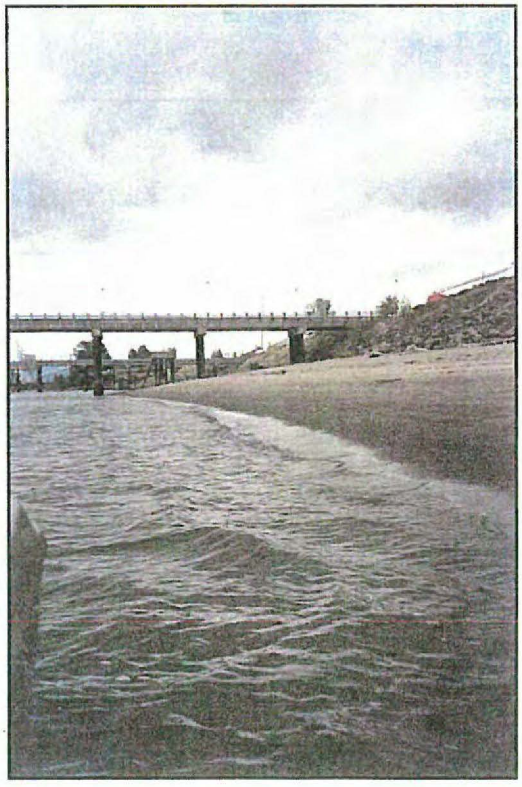

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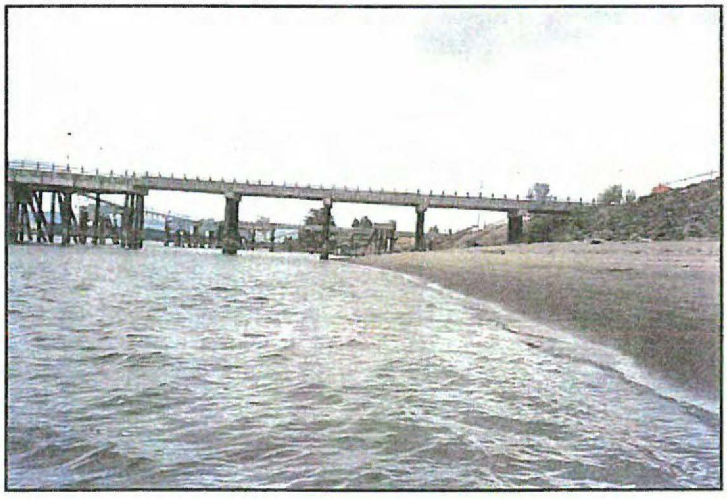
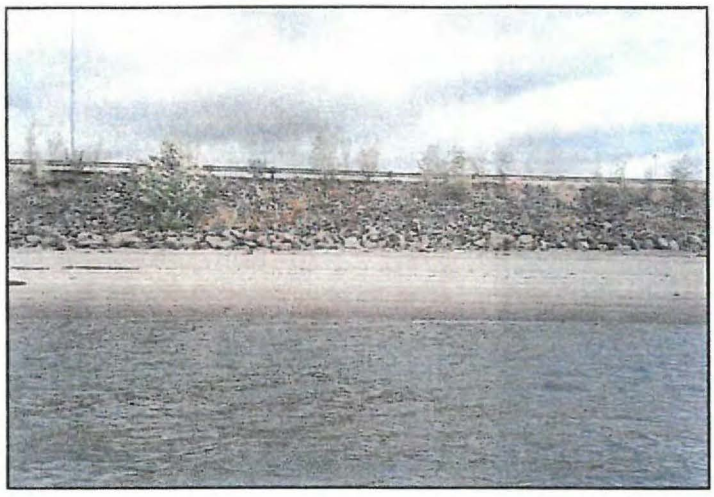
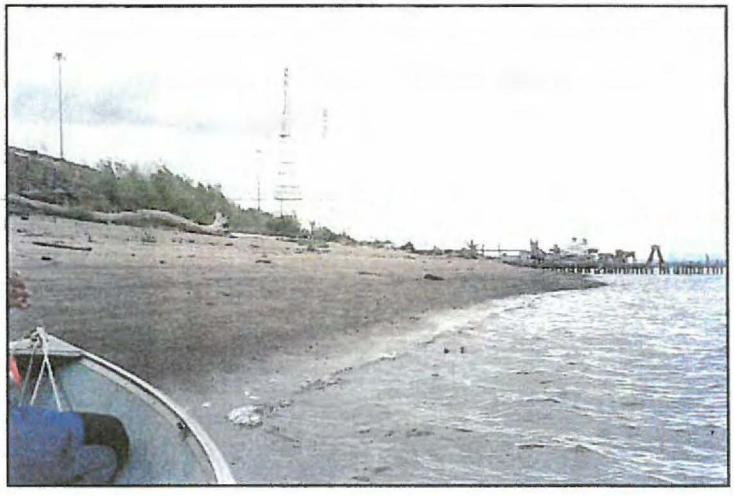


Downstream View

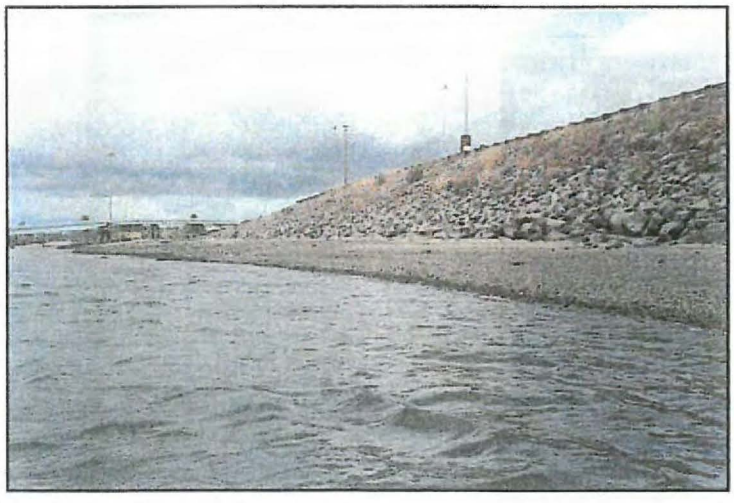
Transect No. 8



Shoreview

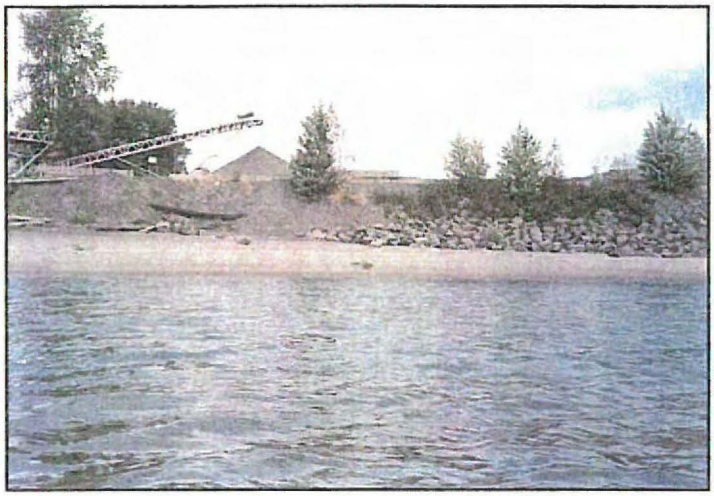


Upstream View

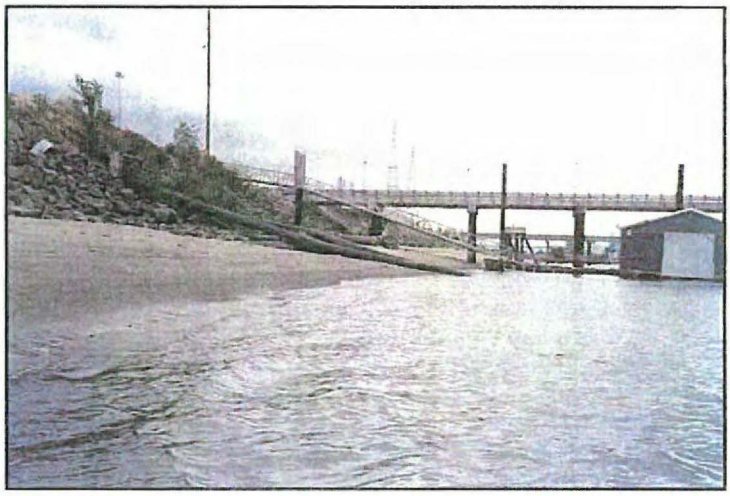


Downstream View

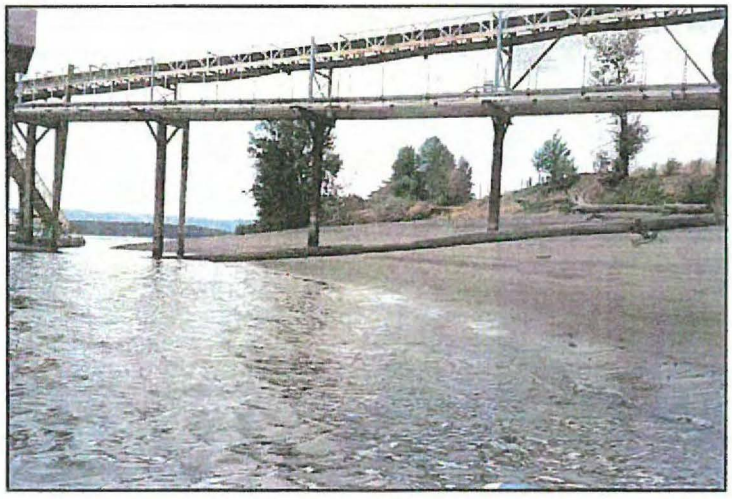
Transect No. 9



Shoreview

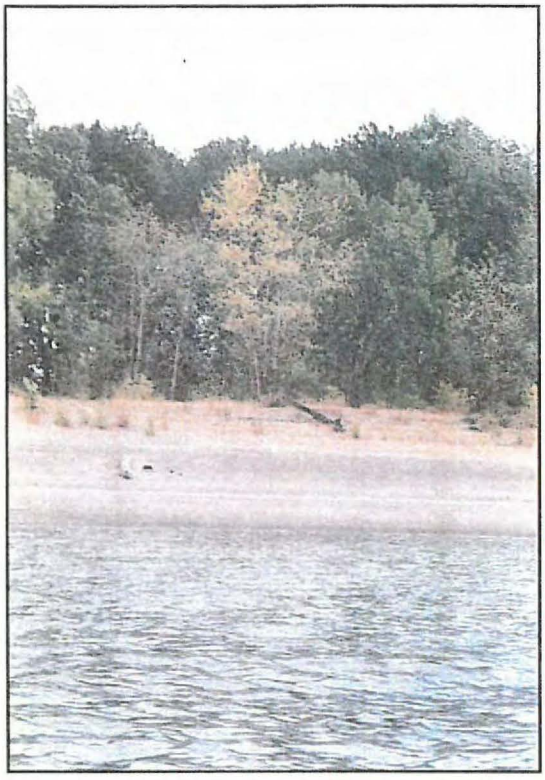


Upstream View

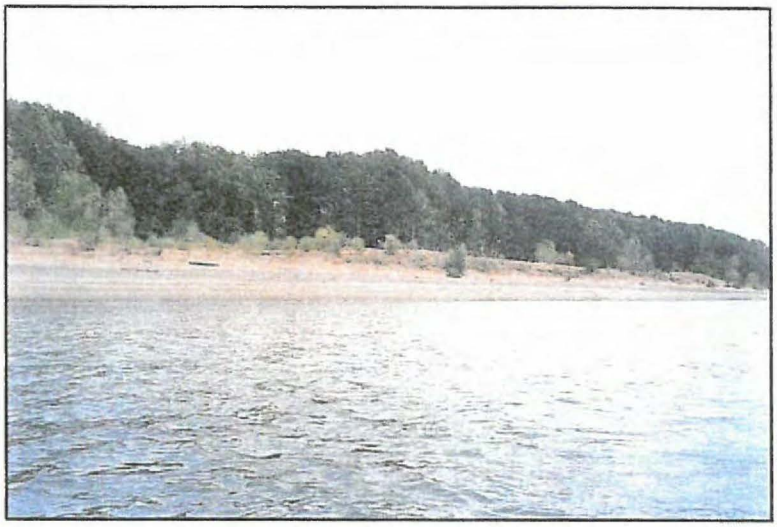


Downstream View

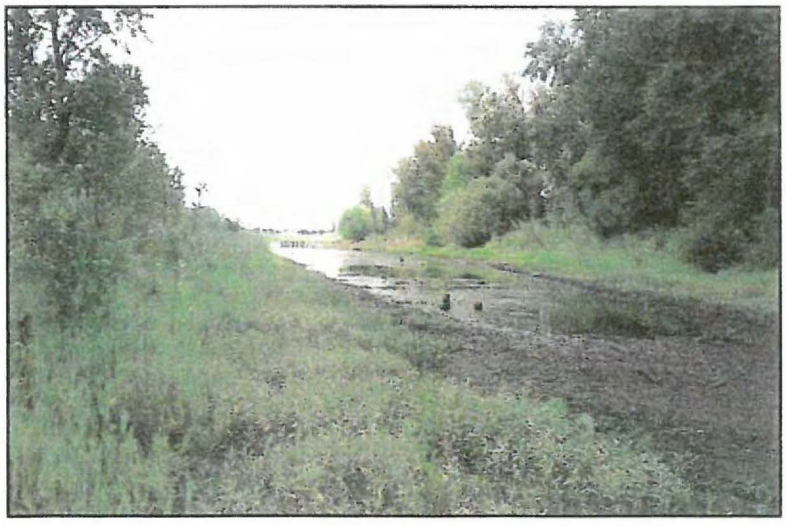
Transect Reference



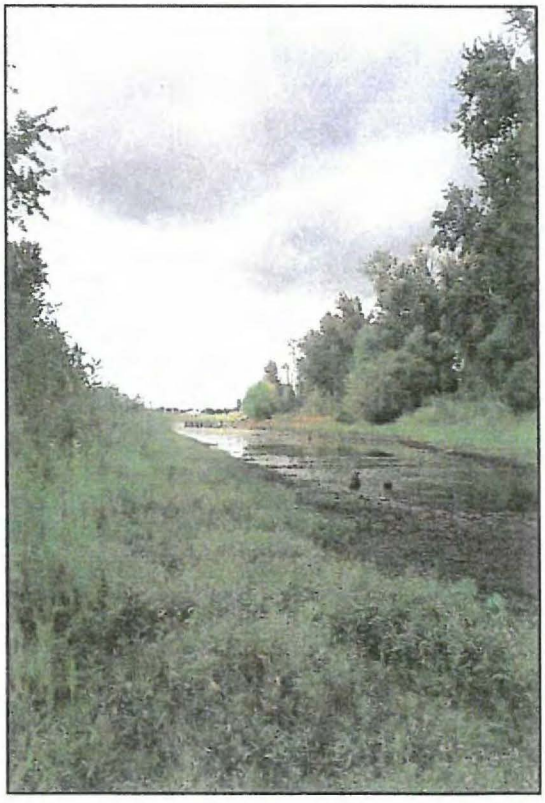
Shoreview



Upstream View



Downstream View



Downstream View

Appendix B: Statistical Analysis of Slope Breaks

EX-0022-000135-PCE

Statistical Analysis of Slope Breaks

We compared the dominant shoreline types to determine whether a statistically significant difference exists in nearshore habitat quantity between shoreline types identified as steep, gradual, and uniformly shallow. The statistical analysis consisted of a one-way ANOVA and a Tukey Honestly Significant Difference test. Table 1 presents the results of the statistical analyses for the dominant shoreline types including steep (S), moderate (M), and gradual (G) shorelines. This table compares the shoreline types against each other.

Table 1. Shoreline Statistical Analysis

	p-Value[a]	Shoreline Type (1 = S, 2 = M, 3 =G)[b]		
		Lowest Mean		Highest Mean
2-Yr Width	**0.0002**	1	2	3
2-Yr Unit Habitat Volume	**0.0003**	1	2	3
2-Yr High Quality Width	**<0.0001**	1	2	3
2-Yr High Quality Volume	**0.0001**	1	2	3
Mean Spring Width	**0.0013**	1	2	3
Mean Spring Volume	**0.0078**	1	2	3
Mean Spring High Quality Width	**0.0216**	1	2	3

[a] Values in bold indicate a significant differences exist ($\alpha = 0.05$) between shoreline types based on the results from a one-way ANOVA.
[b] Values connected by a single unbroken line are not significantly different based on the results from a Tukey honestly significant difference (HSD) test.
S – Steep
M – Moderate
G – Gradual

Table 1 shows that there are clear statistical differences between the Reference Site and both the developed shoreline types across flow regimes based on two statistical tests. The statistical test results are important because they confirm the field observations that there is a clear difference in the amount and quality of nearshore habitat between the Reference Site and the developed Port shoreline. The moderate shoreline type found at portions of the developed Port shoreline appear to be transitional between the steep riprap bank sections that provide little nearshore habitat and the Reference Site that provides gradual nearshore habitat that may be similar to historic conditions. It is important to point out that the small sample size (two values per shoreline type) may skew the results to diminish the difference between the moderate and the steep shoreline type.

Appendix C: Design Details

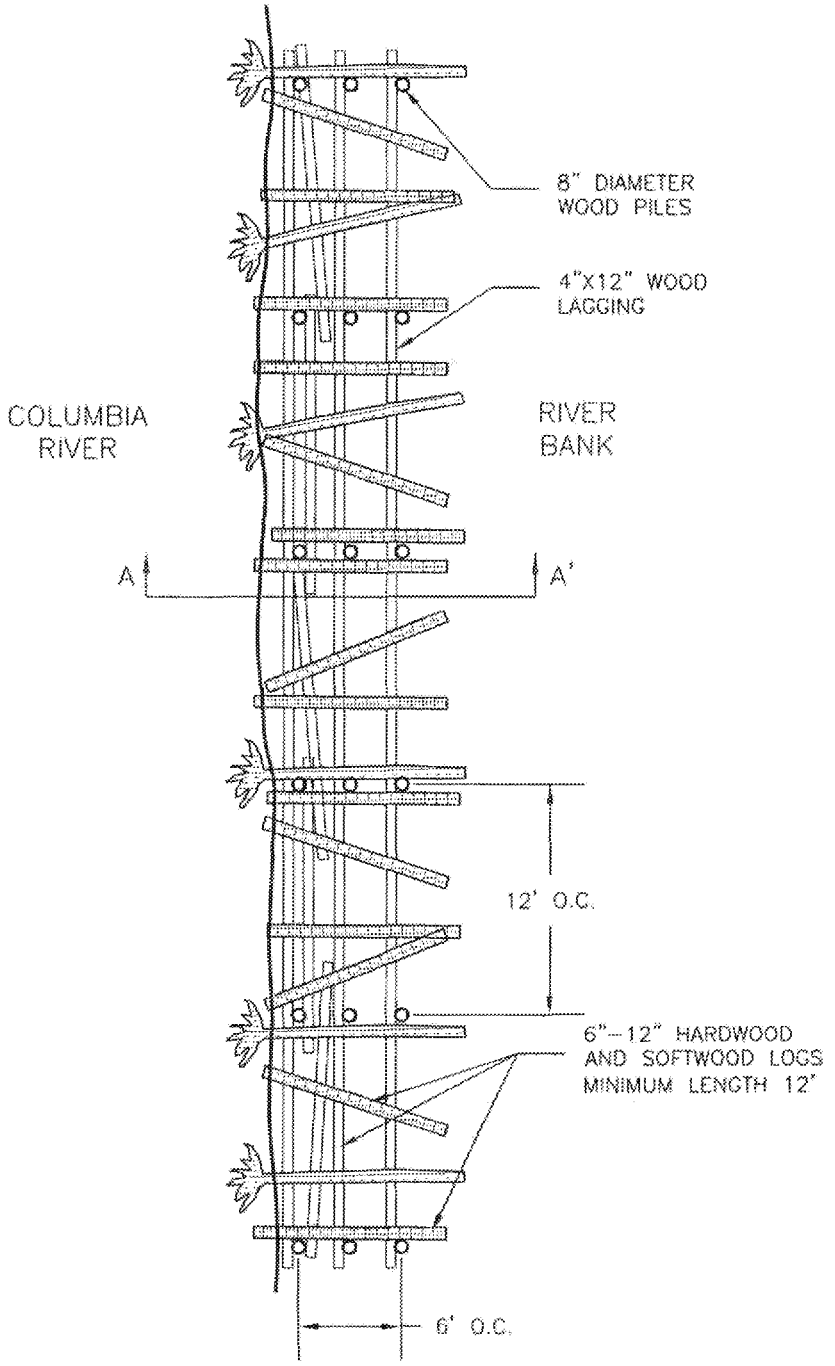
Figure 1

Port of Vancouver USA

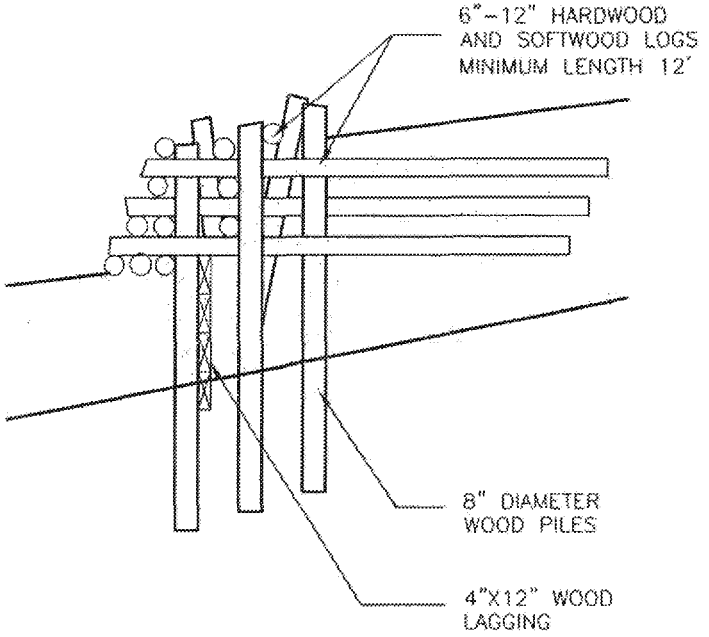
Natural Resources Inventory Management Plan

Schematic Crib Details

VIGIL AGRIMIS, INC.



CRIB WALL PLAN



SECTION A – A'

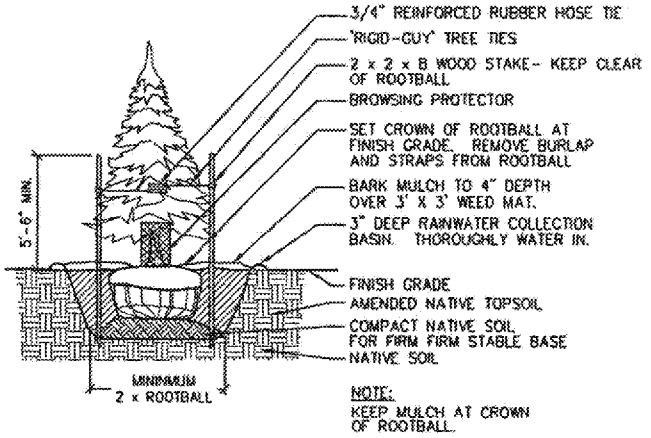
Figure 2

Port of Vancouver USA

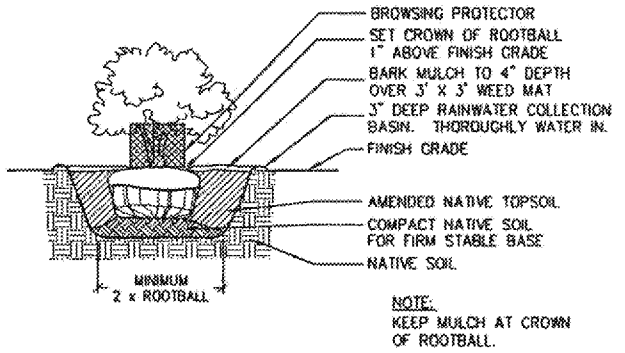
Natural Resources Inventory Management Plan

Woody Plant & Wetland Planting Details

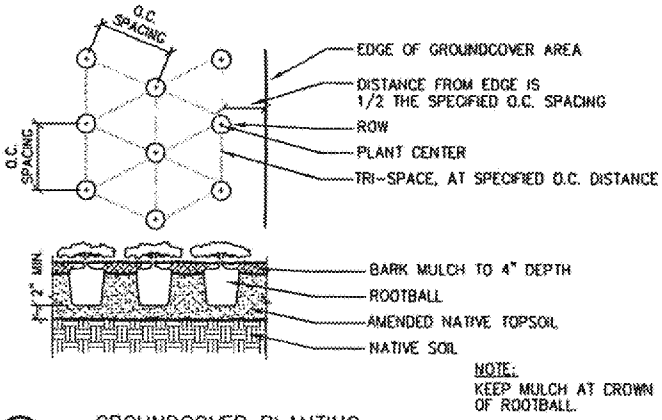
VIGIL AGRIMIS, INC.



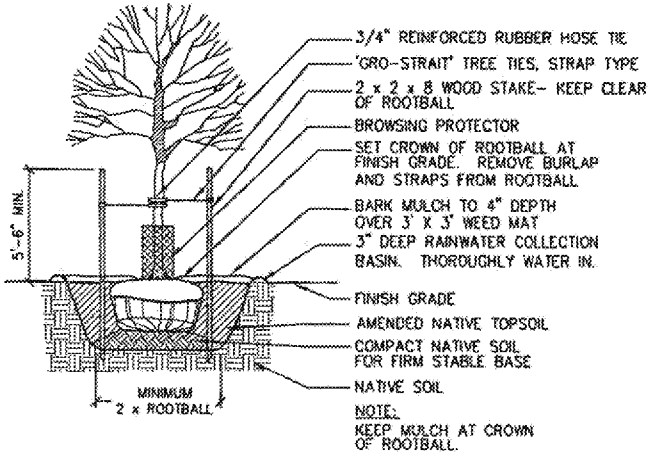
1A EVERGREEN TREE PLANTING
SCALE: NTS



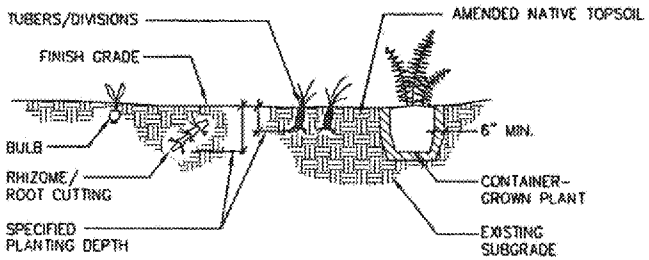
1C CONTAINER SHRUB PLANTING
SCALE: NTS



1D GROUNDCOVER PLANTING
SCALE: NTS



1B DECIDUOUS TREE PLANTING
SCALE: NTS



1E WETLAND / HERBACEOUS PLANTING DETAIL
SCALE: NTS

EX-0022-000142-PCE

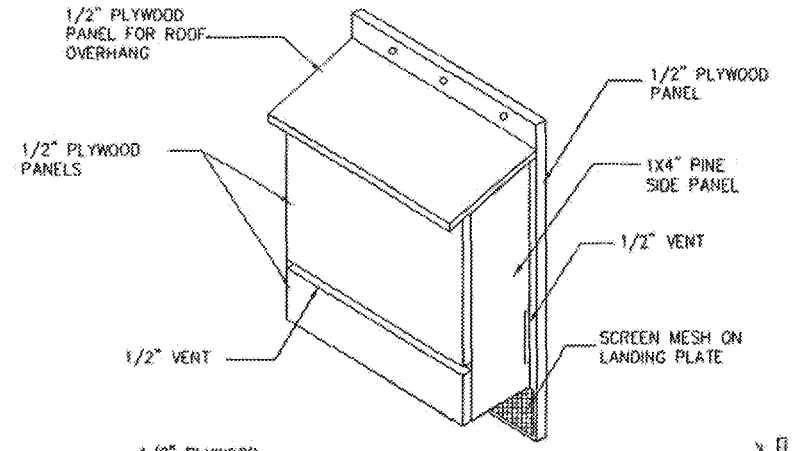
Figure 3

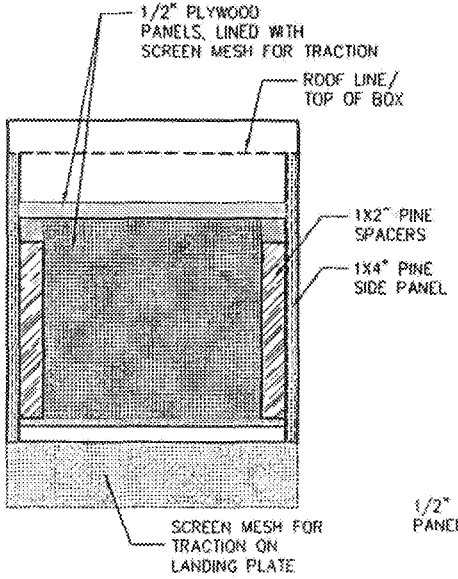
Port of Vancouver USA

Natural Resources Inventory Management Plan

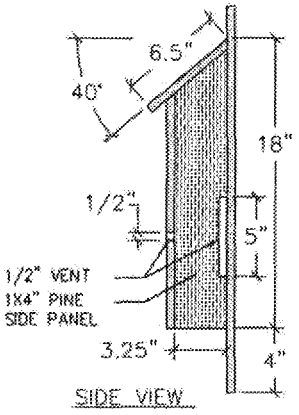
Habitat Details

VIGIL AGRIMIS, INC.

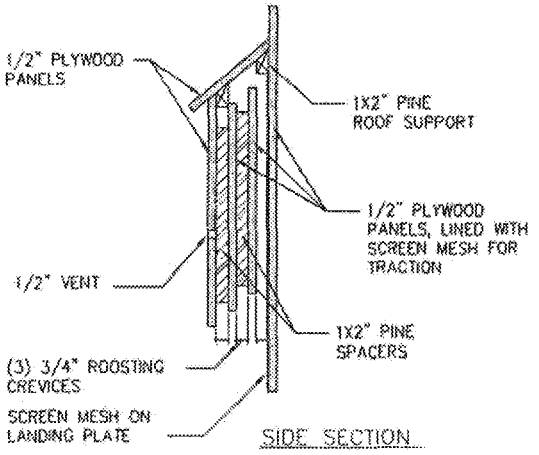




FRONT SECTION



SIDE VIEW



SIDE SECTION

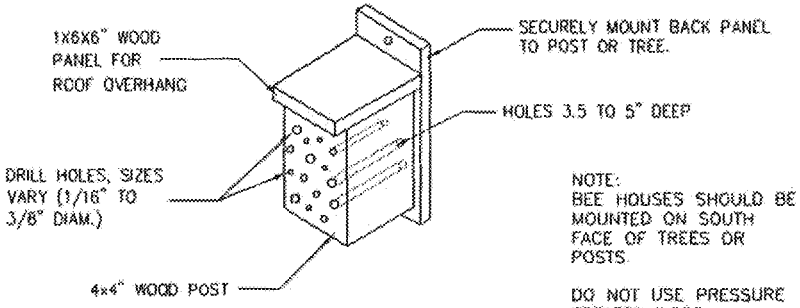
NOTE:
BAT HOUSES SHOULD BE MOUNTED ON SOUTH FACE OF TREES OR POSTS.

DO NOT USE PRESSURE TREATED WOOD.

SEAL JOINTS WITH SILICONE CAULK. DO NOT USE GLUE.

PAINT EXTERIOR OF BOXES WITH A MINIMUM OF TWO COATS LATEX PAINT (DARK GREY, BROWN, OR GREEN)

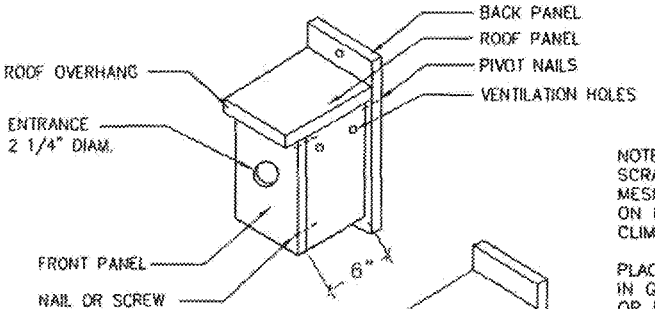
2A BAT BOX
SCALE: NTS



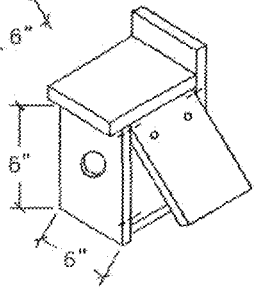
NOTE:
BEE HOUSES SHOULD BE MOUNTED ON SOUTH FACE OF TREES OR POSTS.

DO NOT USE PRESSURE TREATED WOOD.

2B BEE BOX
SCALE: NTS



DRILL HOLE INTO FRONT AND SIDE PANELS. PLACE NAIL IN HOLE TO SECURE DOOR.



NOTE:
SCRATCH WOOD OR AFIX WIRE MESH BELOW ENTRANCE HOLE ON BOTH SIDES TO PROVIDE CLIMBING TRACTION.

PLACE PURPLE MARTIN HOUSES IN GROUPS OF 5 OR MORE, OR PROVIDE ONE STRUCTURE TO HOUSE 6-9 FAMILIES, WITH EACH UNIT MEETING THE SIZE REQUIREMENTS AS NOTED.

DO NOT USE PRESSURE TREATED WOOD.

2C BIRD NESTING BOX - PURPLE MARTIN
SCALE: NTS

EX-0022-000143-PCE

Figure 4

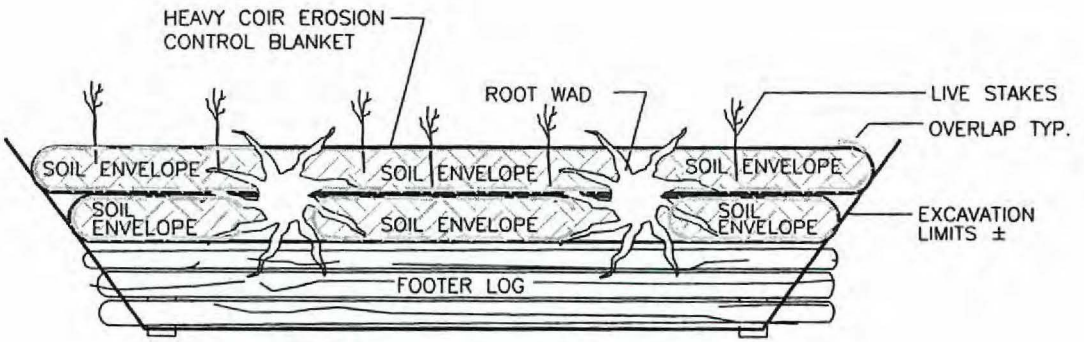
Port of Vancouver USA

Natural Resources Inventory Management Plan

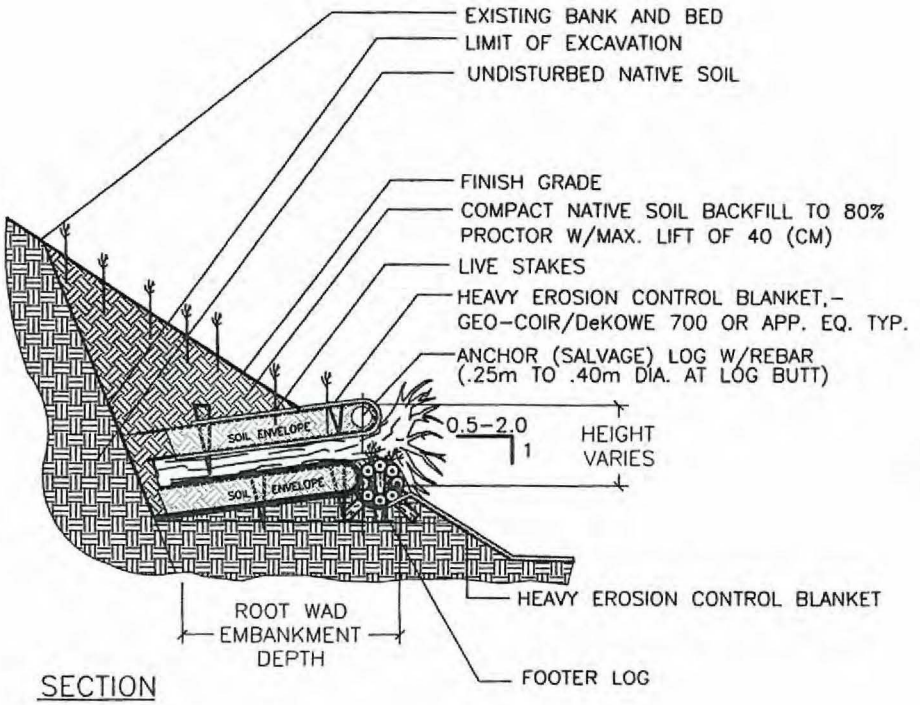
Bioengineering Bank Treatments

VIGIL AGRIMIS, INC.
Engineering, Landscape Architecture, Environmental Science

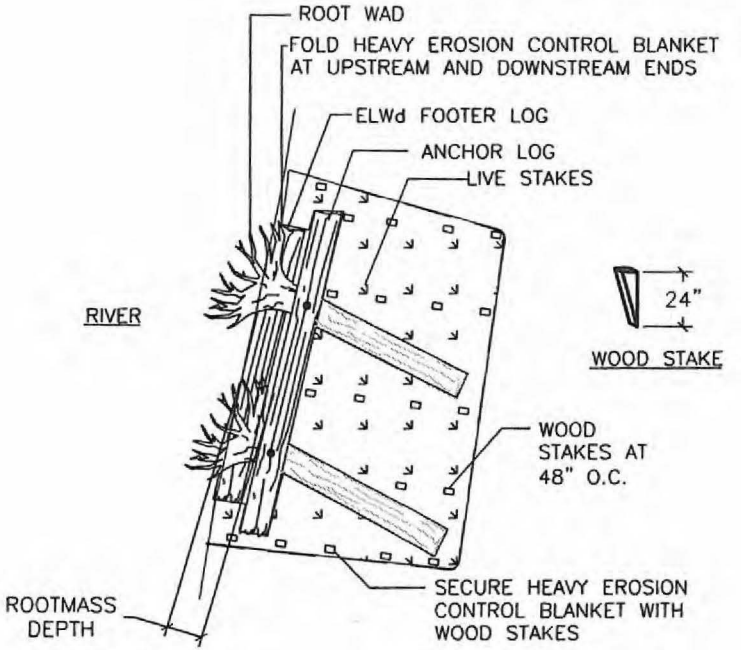
HERRERA



ELEVATION



SECTION



NOTES:

1. ROOT WAD TO PROTRUDE INTO CHANNEL THE DEPTH OF THE ROOTMASS AS MEASURED FROM EXISTING CHANNEL BANK
2. BATTER ROOT WAD (0.5-2.0:1) TO MATCH EXISTING CHANNEL BANK
3. CUT LIVE STAKE END TO A POINT FOR EASIER INSTALLATION
4. TRIM OFF BRANCHES FROM LIVE STAKE W/ CLEAN CUTS

PLAN

EX-0022-000144 BCE

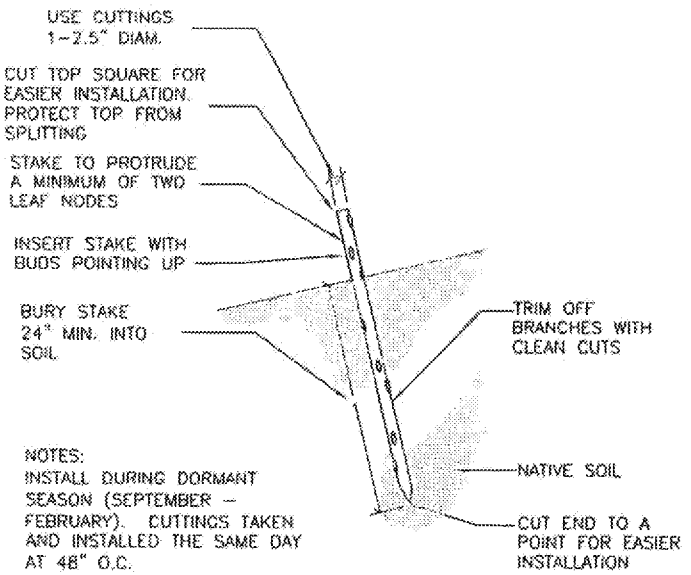
Figure 5

Port of Vancouver USA

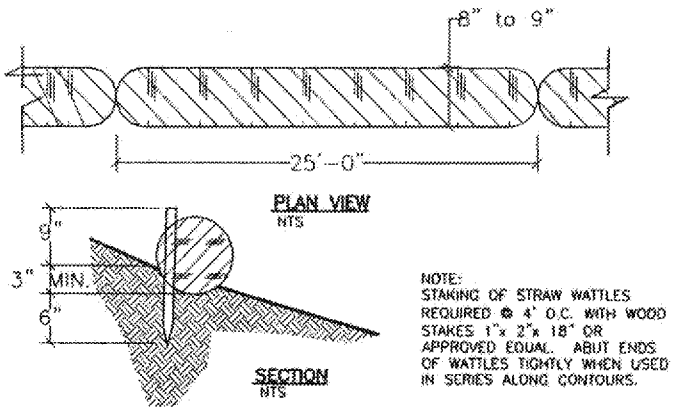
Natural Resources Inventory Management Plan

Erosion Control Details

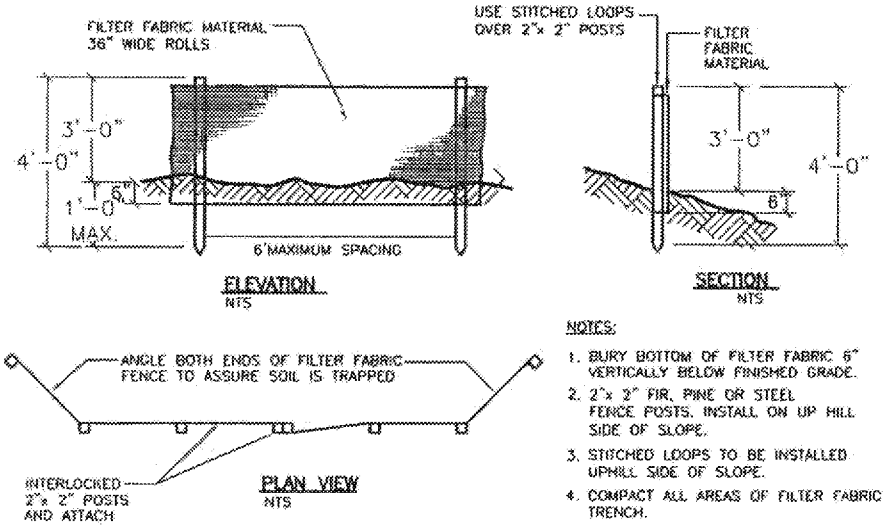
VIGIL AGRIMIS, INC.



3A LIVE STAKE DETAIL
SCALE: NTS



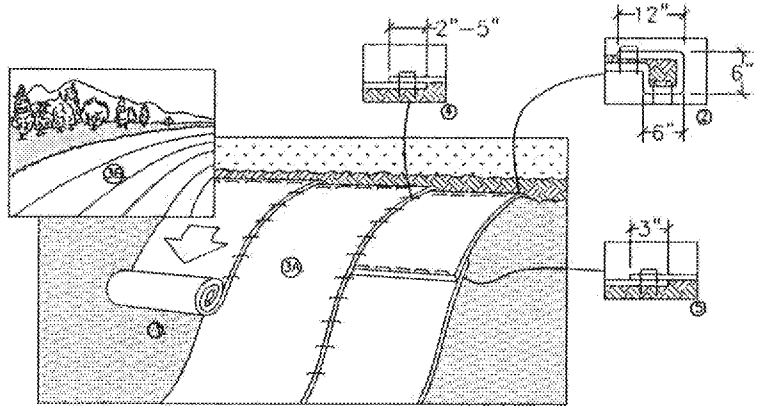
3C STRAW WATTLE
SCALE: NTS



NOTES:

1. BURY BOTTOM OF FILTER FABRIC 6" VERTICALLY BELOW FINISHED GRADE.
2. 2"x 2" FIR, PINE OR STEEL FENCE POSTS. INSTALL ON UP HILL SIDE OF SLOPE.
3. STITCHED LOOPS TO BE INSTALLED UPHILL SIDE OF SLOPE.
4. COMPACT ALL AREAS OF FILTER FABRIC TRENCH.

3B SEDIMENT FENCE
SCALE: NTS



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL THE BLANKETS (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH MINIMUM 6" (10cm) OVERLAP.
5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH MINIMUM 6" (15cm) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30cm) APART ACROSS ENTIRE BLANKET WIDTH.

NOTE:

1. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15cm) MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.
2. INSTALL PRODUCT IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

3D EROSION CONTROL BLANKET ON SLOPE
SCALE: NTS

EX-0022-000145-PCE

Figure 6

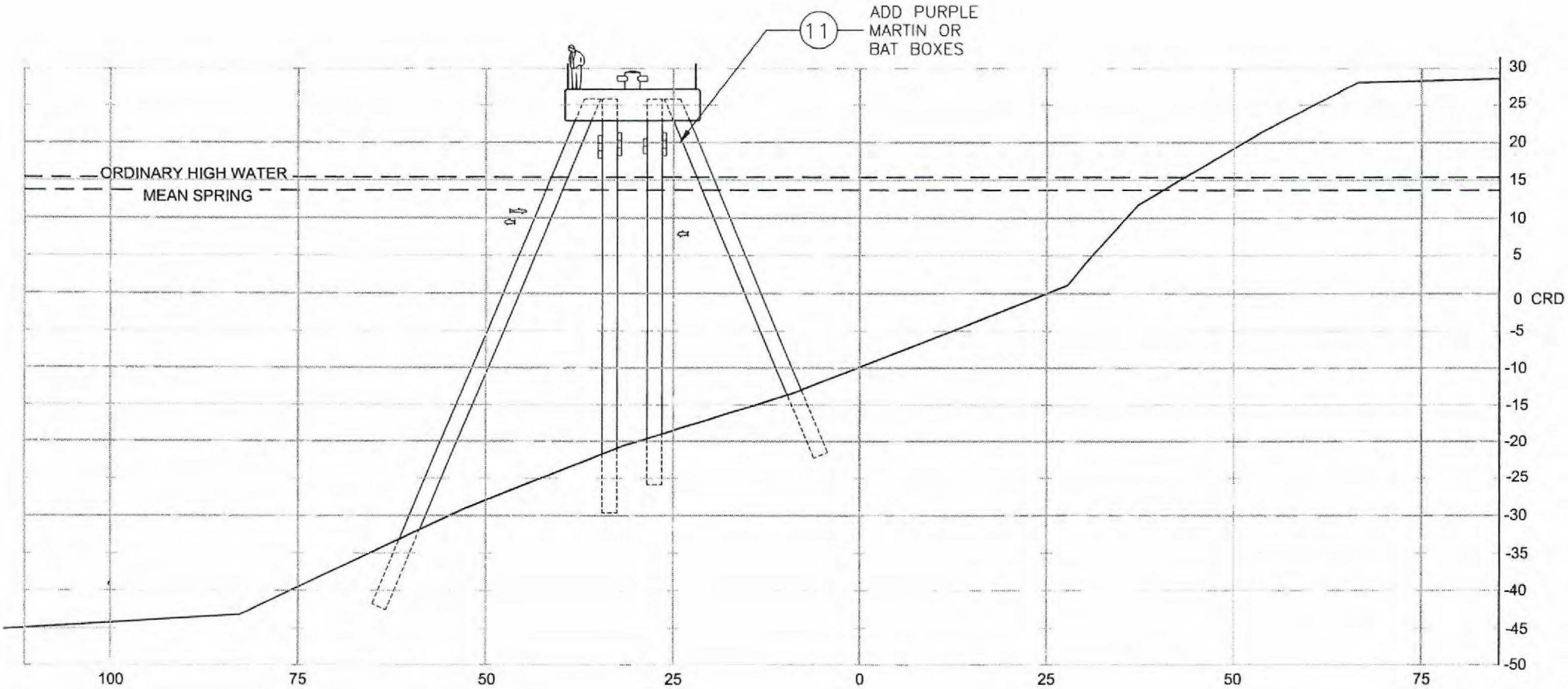
Port of Vancouver USA

Natural Resources Inventory Management Plan

Dolphin / Fender Pile Treatments

VIGIL AGRIMIS, INC.
Engineering, Landscape Architecture, Environmental Science

HERRERA

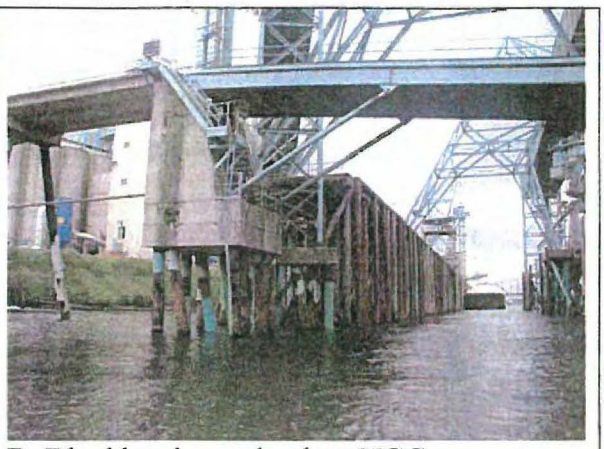


EX-0022-000146-PCE

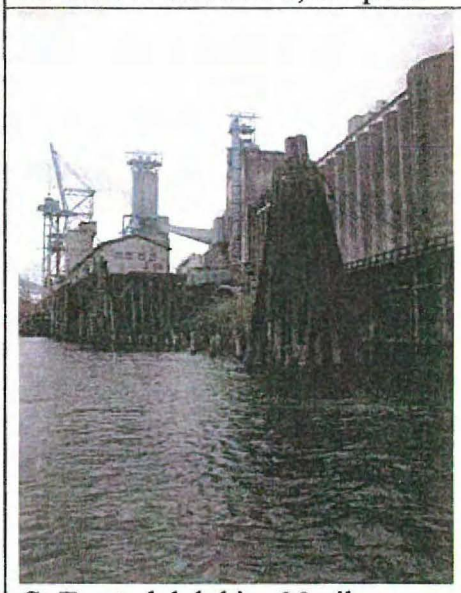
Appendix D: Mitigation Survey Photographs

(Port Staff Boat Survey May 10, 2004)

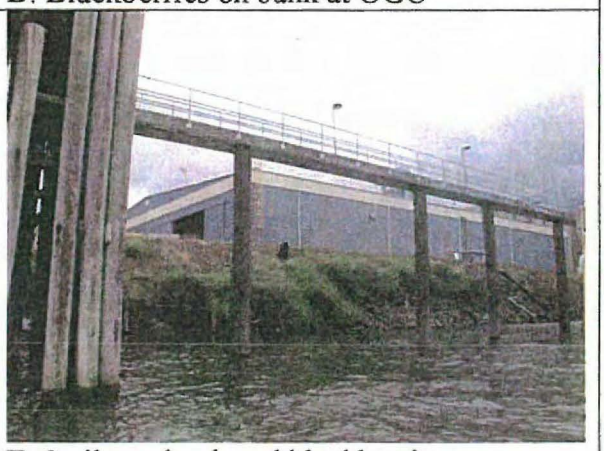
A: UGC Dock: 800-1,000 piles



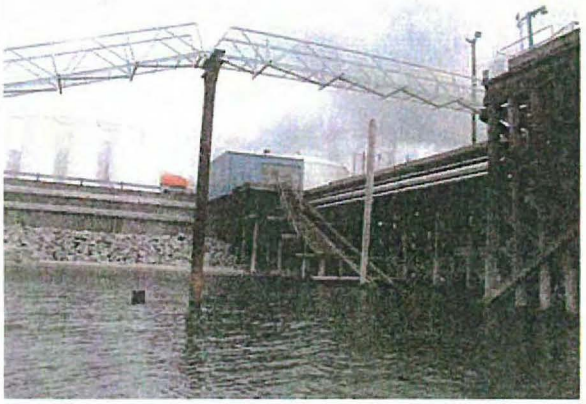
B: Blackberries on bank at UGC



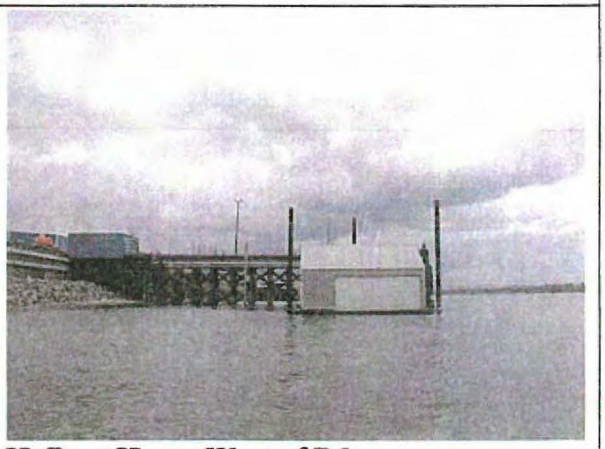
C: Treated dolphin: 30 piles



E: 3 pile on bank and blackberries



G: Old Boat Launch West of B5: 18 piles



H: Boat House West of B5

J: Blackberries and debris on bank

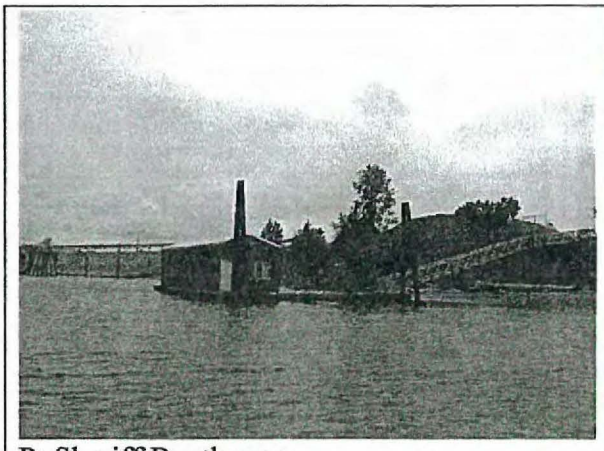
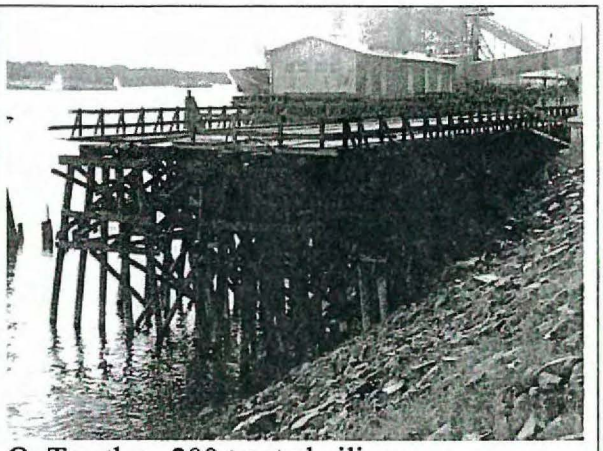
K: Treated pilings and debris along bank between Berths 8 and 9

L: 3 pile and treated debris on bank

M: 2 pilings

N: Dolphin: 4 pile

O: Steel/Concrete Dolphin: 12 pile

 P: Sheriff Boathouse	 Q: Trestle: ~200 treated pilings
No photos for sites D, F, I,	

Appendix E: Costs

Preliminary Cost Estimate

Project: **Port of Vancouver Natural Resources Inventory Management Plan**

Description of Work: 200 feet of bank restoration on gradually sloping shoreline - Figure 16.

Assumptions: Revegetation at site not covered by Coast Guard security requirements. 2-year flood water level at El 14. Spring water level at El 11. Approx. 5000 SF w/average of 6 trees/1000 SF=30. Approx. 6000 SF w/average of 35 shrubs/1000 SF=210.

Number	Description	Quantity	Units	Unit Price	Total Price	Comment
1	Mobilization	1	LS		$1,613.60	
	TESC (Temporary Erosion and Sediment Control)					
	Straw wattles	400	LF	$3.00	$1,200.00	
2	Revegetation					
	1 Riparian trees in clusters of 3 to 9	30	EA	$50.00	$1,500.00	
	2 Riparian shrubs in drifts/masses of 20 to 50	210	EA	$7.00	$1,470.00	
	3 LWD in small groups at 200' oc	8	EA	$2,000.00	$16,000.00	
3	Contingency at 10%				$2,017.00	
Subtotal					$23,810.00	
	Contractor's Overhead @ 10%				$2,381.00	
	Profit @ 5%				$1,191.00	
	Insurance at 2%				$477.00	
Subtotal					$27,860.00	
	Sales Tax @7.7%				$2,146.00	Calculated with Sales Tax
	Bond @3%				$901.00	
					$30,910	

Preliminary Cost Estimate

Project: **Port of Vancouver Natural Resources Inventory Management Plan**

Description of Work: 200 feet of bank restoration on moderately sloping shoreline with wood cribbing. Figure 17.

Assumptions: Wood piles and LWD used to construct wood/concrete cribs for grade control. 60 foot at 2:1 ratio bury versus stickup, doug fir peeled, delivered 6$/ft - plus $300 to drive a piece. Pile driving from barge. Revegetation at site not covered by Coast Guard security requirements. 2-year flood water level at El 15. Spring water level at El 13. Approx. 6000 SF w/average of 35 shrubs/1000 SF=210.

Number	Description		Quantity	Units	Unit Price	Total Price	Comment
1	Mobilization		1	LS		$25,869.60	
	TESC (Temporary Erosion and Sediment Control)						
		Straw wattles	200	LF	$3.00	$600.00	
		Silt curtain	250	LF	$14.00	$3,500.00	
		Dewatering	8	DAY	$700.00	$5,600.00	
2	Crib structure -lower levels (2)						
	4	Wood piles (10" dia., 12' oc)	80	EA	$380.00	$30,400.00	From barge
	4	12 - 18" crib logs	120	EA	$300.00	$36,000.00	20-50' long
	4	12 - 18" crib logs w/ root wads	40	EA	$500.00	$20,000.00	20-50' long
	4	12" anchor logs w/ rootwads	40	EA	$500.00	$20,000.00	20-50' long
	4	wood lagging	400	LF	$8.00	$3,200.00	2x10s lagged to 40' high
3	Crib structure-upper level (2)						
	4	Wood piles (10" dia., 12' oc)	80	EA	$380.00	$30,400.00	From barge
	4	12 - 18" crib logs	120	EA	$300.00	$36,000.00	20-50' long
	4	12 - 18" crib logs w/ root wads	40	EA	$500.00	$20,000.00	20-50' long
	4	12" anchor logs w/ rootwads	40	EA	$500.00	$20,000.00	20-50' long
	4	wood lagging	400	LF	$8.00	$3,200.00	2x10s lagged to 40' high
4	Dredge Fill						
	6	Dredge spoil staging and offload	7	DAY	$500.00	$3,500.00	
	6	Dredge spoil placement	8000	CY	$9.00	$72,000.00	From barge
5	Revegetation						
	5	Riparian trees in clusters of 3 to 9	30	EA	$50.00	$1,500.00	
	5	Riparian shrubs in drifts/masses of 20 to 50	210	EA	$7.00	$1,470.00	
	5	LWD in small groups at 200' oc	8	EA	$2,000.00	$16,000.00	
6	Contingency at 10%					$32,337.00	
Subtotal						$381,580.00	
	Contractor's Overhead @ 10%					$38,158.00	
	Profit @ 5%					$19,079.00	
	Insurance at 2%					$7,632.00	
Subtotal						$446,450.00	
	Sales Tax @7.7%					$34,377.00	Calculated with Sales Tax
	Bond @3%					$14,425.00	
						$495,260	

Preliminary Cost Estimate

Project: Port of Vancouver Natural Resources Inventory Management Plan

Description of Work: 200 feet of shallow water/nearshore habitat improvement at existing piles. Figure 18.

Assumptions: Steel lagging can be attached to existing piles. Water depth at lower level makes scuba installation more economical than dewatering for installation. Upper level installed terrestrially. 2-year flood water level at El 15. Spring water level at El 13.

Number	Description	Quantity	Units	Unit Price	Total Price	Comment
1	Mobilization	1	LS		$43,400.00	
	TESC (Temporary Erosion and Sediment Control)					
	Silt curtain	250	LF	$14.00	$3,500.00	
2	Crib structure -lower level)					
	8 Attach steel lagging (c 10x30)	4000	LF	$40.00	$160,000.00	Scuba installation
3	Crib structure-upper level (2)					
	8 Attach steel lagging (c 10x30)	2000	LF	$20.00	$40,000.00	Normal installation
4	Dredge Fill					
	9 Dredge spoil staging and offload	10	DAY	$500.00	$5,000.00	
	9 Dredge spoil placement	12000	CY	$9.00	$108,000.00	From barge
5	Provide Light Wells					
	10 2" OC cross bars, 2.25"x3/16"	7,500	SF	$30.00	$225,000.00	
6	Provide Bat Boxes					
	11 Wood boxes mounted to steel piles 20' OC	10	EA	$100.00	$1,000.00	
7	Contingency at 10%				$54,150.00	
Subtotal					$640,050.00	
	Contractor's Overhead @ 10%				$64,005.00	
	Profit @ 5%				$32,003.00	
	Insurance at 2%				$12,801.00	
Subtotal					$748,860.00	
	Sales Tax @7.7%				$57,663.00	Calculated with Sales Tax
	Bond @3%				$24,196.00	
					$830,720	

Preliminary Cost Estimate

Project: **Port of Vancouver Natural Resources Inventory Management Plan**

Description of Work: 200 feet of shallow water/nearshore habitat improvement with partial pile and dock removal. Figure 19.

Assumptions: Steel lagging can be attached to existing piles. Water depth at lower level makes scuba installation more economical than dewatering for installation. Upper level installed terrestrially. 2-year flood water level at El 15. Spring water level at El 13. Approximately 6000 SF of riparian shrub enhancement consistent with Coast Guard security regulations.

Number	Description		Quantity	Units	Unit Price	Total Price	Comment
1	Mobilization		1	LS		$35,477.60	
	TESC (Temporary Erosion and Sediment Control)						
		Silt curtain	250	LF	$14.00	$3,500.00	
2	Crib structure -lower levels (1)						
	8	Attach steel lagging (c 10x30)	4000	LF	$40.00	$160,000.00	Scuba installation
3	Crib structure-upper level (2)						
	8	Attach steel lagging (c 10x30)	2000	LF	$20.00	$40,000.00	Normal installation
4	Dredge Fill						
	9	Dredge spoil staging and offload	10	DAY	$500.00	$5,000.00	
	9	Dredge spoil placement	12000	CY	$9.00	$108,000.00	From barge
5	Cut and remove piles and decking						
	a	Cut and remove piles	24	EA	$2,000.00	$48,000.00	
	b	Cut and remove decking	7,500	SF	$10.00	$75,000.00	
6	Provide Bat Boxes						
	11	Wood boxes mounted to steel piles 20' OC	10	EA	$100.00	$1,000.00	
7	Remove Hilmalayan blackberries and install shrubs						
	2	Remove Himalayan blackberries	1,000	SF	$1.50	$1,500.00	
	2	Riparian shrubs in drifts/masses of 20 to 50	210	EA	$7.00	$1,470.00	
8	Contingency at 10%					$36,450.00	
Subtotal						$515,400.00	
	Contractor's Overhead @ 10%					$51,540.00	
	Profit @ 5%					$25,770.00	
	Insurance at 2%					$10,308.00	
Subtotal						$603,020.00	
	Sales Tax @7.7%					$46,433.00	Calculated with Sales Tax
	Bond @3%					$19,484.00	
						$668,940	

Preliminary Cost Estimate

Project: Port of Vancouver Natural Resources Inventory Management Plan

Description of Work: 200 feet of shallow water/nearshore habitat improvement with existing dense piles. Figure 20.

Assumptions: Steel lagging can be attached to existing piles. Water depth at lower level makes scuba installation more economical than dewatering for installation. Upper level installed terrestrially. 2-year flood water level at El 15. Spring water level at El 13.

Number	Description	Quantity	Units	Unit Price	Total Price	Comment
1	Mobilization	1	LS		$46,600.00	
	TESC (Temporary Erosion and Sediment Control)					
	Silt curtain	250	LF	$14.00	$3,500.00	
2	Crib structure -lower levels (1)					
	8 Attach steel lagging (c 10x30)	4000	LF	$40.00	$160,000.00	Scuba installation
3	Crib structure-upper level (4)					
	8 Attach steel lagging (c 10x30)	4000	LF	$20.00	$80,000.00	Normal installation
4	Dredge Fill					
	9 Dredge spoil staging and offload	10	DAY	$500.00	$5,000.00	
	9 Dredge spoil placement	12000	CY	$9.00	$108,000.00	From barge
5	Provide Light Wells					
	10 2" OC cross bars, 2.25"x3/16"	7,500	SF	$30.00	$225,000.00	
6	Provide Bat Boxes					
	11 Wood boxes mounted to steel piles 20' OC	10	EA	$100.00	$1,000.00	
7	Contingency at 10%				$58,150.00	
Subtotal					$687,250.00	
	Contractor's Overhead @ 10%				$68,725.00	
	Profit @ 5%				$34,363.00	
	Insurance at 2%				$13,745.00	
Subtotal					$804,090.00	
	Sales Tax @7.7%				$61,915.00	Calculated with Sales Tax
	Bond @3%				$25,981.00	
					$891,990	

Preliminary Cost Estimate

Project: **Port of Vancouver Natural Resources Inventory Management Plan**

Description of Work: 200 feet of bank restoration on steeply sloping shoreline with pile removal. Figure 21.

Assumptions: Removal of piles to 2' below ground surface. 2-year flood water level at El 15. Spring water level at El 13.

Number	Description	Quantity	Units	Unit Price	Total Price	Comment
1	Mobilization	1	LS		$27,640.00	
	TESC (Temporary Erosion and Sediment Control)					
	Silt curtain	250	LF	$14.00	$3,500.00	
	Dewatering	20	DAY	$700.00	$14,000.00	
2	Cut and remove piles and decking					
	12 Cut and remove piles	190	EA	$1,200.00	$228,000.00	From barge
	12 Cut and remove decking	10,000	SF	$10.00	$100,000.00	20-50' long
6	Contingency at 10%				$34,550.00	
Subtotal					$407,690.00	
	Contractor's Overhead @ 10%				$40,769.00	
	Profit @ 5%				$20,385.00	
	Insurance at 2%				$8,154.00	
Subtotal					$477,000.00	
	Sales Tax @7.7%				$36,729.00	Calculated with Sales Tax
	Bond @3%				$15,412.00	
					$529,150	

Preliminary Cost Estimate

Project: Port of Vancouver Natural Resources Inventory Management Plan

Description of Work: 200 feet of shallow water/nearshore habitat improvement with partial pile and dock removal. Figure 22.

Assumptions: Steel lagging can be attached to existing piles. Water depth at lower level makes scuba installation more economical than dewatering for installation. Upper level installed terrestrially. 2-year flood water level at El 15. Spring water level at El 13. Approximately 6000 SF of riparian shrub enhancement consistent with Coast Guard security regulations.

Number	Description	Quantity	Units	Unit Price	Total Price	Comment
1	Mobilization	1	LS		$65,320.00	
	TESC (Temporary Erosion and Sediment Control)					
	Silt curtain	250	LF	$14.00	$3,500.00	
2	Crib structure -lower levels (1)					
	8 Attach steel lagging (c 10x30)	3000	LF	$40.00	$120,000.00	Scuba installation
3	Crib structure-upper level (4)					
	8 Attach steel lagging (c 10x30)	4000	LF	$20.00	$80,000.00	Normal installation
4	Dredge Fill					
	9 Dredge spoil staging and offload	10	DAY	$500.00	$5,000.00	
	9 Dredge spoil placement	8000	CY	$9.00	$72,000.00	From barge
5	Cut and remove piles and decking					
	12 Cut and remove piles	280	EA	$1,200.00	$336,000.00	
	12 Cut and remove decking	20,000	SF	$10.00	$200,000.00	
6	Contingency at 10%				$61,650.00	
Subtotal					$943,470.00	
	Contractor's Overhead @ 10%				$94,347.00	
	Profit @ 5%				$47,174.00	
	Insurance at 2%				$18,870.00	
Subtotal					$1,103,870.00	
	Sales Tax @7.7%				$84,998.00	Calculated with Sales Tax
	Bond @3%				$35,667.00	
					$1,224,540	

Attachment 4: Copy of WDFW Policy POL 5210

Effective Date: 05/02/11

POLICY – 5210

See Also: **RCW 42.56.430(2)**
POL-1005
POL-5301, PRO-5301

Approved by: /s/ Phil Anderson

POL - 5210 RELEASING SENSITIVE FISH AND WILDLIFE INFORMATION

This policy applies to all WDFW employees, volunteers, contractors, and parties holding fish and wildlife information that the Director has determined to be sensitive (Appendix A). This policy is updated to be in compliance and consistent with RCW 42.56.430.

Definitions:

Sensitive Fish and Wildlife Information: Designation of fish and wildlife data as "sensitive" is under the discretion of the Director, but must meet the following criteria:

1. The nesting sites or specific locations of endangered species designated under RCW 77.12.020, or threatened or sensitive species classified by rule of the Commission (232-12-011, 232-12-014); or

2. Radio frequencies used in, or locational data generated by, telemetry studies; or

3. Other location data that could compromise the viability of a specific fish or wildlife population, and where at least one of the following criteria is met:

    A. The species has a known commercial or black-market value.

    B. There is a history of malicious take of that species and the species behavior or ecology renders it especially vulnerable.

    C. There is a known demand to visit, take, or disturb the species.

    D. The species has an extremely limited distribution and concentration.

Sensitive fish and wildlife information does not include data related to reports of predatory wildlife as specified in RCW 77.12.885.

1. **Washington State Law Exempts Sensitive Fish and Wildlife Information From Public Inspection and Copying.**

2. **Employees Shall Only Release Sensitive Fish and Wildlife Information to the Following Entities and Their Agents (e.g., Consultants) for Fish, Wildlife, Land Management Purposes, or Scientific Research Needs:**

   A. Government agencies.

   B. Tribes.

   C. Accredited colleges and universities.

   D. The owner, lessee, or right-of-way or easement holder of private land to which the data pertain or who initially provided the data.

   E. Public utilities.

3. **The Release of Sensitive Fish and Wildlife Data May be Subject to a Confidentiality Agreement by Means of a WDFW Sensitive Fish and Wildlife Information Release Agreement.** The agreement must indicate that the signatory (person or organization) recognizes the appropriate guidelines and criteria for species listed in Appendix A for disseminating sensitive fish and wildlife information and has agreed to the provisions of this policy.

4. **Individuals and Organizations May Release Sensitive Fish and Wildlife Information Obtained From WDFW Subject to the Following Provision:**

   Parties holding sensitive fish and wildlife information obtained from WDFW may release it only to the parties listed in Section 2 of this policy when such a release accompanies an agreement to abide by the provisions of this policy.

5. **Employees May Release Sensitive Fish and Wildlife Information During Certain Governmental Activities.**

   The following activities constitute circumstances appropriate for the release of maps or other items that display sensitive fish and wildlife information. Any sensitive fish and wildlife information released in these circumstances shall abide by the other provisions of this policy:

   A. When working with citizen advisory committees.

   B. In public meetings and hearings, sensitive fish and wildlife information shall not be displayed at resolutions finer than 1:100,000. Maps or other media that display or refer to sensitive fish and wildlife information in accordance with this policy may not be reproduced or distributed. Metadata used in making these maps shall not be released unless the provisions in Section 3 of this policy are met. Answer specific questions only to the extent as provided in the

provisions of this policy.

C. Very small-scale maps (1:250,000) that display sensitive fish and wildlife information may be reproduced and distributed to the public.

6. The Director, or a Designee, May Alter Sensitive Fish and Wildlife Information Release Requirements in Emergencies.

In the event of an emergency, as defined by the Administrative Procedure Act, the Director, or a designee, may waive restrictions on the release of sensitive fish and wildlife information to assist in minimizing negative impacts to fish and wildlife, to assess damage, or to otherwise assist in managing the emergency. In the event of an emergency or a critical resource protection need, the Director, or a designee, may add a new species or habitat to Appendix A List of Sensitive Fish and Wildlife Information.

APPENDIX A

SENSITIVE FISH AND WILDLIFE INFORMATION

Information concerning the specific locations of the species and habitats listed below is considered to be fish and wildlife information that has been determined to be sensitive by the Director. Locations are not regarded as sensitive if they are generalized to the finest resolution allowable without a release agreement (see table below).

Note: Not all information related to a species or habitat may be considered sensitive. The information that is considered sensitive is indicated in the column titled "Information Considered Sensitive" in the table below. For example, the only sharp- tailed grouse information considered sensitive involves lek sites. The release of locations or other information related to lek sites would be restricted to the disclosure of *which* Township(s) have sharp- tailed grouse lek sites, but not *where* they occur.

Species or Habitat for Which Information is Considered Sensitive	Sensitive Criteria*	Information Considered Sensitive	Finest Resolution Allowable Without Release Agreement
FISH/SHELLFISH			
Northern abalone (C)	A,C	All	Township
REPTILES			
Pacific pond turtle (E) Painted turtle	A,D	All	Quarter-Township
California mountain kingsnake Sharptail snake Ringneck snake Striped whipsnake	A,C,D	All	Quarter-Township
Western rattlesnake Gopher snake Rubber boa Racer Night snake Northwestern garter snake Common garter snake Western terrestrial garter snake	A,B,C	Den sites and hibernacula	Quarter-Township

Species or Habitat for Which Information is Considered Sensitive	Sensitive Criteria*	Information Considered Sensitive	Finest Resolution Allowable Without Release Agreement
BIRDS			
Greater sage-grouse (T)	C,D	Leks	Township
Columbian sharp-tailed grouse (T)	C,D	Leks	Township
Ferruginous hawk (T)	B,C	Nest sites	Township
Golden eagle (C)	B,C	Nest sites	Township
Northern spotted owl (E)	B,C	All	Township
MAMMALS			
Big brown bat Keen's myotis Little brown myotis Townsend's big- eared bat Yuma myotis	B,C,D	Aggregations, maternity colonies, hibernacula; does not include sites in privately-owned buildings	Township
California myotis Canyon bat Fringed myotis Long-legged myotis Western long-eared bat Western small footed myotis	B,C,D	All occurrences in caves	Township

Townsend's ground squirrel (C) (*Urocitellus t. townsendii*)	B,C,D	All	Quarter-Township
Washington ground squirrel (C)	B,C,D	All	Quarter-Township
Gray wolf (E)	A,B,C,D	All	Township
Grizzly bear (E)	A,B,C,D	All	Township
Fisher (E)	A,B,C	Den sites	Section
Wolverine	A,D	All	Township
Lynx (T)	A,B,C	Den sites	Township
INVERTEBRATES			
Oregon silverspot butterfly (E)	A,C,D	All	Section
Taylor's checkerspot (E)	A,C,D	All	Section
Mardon skipper butterfly (E)	A,C,D	All	Section
Island marble butterfly (C)	A,C,D	All	Section
HABITATS			
Caves	B,C,D	All	Township

(E) – Endangered species
(T) – Threatened species
(S) – Sensitive species
(C) - Candidate